

ITS specification Inductive loops and feeder cables (ITS-03-01)

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Document management plan

1) Purpose

The purpose of this document is to specify the requirements for supply and installation of inductive loops and feeder cables.

2) Document information

Document name	<i>ITS specification: Inductive loops and feeder cables</i>	
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3) Key words

ITS Inductive Loops and Feeder Cables Requirements.

Record of amendments

Amendment number	Section amended	Description of change	Updated by	Effective date
Draft R0	All	ITS Draft Specifications Issue	JF/TLH	20/9/2010
Draft R1	All	AMA Specifications Review	JF & TLH	25/1/2011
Final R2	All	Provisional	BW & JS	14/2/2012

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1.0 General

1.1 Scope

This Section sets out the requirements for the supply and installation of inductive loops and feeder cables as part of Ramp Signalling System.

Ramp signal site layout is specified in NZTA's *ITS specification: Ramp signal site layout (ITS-05-01)*.

Requirements of ramp signal supply and installation is specified in NZTA's *ITS specification: Ramp signal supply and installation (ITS-05-02)*.

1.2 Loop configurations

The inductive loop configurations required for Ramp Meter System sites are:

- a. Dual inductive mainline loops;
- b. Dual inductive count loops in on-ramp and off-ramp lanes;
- c. Single queue loops in on-ramps and local arterial roads;
- d. Dual queue loops in on-ramps and local arterial roads.

1.3 Standard drawings

The standard drawing attached in Appendix A is provided for information as the basis for design and installation.

2.0 Design criteria

2.1 Loop identification

For the purpose of loop identification the loops shall be numbered from the left hand lane closest to the Toby box connected directly to the vehicle detector cabinet.

The loops shall be numbered in the direction of the traffic sequentially across the whole motorway carriageway.

Thus for a four lane motorway mainline loop set, loop 1 is the upstream loop in the left hand lane in one traffic direction, loop 2 is the downstream in the left hand lane, loop 7 is the upstream loop in the left hand lane in the opposite traffic direction and loop 8 is the downstream loop in the left hand lane in the opposite traffic direction. See Figure 1 below.

The loops shall have an identification marker attached and shall NOT have knots tied due to the risk of damage to the loop cable.

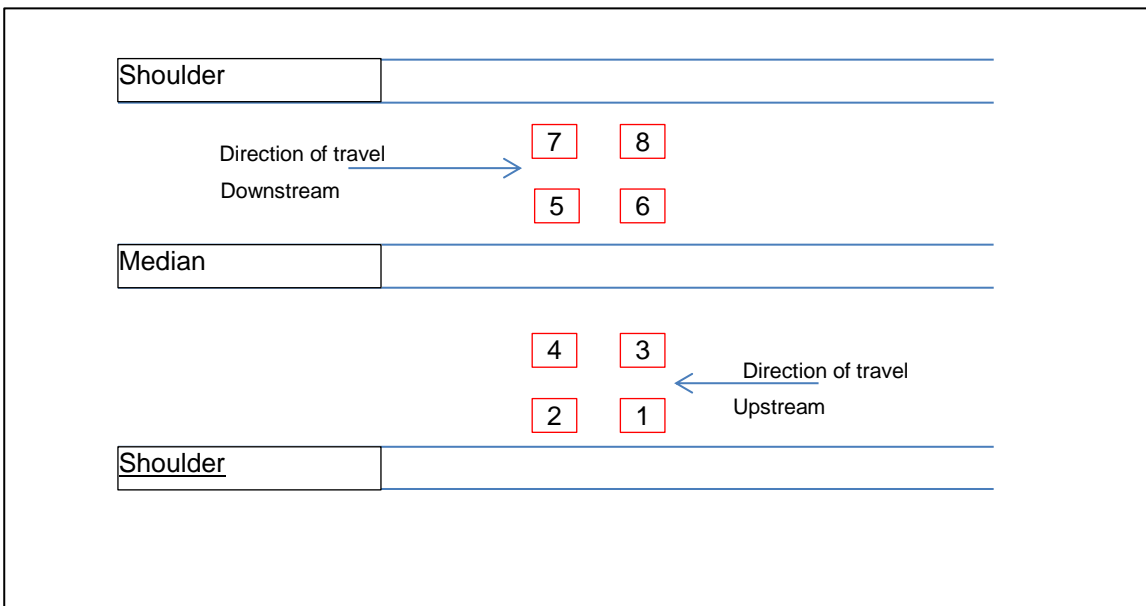


Figure 1

3.0 Civil and motorway site works

3.1 General

Loop feeder cable ducts shall be 50mm uPVC ducts installed in trenches in accordance with the NZTA's *ITS specification: Duct supply and installation* (ITS-02-01).

Loop feeder cable Toby boxes shall be constructed in accordance with the NZTA's *ITS specification: Jointing chambers and pull pits* (ITS-02-02).

3.2 Asphalt in shoulder

Where the pavement surface in the motorway shoulder is chip sealed a 25mm layer of asphaltic concrete 2.0m long shall be constructed across the full width of the shoulder from the carriageway asphaltic surfacing to the edge of the pavement.

The mid point of the asphaltic concrete strip shall be located so that the inductive loop wire tails can be cut directly to the shoulder Toby box.

