ITS specification

Civil and structural requirements (ITS-01-04)

First edition, Amendment 3

Effective from October 2013

NZ TRANSPORT AGENCY
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More information …

Published October 2013

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Document management plan

1) Purpose

The purpose of this document is to specify the requirements for support structures and associated foundations for ITS equipment and systems design and installation.

2) Document information

Document name	*ITS specification: Civil and structural requirements*	
Document number	ITS-01-04	
Document status	Provisional	
Document availability	This document is located in electronic form on the NZ Transport Agency's website at www.nzta.govt.nz.	
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3) Key words

ITS Installation Civil and Motorway Site Works Requirements, ITS Support Structures and Foundations Requirements

Record of amendments

Amendment number	Section amended	Description of change	Updated by	Effective date
0	All	ITS Draft Specifications Issue	TLH	20/9/2010
Draft R1	All	AMA Specifications Review	JF & TLH	25/1/2011
Final R2	All	Update following consultation	PTA & BW	09/01/2012
Final R3	All	Final	BW & JS	08/03/2012

Contents

1.0 General

1.1 Scope

This specification covers the minimum requirements for installation of structures and their associated foundations for the following NZ Transport Agency's (NZTA) ITS equipment:

- Closed Circuit Television (CCTV)
- Variable Message Signs (VMS)
- Lane Control Unit (LCU) and
- Ramp Signalling System (RSS) , including Advanced Warning Signs (AWS)

1.2 Standard drawings

The standard drawings attached in Appendix A are provided for information to provide a basis for design.

It should be noted that this document is not intended to be a detailed design guide.

It is anticipated that a detailed design will be provided for all structures and foundations associated with the project for review prior to construction or fabrication.

2.0 Provision of civil infrastructure to support roadside ITS equipment

The civil and motorway site construction works shall be carried out in accordance with the NZTA's standard specifications, including bituminous materials, concrete and earthworks/fill materials classification and testing. Safety barrier should be supplied in accordance with NZTA standard specification.

2.1 Roadside cabinet plinths and aprons

Roadside cabinets shall be supported on reinforced concrete plinths with a minimum thickness of 300mm and plan dimensions matching the external dimensions of the roadside cabinet.

At all roadside cabinet concrete aprons having a thickness of 100mm and 1 metre in width shall be constructed around all four sides of the cabinet plinth.

The surface of the concrete apron adjacent to the cabinet shall be 20mm below the inside of the cabinet plinth base, and the apron shall have a fall of 30mm towards the outer edges to shed storm-water runoff.

The apron concrete surface shall be lightly broomed in a transverse direction to provide a non slip finish.

The area surrounding the cabinets shall, if necessary shall be contoured to ensure that there is no ponding of surface runoff water and shall be re-topsoiled, grassed and finished in a workmanlike manner, in accordance with the contract specification.

2.2 Roadside cabinet duct connections

Each roadside cabinet plinth shall have six 100mm N.B. uPVC or HDPE long radius bend ducts terminated flush with the plinth top surface and extending to the perimeter of the cabinet apron where there shall be 600mm cover over the duct.

The cable ducts to the cabinet shall be connected to the bends and the spare bends should be capped at their outer ends.

Where loop feeder cable ducts are shown connected into a cabinet the connection may be made with a 50mm N.B. uPVC or HDPE long radius bend connected to the feeder cable duct.

2.3 Maintenance access areas

A paved access path shall be provided to all roadside control cabinets and all supporting structure sites connecting to a suitable hard standing area to give access for parking a maintenance vehicle.

For CCTV sites with fixed CCTV poles, or without demountable cameras, the hard standing area shall be designed to accommodate a "scissor lift" or "cherry picker" and its towing vehicle that will be used to gain access to all equipment. The paved area shall be sufficient to accommodate any stabiliser arms from the scissor lift or cherry picker.

For folding CCTV poles and overhead gantry structures the hard standing areas shall be designed to accommodate a maintenance vehicle. Access to maintenance ladders shall be from behind the safety

barrier. The access pad shall be of sufficient size to allow the folding CCTV pole to be lowered by maintenance personal. The additional area required to lower the pole should be solid, free of vegetation and free of standing water or mud.

Consultation should be undertaken with the relevant maintenance organisation regarding maintenance access requirements.

2.4 Site access barrier protection

The paved maintenance access area shall be sufficient to provide a safe working distance from the motorway traffic lanes and shall be protected by road safety barriers as required.

