

ITS specification

General requirements

(ITS-01-01)

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Document management plan

1) Purpose

The purpose of this document is to specify the general requirements for ITS equipment and systems design and installation.

2) Document information

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3) Key words

ITS Supply and Installation General Requirements.

Record of amendments

Amendment number	Section amended	Description of change	Updated by	Effective date
Draft R 0	All	ITS Draft Specifications Issue	TLH	24/9/2010
Draft R1	All	AMA Specifications Review	JF & TLH	25/1/2011
Final R2	All	Updated following consultation comments	PTA	9/1/2012
Final R3	All	Provisional	BW & JS	14/2/2012

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1.0 Introduction

1.1 Project description

The NZ Transport Agency (NZTA) is continuing to develop and implement Intelligent Transportation Systems on the Motorway network to enhance the efficiency and safety of the State Highway system.

The equipment and systems supplied and installed under these projects must be compatible with existing equipment and the existing operating systems. They must also be designed with future requirements in mind, especially with the continual developments within ITS.

The equipment and systems supplied and installed under ITS contracts shall comply with the requirements of the NZTA's ITS specifications included in the contract documents.

1.2 Scope of work

The scope of work and the functional requirements for the ITS equipment and systems supplied and installed typically consist of the following:

- a. Communications Infrastructure, including power, fibre optic cable and roadside communications cabinets;
- b. Vehicle Detection Systems including inductive loops and the traffic counting system;
- c. Lane Control System;
- d. Ramp Signalling System;
- e. Variable Message Signs;
- f. Closed Circuit Television Surveillance;
- g. Incident Detection Systems including automatic video incident detection and over-height vehicle detection;
- h. Motorway Emergency Telephones;
- i. Testing, Commissioning and Handover of the ITS equipment and systems supplied and installed to the NZTA Traffic Operations Centre.

2.0 Documentation

2.1 General

This section details the minimum requirements for Documentation that shall be provided by the Contractor.

Documentation submissions are directly linked to the concept of Quality Assurance.

Documentation shall be of the same quality as the existing systems documentation. The same numbering systems and conventions shall be used. Aside from the title block content, the documentation supplied shall look identical to the existing.

Copies of the existing documentation are available for inspection during the tender phase.

All text documentation shall be in A4 format.

All submissions including drawings and diagrams shall be written in English.

Documentation shall use standard text sizes and be bound with a rigid and durable cover.

All design drawings shall use the S.I. metric system of measurements.

Schematics and diagrams shall be incorporated within the documents where appropriate to assist in ensuring a clear concise document is provided.

All documentation shall be submitted to the Engineer for review and comment. The Contractor shall act on comments returned and amend the documents accordingly.

The Contractor shall make adequate time and resources allowance in his programme for the preparation, submission and amendment of all required submissions to the satisfaction of the Engineer.

The Contractor shall submit a complete documentation package incorporating all of the requirements for each submission to the Engineer for Acceptance within the time frames listed in the contract documents.. Acceptance of all of the documentation by the Engineer shall be the criteria for the achievement of a payment milestone.

The following sections outline the submissions to be made as part of this Contract.

2.2 Preliminary documentation

In accordance with the Contract timescales, for any Variation to the Contract instructing the design and construction of the Works referred to herein, the Contractor shall submit to the Engineer:

- a. A preliminary programme of works;
- b. Preliminary Functional Requirements documents.

2.3 Detail design documentation

Within a suitable time agreed with the NZTA of the award or any Variation to the Contract instructing the design and construction of the Works referred to herein, the Contractor shall submit detail design documentation of the overall system for the Engineer's review and comment.

For all major subsystems, the Contractor shall submit detailed design drawings and specifications of plant, equipment and works to the Engineer for review prior to making any commitment to purchase,

fabricate, erect, or construct any of the work. The Engineer will review the submissions only for general compliance with the specification.

The detail design documentation shall include but not be limited to:

- a. Project Layout Drawings for all items as required in the Scope of work. For supply contracts this shall be detail design drawings of items supplied. For Installation contracts this shall be layout drawings of equipment locations, cable routes etc
- b. Final Equipment Specifications for all electronic equipment to be installed under this contract;
- c. Schematic drawings showing equipment connections, including local site connections as well as connections to the backbone fibre optic cable;

The Contractor shall allow a period of time in the programme of works for obtaining the Engineer's comment on each submission of the detail design. This period of time shall only commence once all of the documents listed above have been received in full by the Engineer. Any delays resulting from the Engineer requesting revisions, or objecting, will not be reason for an extension of time to the contract. The length of the period of time allowed shall be as specified in the contract documents.