The asphalt concrete shall be constructed in compliance with NZTA specifications P/9P and M10 and Project Specification Section 11.5: Asphalt Surfacing.

3.3 Feeder cable ducts across carriageways

Where a loop connection has to be made across a motorway median the feeder cable shall be installed in a cross carriageway duct from the far carriageway shoulder to the near carriageway shoulder. The cross carriageway duct shall be a 50mm uPVC duct installed between cable pits connected to the toby boxes installed in the shoulder. The installation of toby boxes in the median should be avoided where reasonably practicable.

4.0 Inductive loop installation

4.1 General

Installation of in-pavement inductive loops shall follow the recommendations of the NZTA Research Report No. 5: Installation and Maintenance of Inductive Detector Loops.

Loops shall be formed with single core polypropylene insulated wire with a nominal cross-sectional area of 1.5mm², and complying with AS/NZS2276.3:-2002 "Cables For Traffic Signal Installations, Part 3 - Loop Cable for Vehicle Detectors

The inductive loop wire shall be installed in 5mm wide by 30mm minimum depth saw-cut slot. The depth of the saw cut slot shall provide a minimum cover to the wire of 25mm. All saw cuts shall extend past the loop corners to ensure the full depth of cut throughout.

All saw cuts shall be straight to a tolerance of +/- 5mm of the standard loop dimensions.

Prior to placing the loop wire, the slot shall be dried and cleaned and free of debris to provide a smooth bed for the wire. The recommended method of doing this is with the use of compressed air.

The loop wire shall be "rolled" into the slot without damaging the insulation. This can be achieved using a thin disc such as a modified saw blade but not a screwdriver. Special care shall be taken at the corners to ensure the wire is curved rather than bent. Prior to sealing the slot, the loop shall be tested to ensure the insulation or wire is not damaged.

The loop shall have a resistance to earth of not less than 10 Mega-ohms

The loop wire shall be sealed with Trixophlate or an approved equivalent flexible epoxy sealant, ensuring a continuous seal over the complete length of the loop and loop tails. The sealant shall be finished flush to the road surface; sealing shall be done within 2 hours of saw cutting the loop.

4.2 Loop configuration

	Main line loops	Count Loops	Double Queue Loops	Single Queue Loops
Spacing between loops	3.0m	3.0m	1.0m	2.75m
Length of loop	2.0m	2.0m	1.75m	1.75m
Clearance from the lane edge	0.7m	0.7m	0.7m	0.7m

The standard drawing is attached in Appendix A.

Each pair of loops shall be aligned with and centred in each lane.

Each loop shall be formed from two or four turns of tinned copper wire dependent upon equipment requirements.

Each loop shall have tails brought out to a shoulder Toby box.

4.3 Inductive loop cable termination

Each loop wire tail shall be terminated in a roadside Toby Box. Terminations shall be made with water proof joints.

Each termination shall be clearly and unambiguously labelled to identify the lane and position of the loop.

A clean, dry, waterproof electrical connection between the loop feeder and each loop tail shall be made within the toby box using scotch-link 314 connections or similar.

The loop feeder cable shall meet the specification detailed in AS/NZS2276.3:-2002 "Cables For Traffic Signal Installations, Part 2 – Feeder Cable for Vehicle Detectors, and consist of single core polypropylene insulated cable with a nominal cross-sectional area of 1.5mm².

The loop feeder cable shall be continuous to the roadside cabinet where each loop feeder cable wire shall be clearly and unambiguously labelled to identify the lane and position of the loop to which it is connected.

4.4 Loop testing

Each loop shall be tested after installation and for acceptance in the presence of the Engineer.

The acceptance criteria for the inductive loops are:

- a. A minimum of 10 Mega ohm insulation resistance at 500V.
- b. A maximum of 10 ohm loop resistance, as measured at the ends of the loop tails.
- c. Inductance of 120 to 180 uH, as measured at the ends of the loop tails.

The Contractor shall inform the Engineer in writing in accordance with the Contract timescale of the Contractor's intent to undertake the loop testing. The Engineer or the Engineer's Representative will attend and witness the loop testing.

The Contractor shall record all test results and provide a written signed copy to the Engineer on completion.

4.5 As-built loop measurements

The Contractor shall measure the as-built dimensions of each loop, including the separation between dual loops and the off-sets between the edges of the loops and the lane lines or shoulder lines.

The measurements shall be recorded in millimetres and a signed copy of the loop as-built dimensions submitted to the Engineer with the loop test data on completion.

5.0 Loop feeder cable

The loop feeder cable is a continuous piece of cable that enables the loops to be connected to the relevant control equipment; each feeder cable shall meet the specification detailed in AS/NZS2276.2:-1998 "Cables For Traffic Signal Installations, Part 2 – Feeder Cable for Vehicle Detectors.

For ramp signal loop installations within 250m of the Controller the cable comprises of multiple cores with a nominal cross-sectional area of 1.5mm² shall be used.

For ramp signal loop installations greater than 250m from the Controller the cable comprises multiple cores with a nominal cross-sectional area of 0.75mm² shall be used.

Any loop feeder cable runs that are greater than 500m shall require the installation of an external detector. Preference is given to the exclusion of these devices; designs should aim to keep loop feeder runs to less than 500m where possible.

6.0 Appendix A: Drawings

Ramp Signal System Loop Details

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Ramp Signal System Loop Details