The Contractor shall be responsible for ensuring that safety barriers or guardrails are provided at all required locations in accordance with the latest NZTA policies, standards and guidelines.

Where concrete barriers are proposed they shall be of a similar type to that used adjacent to the particular maintenance area, and be interchangeable with other units used by the Purchaser on the NZTA motorway and expressway network.

All new pavement areas shall be designed to provide free draining finished surfaces. Where new works butt onto existing pavements, the new lines and levels shall match the existing.

Disposal of stormwater runoff shall be designed to comply with the NZTA and the relevant Local Authority requirements.

The area surrounding the control cabinets if necessary shall be contoured to ensure that there is no ponding of surface runoff water and earth areas are to be re-topsoiled, grassed and finished in a workmanlike manner.

2.5 Motorway lighting

The Contractor shall ensure that the ITS civil and motorway site works and structures along the motorway corridor do not create or induce lighting levels to change to be below the standard requirements for lighting levels on the motorway.

3.0 Gantry and pole support structure construction

3.1.1 General

Shop drawings for the supporting structures shall be submitted to the Engineer for comment within three weeks from the start of the contract prior to fabrication and construction.

All steel components shall be hot-dip galvanised.

3.1.2 Protective coatings

All VMS and LCS gantry structures and AWS support poles and brackets shall be hot dip galvanised steel in line with the following requirements:

a. AS/NZS 4680:1999 Hot-Dip Galvanised (zinc) coatings on fabricated ferrous articles.

b. AS/NZS 4791:1999 Hot-Dip Galvanised (zinc) coatings on ferrous open sections, applied by an in-line process.

c. AS/NZS 4792:1999 Hot-Dip Galvanised (zinc) coatings on ferrous hollow sections, applied by a continuous or specialised process.

d. AS 1650:1989 Hot dipped Galvanised coatings on ferrous articles

The protective coatings shall be either:

a. zinc with a dry film build-up of 0.350mm or

b. hot dip Galvanised the minimum thickness of zinc coating shall be in accordance with Table 1 of 2 of AS/NZS 4680:1999

All structural steel systems shall have protective coating suitable for the specific environment.

3.1.3 Excavation and construction material

Excavation and backfilling will be in accordance with NZTA standard specification.

Foundation concrete shall be poured against undisturbed surfaces free from loose material. Any unsuitable material shall be excavated and backfilled with blinding concrete, as directed by the Engineer. The final excavated surfaces shall be inspected and approved by the Engineer before the work proceeds. If excessive overbreak does occur, either temporary or permanent formwork may be used to form the foundation. The overbreak shall then be backfilled with 10MPa concrete or approved granular material to ensure no voids are present between the outside face of the foundations and the ground.

Care shall be taken to avoid disturbance of adjacent foundation material in the median strip and shoulders.

Granular backfill shall be compacted in 150mm layers using approved hand operated mechanical tamping equipment to the satisfaction of the Engineer and to a standard at least equivalent to that prior to excavation.

Concrete specification (including reinforcement and formwork) and testing shall be in accordance with NZTA standard specification.

3.1.4 Relevant standards

AS 1111: 2000	ISO metric hexagon bolts and screws
AS 1163: 1991	Structural steel hollow sections
AS 1252: 1996	High strength steel bolts with associated nuts and washers for structural engineering
AS/NZ 1554: 2008	Structural steel welding
AS/NZS 1866: 1997	Aluminium and aluminium alloys – extruded rod, bar, solid an hollow shapes
AS/NZS 2312: 2002	Guidelines to the protection of structural steel against atmospheric corrosion by use of protective coatings
AS/NZS 3678: 1999	Structural steel hot rolled plates, floor plates and slabs
AS/NZS 4506: 2005	Metal finishing – thermoset powder coatings
AS/NZS 4671: 2001	Steel reinforcing materials
NZS 3404: 1997	Steel structures standard
NZS 4680: 2006	Hot Dip galvanised coatings (zinc) on fabricated ferrous articles.

4.0 Closed Circuit Television (CCTV)

4.1 Design

4.1.1 Column type

Three types of CCTV support columns will be accepted by the NZTA:

c. Mid-Hinged Folding Column

d. Rigid Column

c. Wind down Column

Where the natural ground contour requires a column taller than 15m, the column and its associated foundation shall be designed to account for any additional loading and specific consideration shall be given to maintenance access.

