SYSTEMS ENGINEERING FUNCTIONAL REQUIREMENTS

for:

ROAD WEATHER INFORMATION SYSTEM

MINNESOTA DEPARTMENT OF TRANSPORTATION

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1.0 SCOPE OF APPLICATION PACKAGE

1.1 Basic Road Weather Information System (RWIS)

This document provides ***Functional Requirements*** (*FRs*) for for Road Weather Information System (RWIS) installations. A Road Weather Information System (RWIS) uses Environmental Sensor Stations (ESSs) in the field with sensors and processors, a communication system for data transfer, and central systems to collect and disseminate field data from numerous ESSs. These stations measure atmospheric, pavement, or water level conditions, or combinations of these. Central RWIS hardware and software are used to process observations from ESSs to develop forecasts and display or disseminate road weather information that can be easily interpreted by a manager to support decision making, for example via the Minnesota Maintenance Decision Support System (MDSS), or for the general public to use, for instance, via the Minnesota 511 Traveler Information system. The *FRs* focus on the field elements of ESSs.

Closed circuit television (CCTV) cameras at are typically provided at the ESS to observe field conditions on both weather and traffic. RWIS installations may also be integrated with automated fixed anti-icing spray technology (FAST) installations, and their data may be an input to the national Clarus weather system.

1.2 Other

[Reserved for new RWIS features and their characteristics. Please consult with appropriate Mn/DOT, FHWA, or local staff to develop needed scope description.]

2.0 REFERENCE DOCUMENTS

See *ConOps* Section 2. To that list add:
National ITS Architecture, V 6.1, http://www.iteris.com/itsarch/index.htm

3.0 FUNCTIONAL REQUIREMENTS AND VERIFICATION METHOD

Table 1 lists the pertinent Functional Requirements including Verification Method. Table 2 maps the ITS Needs and Services that were identified in the companion *ConOps* document for each feature (Table 2 of that document) to the *FRs* identified here, for traceability from the *ConOps* to the *FRs*.

4.0 SUPPORTING DOCUMENTATION

See associated *Checklist* for additional support documents.

Table 1 Functional Requirements for RWIS

ID	Functional Requirement	Verification Method*	Comments
RWIS	*Road Weather Information System*		
	Sensors		
RWIS-1	The field element shall include surface and sub-surface environmental sensors that measure road surface temperature, moisture, icing, salinity, and other measures, as specified in the plans.	I, D	
RWIS-2	The field element shall include environmental sensors that measure weather conditions including temperature, wind, humidity, precipitation, and visibility, as specified in the plans.	I, D	
RWIS-3	The field element shall include sensors that measure water level and temperature, as specified in the plans.	I, D	
RWIS-4	When specified in the plans, the field element shall collect traffic data vehicle speed, length, and classification.	I, D	
RWIS-5	When specified in the plans, the field element shall include a pan-tilt-zoom CCTV camera.	I, D	
RWIS-6	When specified in the plans, the field element shall share power and communications with other device subsystems such as CORS GPS stations, soil temperature/moisture grids, traffic information systems, and weigh-in-motion stations.	I, D	
	Control and Monitoring		
RWIS-7	The field element's environmental sensors shall be remotely controlled by a maintenance center, an RWIS control center, a traffic management center, or a maintenance and construction vehicle, as specified in the plans.	I, D	

* D - Demonstration
T - Test
A - Analysis
I - Inspection

Table 1 Functional Requirements for RWIS (continued)

ID	Functional Requirement	-	Approval Date
	Control and Monitoring (cont.)		
RWIS-8	The field element shall provide environmental sensor equipment operational status to the controlling center or maintenance vehicle.	I, D	
RWIS-9	The field element shall provide environmental sensor equipment fault indication to the controlling center or maintenance vehicle.	I, D	
	Data Flow and Interface		
RWIS-10	When specified in the plans, the field element shall remotely aggregate environmental sensor data with environmental data collected from maintenance and construction vehicles.	I, D	
RWIS-11	When specified in the plans, the field element shall provide weather and road surface condition data via serial port or ethernet using standard protocols such as NTCIP 1204 or TCP/IP.	I, D	
RWIS-12	The field element shall provide weather and road surface condition data to various centers and systems as specified in the plans. Data recipients may include the Mn/DOT MDSS, Minnesota 511, the national Clarus system, the National Weather Service, and Private VAMS.	I, D	
RWIS-13	When specified in the plans, the field element shall provide traffic and weather data to the University of Minn. Duluth Transportation Data Research Laboratory and the Mn/DOT Office of Transportation Data and Analysis.	I, D	
RWIS-Oth	*Other*		
RWIS-Oth-1	*[Develop as appropriate]*		

* D - Demonstration
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Table 2 Mapping of RWIS Needs/Services to Functional Requirements

Feature	Needs/Services		ITS Functional Requirements
Road Weather Information System	WZ04	Provide automated monitoring of road weather conditions	RWIS-1 thru -4, and -6 thru -13
	TM04	Provide cameras at locations with high incidents and areas of high importance for incident identification and verification	RWIS-5
	TM12	Reduce clearance time for primary crashes	RWIS-5
Other		*[Develop as appropriate]*	

Needs/Services per *Minnesota Statewide Regional ITS Architecture* (March 2009)

Needs/Services Key:
WZ - Work Zone
TM - Traffic Management

See Table 1 for Functional Requirements content.