Review or acceptance by the Engineer does not in any way remove the obligation of the Contractor to comply with the requirements of the contract.

All detailed design documentation shall be as-built and submitted to the Engineer for comment and acceptance prior to any application for the Engineer to issue a Certificate of Practical Completion. Any comments will be acted upon by the Contractor and a final set of as-builts issued before Practical Completion is achieved and a certificate to this effect issued by the Engineer.

2.4 Test documentation

The Contractor shall submit, in accordance with the requirements of this Specification and the Contractor's Quality Plan both specific Test Documentation and Test Results.

All Test Documentation shall be submitted in accordance with the Contract timescale.

The Test Documentation shall detail the methodology for each of the test requirements. The methodology shall include objective of each test, test equipment required, location where tests will be completed, set up required for tests and a description of each test that will be completed. A sample of each form that will be completed during the testing, and that will form the test results, shall also be provided.

For all sub-system and system test procedures, the Contractor shall allow the Contract timescale in their programme for review and submission of comments by the Engineer. Final agreed procedures shall then be resubmitted in time to be approved prior to the testing taking place.

The Contractor shall document the results of all tests performed in accordance with the quality control test procedures and submit the results to the Engineer for review following the completion of the test activities.

All testing shall be independently verified.

Test results shall be submitted to the Engineer in accordance with the Contract timescale following completion of the test. In addition, following completion of all testing, the Contractor shall submit a Test result document that includes copies of all tests completed throughout the Contract.

3.0 ITS numbering system

3.1 General

All ITS field equipment, roadside communications cabinets and fibre optic cables, pull pits and jointing chambers shall be tagged in accordance with the following system.

3.2 ITS site and field equipment numbering

3.2.1 Auckland Motorway site numbering

An ITS field equipment site is defined by the fibre optic cable jointing chamber used for optical fibre communications. The site numbers assigned to the Auckland Motorway ITS backbone fibre optic cable Jointing

Chambers are:

- SH 1
Start at 5000 at Karangahape Road in the Central Motorway Junction and decrease in units of 10 to the north and increase in units of 10 to the south. The limits of the backbone fibre are currently Site 3410 at Puhoi and Site 6410 at the Drury Interchange.
- SH 16
Start at 0010 at Karangahape Road in the Central Motorway Junction and increase in units of 10 to the west, extending to 0880 at the SH 16 Brigham Creek Road Intersection.
Start at 8010 under Grafton Bridge in the Central Motorway Junction and increase in units of 10 to the east.
- SH 18
Start at 2000 at the SH 1 Constellation Drive Interchange and increase in units of 10 to the west extending to 2490 at Hobsonville SH 16 Interchange.
- SH 20
Start at 9510 at the Mangere Bridge north abutment and decrease in units of 10 to the north and increase in units of 10 to the south extending to 9990 at the SH 1 Manukau Interchange.
- SH 20A
Start at 2600 at the SH 20 / SH 20A Interchange and increase in units of 10 to the west extending to 2770 at the Auckland International Airport boundary.
- SH 20B
Start at 2900 at the Auckland International Airport boundary extending to 2980 at the SH 20 Puhinui Road Interchange.

A site may have more than one device (e.g. CCTV plus VDS) and more than one equipment cabinet.

3.2.2 ITS site number

The ITS Site number shall be labelled in the format “BBB-CCCC-D”. Typically 018-2020-W Upper Harbour Drive:

- a. where “BBB” is the state highway designation, e.g. 001, 016, 018 or 020

- b. where “CCCC” is the site number assigned to the Jointing Chamber.
- c. where “D” is the direction of the motorway section in relation to the CMJ on which the site is located
e.g.: N for SH 1 sites north of CMJ, S for SH 1 south of CMJ and SH 20 sites, E for SH 16 sites east of SH 1, W for SH 16 and SH 18 sites west of SH 1.

The site name must relate to the location of the site in relation to the adjacent road network and motorway interchanges, e.g. Greenlane South, Greenlane Interchange and Greenlane North.

The site name shall be unique as the name is generally used for identification of the communications equipment.

3.2.3 Field equipment numbers

All field equipment shall be tagged in accordance with the following system.