The Principal's approval shall be obtained for the location and maintenance access provisions for any column taller than 15m.

4.1.2 Column design requirements

The supporting structures for all the CCTV installations shall be smooth sided vertical columns meeting the details of this specification and be similar in appearance to existing installations.

The CCTV units shall be independent units and shall be detachable from the supporting structure.

CCTV columns must comply with the following requirements:

a. The supporting column and foundation shall be designed to NZS1170 loadings and for the head-load of both a PTZ CCTV unit and an IP Web camera unit;

b. Total height of any Installation (including any aerials, lightning system elements, or any other hardware) shall not exceed 20m above grade due to a District Plan restriction;

c. Height of all installation components that may require regular service during their lifetime shall not exceed 15m above grade;

d. Installations shall be sited away from any other structures that might allow potential vandals easier access to them;

e. The supporting column shall not be fitted with any rungs, ladders, or any other fixture that might allow the general public to climb the structure.

f. The supporting column shall have sufficient internal clearance and provision for cables to be run internally up the length of the column;

g. Hinged folding columns shall have a protection system for the cables at the hinge location;

h. Hinged folding columns shall be proportioned and balanced with the installation of the CCTV units so that the hinged portion of the column will swing down to the base of the column under its own weight. The pole balancing weighting system must be simply adjustable to allow for future addition or removal of equipment.

i. Hinged folding columns shall be aligned and located to swing down parallel to and clear of any carriageway and clear of the site roadside control cabinet or any other obstructions.

j. The hinge of folding columns shall be clamped closed when raised.

k. A supporting chain or steel cable shall be installed to support communications and power cables feeding to equipment installed on the pole.

l. A padlock keyed to the local ATMS standard will be used to secure the pole from unauthorised lowering.

4.2 Construction

4.2.1 CCTV pole foundations

The standard CCTV pole foundation is a galvanised steel pole stub with a flange onto which the CCTV support column is bolted. The pole foundation stub shall be supplied to match the CCTV support column. If the CCTV support column is not supplied with a stub the CCTV pole foundation shall be constructed as specified in Section 6.2.

The cable duct from the CCTV pole to the roadside control cabinet shall be a 100mm N.B. extra high impact uPVC duct with long radius bends into the CCTV pole foundation stub and into the roadside control cabinet. The duct shall be supplied and installed in accordance with the NZTA's *ITS specification: Duct supply and installation* (ITS-02-01).

The supply and construction of concrete for the CCTV pole foundation shall comply with T-CES 101.

The concrete shall have a minimum compressive strength of 25MPa after 28 days.

The CCTV pole stubs shall be positioned and aligned to the following tolerances:

- Level of Top Face: ±3mm.
- Vertical Orientation of Pole Stub: ±0.1 degrees.

The CCTV pole foundation holding down bolts or pole stub bolt holes shall be aligned so that the hinged folding column is aligned and located to swing down parallel to and clear of any carriageway and clear of the site roadside control cabinet.

5.0 Variable Message Signs (VMS)

5.1 Design

5.1.1 Support structure options

This document provides guidance for the civil design of various types of VMS support structures:

- Gantry
- Single post mounted, including cantilever
- Dual post mounted

Figure 1: Typical mounting options for ATMS motorway VMS

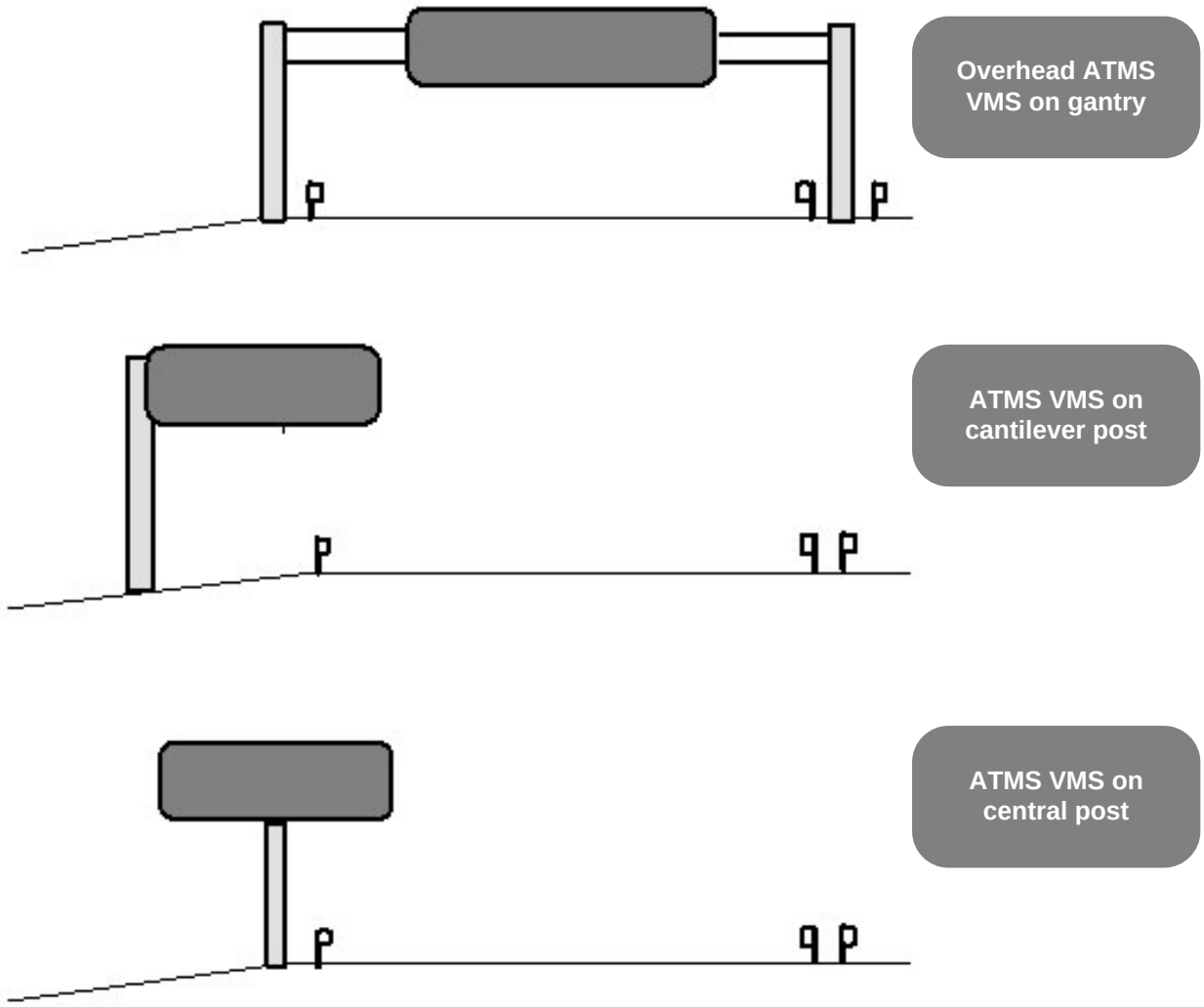
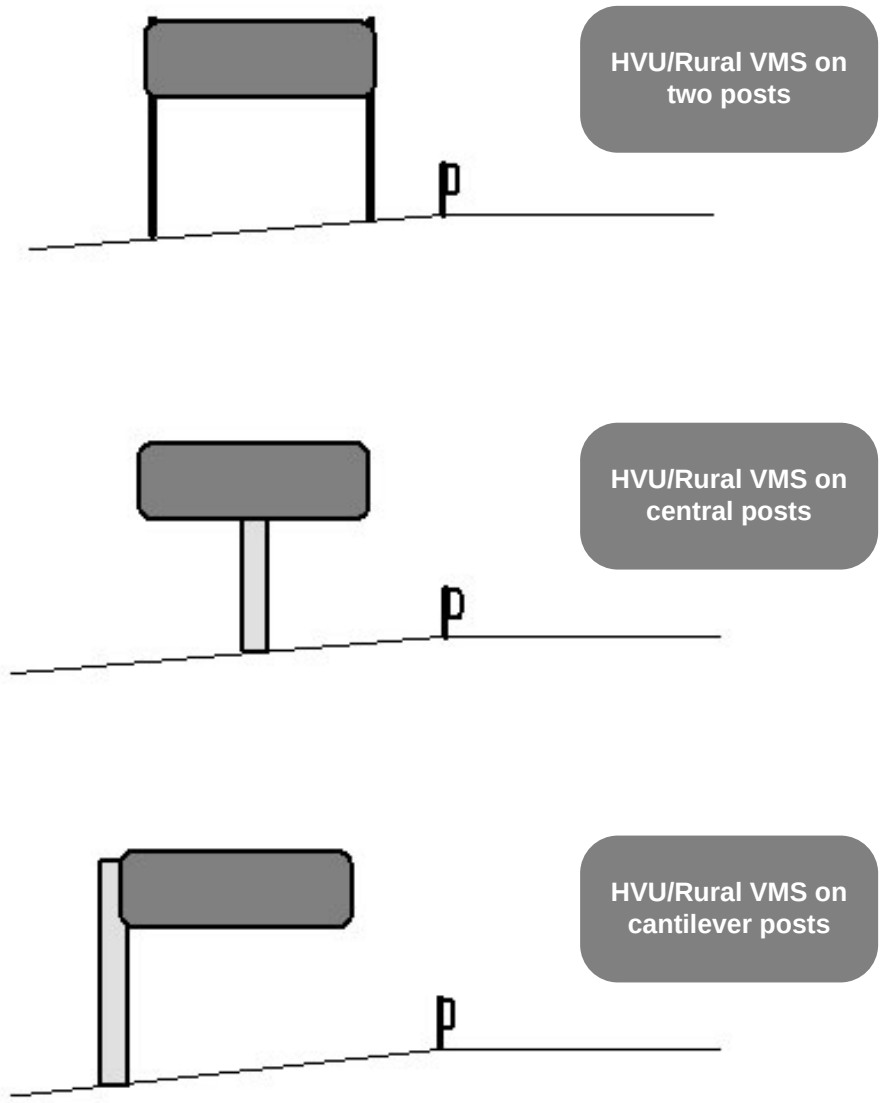