“A-BBB-CCCC-D”, typically V-018-0120-W :

- a. where “A” is C for PTZ CCTV, F for Fixed CCTV, V for VMS, L for LCS, D for VDS and R for Ramp Meter system equipment.
- b. where “BBB” is the state highway designation, e.g. 001, 016, 018 or 020
- c. where “CCCC” is the number assigned to the equipment item by the NZTA, Each type of equipment (e.g. CCTV, VMS) has its own set of numbers.
- d. where “D” is the direction of traffic on the carriageway on which the equipment is able to be accessed from, e.g.: N (northbound), S (southbound), E (eastbound) or W (westbound).

This tag shall be used on all drawings, field installations etc.

3.2.4 Ramp signalling system equipment numbers

Ramp Signalling System field equipment controlled by the ramp signal controller shall be tagged in accordance with the following system.

“A-BBB-RRRR-D-NN”, typically R-020-8013-N-S1

- a. where “A” is R for Ramp Signals, V for the AWS and VMS, L for LCS, D for the Vehicle Detection inductive queue and count loops.
- b. where “BBB” is the state highway designation, e.g. 001, 016, 018 or 020
- c. where “RRRR” is the SCATS identifier number assigned to the Ramp Meter and used for all the ramp meter equipment connected to the controller.

For the Type D AWS variable message signs that are not controlled by the ramp meter controller “RRRR” shall be the ITS site number assigned to the Jointing Chamber, typically V-020-9450-E without the “NN” field.

- d. where “D” is the direction of traffic on the carriageway on which the equipment is able to be accessed from, i.e. N (northbound), S (southbound), E (eastbound) or W (westbound).

Equipment on arterial roads should be given directions orthogonal to the mainline direction, i.e. when the motorway mainline directions are northbound (N) and southbound (S), the arterial road directions will be eastbound (E) and westbound (W).

- e. Where “NN” is the ramp meter system equipment identifier

S1 and S2 for the ramp signals

A1 and A2 for the Type A AWS

B1 and B2 for the Type B AWS

D1, D2 ... D4 for the Type D VMS

Q1, Q2 ... Q22 for the Queue Loops

C7, C8 ... C24 for the Count Loops

M10, M11 ... M34 for the Mainline Count Loops

This tag shall be used on all drawings, field installations etc.

3.3 ITS fibre optic cable numbering

3.3.1 Fibre optic cable chambers

Fibre optic cable chambers shall be labelled in the format

“A-BBB-CCCC-D”, Typically J-018-2020-W

- a. where “A” is P for Pull Pits and J for Jointing Chambers
- b. where “BBB” is the state highway designation, e.g. 001, 016, 018 or 020
- c. where “CCCC” is the number assigned to the Jointing Chamber.
- d. where “D” is the direction of traffic on the carriageway on which the chamber is located, e.g.: N (northbound), S (southbound), E (eastbound) or W (westbound).

3.3.2 ITS backbone fibre optic cable

In each Jointing Chamber the ITS Backbone fibre optic cables shall be labelled in the direction of the highway (north to south, east to west) in the format

“BBB-AA-FF-GGGG/CCCC” for backbone cable from previous chamber (GGGG)

“BBB-AA-FF-CCCC/HHHH” for backbone cable to next chamber (HHHH).

- a. where “BBB” is the state highway designation, e.g. 001, 016, 018 or 020
- b. where “AA” is the local fibre optic cable number
- c. where “FF” is the number of fibre cores in the backbone fibre optic cable
- d. where “CCCC” is the number assigned to the Jointing Chamber.
- e. where “GGGG” is the number assigned to the previous jointing chamber.
- f. where “HHHH” is the number assigned to the next jointing chamber

Typically for Jointing Chamber J-018-2020-W the backbone fibre cable would be numbered 018-01-96-2010/2020 for the cable from previous pit on the left side of the fibre schematic diagram and 018-01-96-2020/2030 for the cable from previous pit on the right side of the fibre schematic diagram.

3.3.3 Roadside control and network node cabinets

Roadside control and network node equipment cabinets shall be labelled in the format “E-CCC-D” typically E-202-W.

- a. where “E” is E for equipment cabinet.
- b. where “CCC” is the first three digits of the site number assigned to the Jointing Chamber.

-
- c. where “D” is the direction of traffic on the carriageway on which the chamber is located, e.g.: N (northbound), S (southbound), E (eastbound) or W (westbound).

3.3.4 Ramp signal controller cabinets

Ramp Signalling System signal controller cabinets shall be labelled in the format “E-RRRR-D” typically E-8006-N.

- a. where “E” is E for equipment cabinet.
- b. where “RRRR” is the SCATS identifier number assigned to the Ramp Meter and used for all the ramp meter equipment connected to the controller.
- c. where “D” is the direction of traffic on the carriageway on which the chamber is located, e.g.: N (northbound), S (southbound), E (eastbound) or W (westbound).

3.3.5 Local fibre optic cables

Local fibre optic cables to Equipment Cabinets shall be labelled in the format

“BBB-AA-GG-E-EEE-E”, typically 018-01-12-E-202-W

- a. where “BBB” is the state highway designation, e.g. 001, 016, 018 or 020
- b. where “AA” is the local fibre optic cable number
- c. where “GG” is the number of fibre cores in the local fibre optic cable
- d. where “E-EEE-E” is the destination equipment cabinet number.

3.4 Other regional site numbering

Numbering of ITS equipment in other regions shall be undertaken in accordance with the local regional practice. Consultation should be undertaken with the regional NZTA office and the regional maintenance contractor to ensure consistency within that region.

4.0 Reliability and availability

4.1 General

Electronic subsystems supplied are required to operate 24 hours per day, every day, and shall be supplied by the Contractor in accordance with the Specification and installed to minimise maintenance.

Evidence shall be provided demonstrating that the required reliability and availability will be met by the equipment offered.

Glossary of terms

AC	Alternating Current
ADSL	Asynchronous Digital Subscriber Line
AGC	Automatic Gain Control
AS	Australian Standards
ATMS	Advanced Traffic Management System
AVID	Automatic Video Incident Detection
BS	British Standards
AWS	Advanced Warning Signs
CCTV	Closed Circuit Television
CoPTTM	Code of Practice for Temporary Traffic Management
CSA	Cross Sectional Area
DC	Direct Current
DLP	Defects Liability Period
DMS	Dynamic Message Sign
EMC	electromagnetic compatibility
FAT	Field Acceptance Test
FCD	Field Control Device
FSORS	Full, Standardised, Object Range Support
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
HDPE	high Density Polyethylene
HRC	High Rupture Capacity
HSE	Health and Safety in Employment
HVU	High Volume Urban
IEC	International Electrotechnical Commission
LAN	Local Area Network
LCD	Liquid Crystal Display
LCS	Lane Control System
LCU	Lane Control Unit
LED	Light Emitting Diode
LFI	LCS Field Installation
LODMAT	Lowest Observed Daily Mean Air Temperature
MCB	Miniature Circuit Breaker

MDPE	Medium Density Polyethylene
MET	Motorway Emergency Telephone
MICC	Mineral Insulated Copper Clad
MIMS	Mineral Insulated Metal Sheathed
MOTSAM	Manual of Traffic Signs and Marking
MTBF	Mean Time Between Failure
NIWA	National Institute for Water and the Atmosphere
NS	Non Shielded
NTCIP	National Transportation Communications for ITS Protocol
NZS	New Zealand Standards
NZTA	NZ Transport Agency
O&M	Operation and Maintenance
OER	Octet Encoding Rules
OFDF	Optical Fibre Distribution Frames
OFDF	Optical Fibre Distribution Frame
OHS	Occupational safety and health
OTDR	Optical Time Domain Reflectometer
PAL	Phase Alternating Line
PDU	Power Distribution Unit
PE	Polyethylene
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
RCA	Road Controlling Authority
RCD	residual current device
RF	Radio Frequency
RMA	Resource Management Act
RTA	Roads and Traffic Authority
RU	Rack Unit
SAT	Site Acceptance Test
SC	Single Circuit
SCATS	Sydney Co-ordination Adaptive Traffic System
SCOP	Small Cable Overheat Protection
SE	Single Element
SMI	Structure and Identification of Management Information
STMF	Simple Transportation Management Framework

STMP	Simple Transportation Management Protocol
STMS	Site Traffic Management Supervisor
SWA	Single Wired Armoured
TCDM	Traffic Control Devices Manual
TCP	Transmission Control Protocol
TDM	Travel Demand Management
TMP	Temporary Traffic Management
TOC	Traffic Operations Centre
TPS	Thermal Plastic Sheathed
TTM	Temporary Traffic Management
UAT	User Acceptance Test
UPS	Uninterruptible Power Supply
UPVC	Unplasticised Polyvinyl Chloride
UV	Ultra Violet
VDS	Vehicle Detection Station
VFI	VMS Field Installation
VIP	Video Image Processor
VMS	Variable Message Signs
VoIP	Voice over IP
XLPE	Cross Linked Polyethylene