Figure 2: Typical mounting options for HVU and rural VMS



5.1.2 Prescribed design routes

There are two prescribed design routes for VMS support structures.

A. Standard solutions for regional VMS

Standard solutions are generic standardised designs for Regional VMS, where neither the sign support system nor the foundation requires further specific engineering design. Standard solutions are provided for:

- Two post support structures for Sign Types A, B, C, D & F
- Single post, centre mounted support structures for Sign Types A, B, C, D & F. These standard solutions do allow for offsets of the supporting pole from the centre of the sign to suit the particular site circumstances, up to the dimension limits given on the drawings.
- Single post rotating flange support structures for Sign Types C, D & F. These standard solutions are for constrained sites. The VMS can be rotated on the support structure to provide access for planned and reactive servicing.

Standard support structure designs are available through the NZTA National Office Network Operations – Customer Information Services Manager. The drawings contain standard foundations designs for specified ranges of geotechnical conditions. These standard support structures and foundation designs should be used where the site and ground conditions meet the standard design criteria.

B. Specific engineering design

Signs are subject to specific engineering design. Specific design is required in the following situations:

- Gantry signs
- Cantilever signs
- Single post centre mounted signs not meeting the requirements for use of a Standard Solution
- Dual post mounted signs not meeting the requirements for use of a Standard Solution

5.1.3 Standard solutions for regional VMS

Where the proposed sign and foundation soil conditions meet the standard design criteria, a "Standard Solution" sign support structure and foundation detail can be used for Regional VMS.

Construction drawings for Rural/HVU VMS support structure Standard Solutions are available from the NZTA National Office Network Operations CIS Manager.

Where the following requirements are met a Standard Solution VMS support structure may be used and no specific engineering design is required.

Foundation conditions for regional VMS

Before adopting a standard solution, site investigations shall be completed to confirm that the foundation soil meets the following minimum soil property requirements:

- For non-cohesive soils (sands/gravels) angle of internal friction (Φ) $\geq$ 25 degrees, and soil unit weight of 16 kN/cubic metre, for the dual post mounted signs
- For non-cohesive soils (sands/gravels) angle of internal friction (Φ) $\geq$ 33 degrees, and soil unit weight of 18 kN/cubic metre, for the single post centre mounted signs
- For cohesive soils (clay) a Cohesion (c) value of at least 50kPa
- The ground water level must be at or below the base of the footing

Face area of VMS sign panel

The standard solutions may only be used for signs that conform to the range of dimensions shown on the drawings. Note that the face panel dimensions ***must include the bezel***, as the wind loading calculations are based on the total face area.

Sign mounting height

The mounting height of standard solution signs, measured from ground level to the bottom edge of the enclosure, on flat ground shall be 3.0 metres. This is to ensure:

- Safety requirements are met when servicing from a ladder
- Vandalism is minimised
- Design wind loading requirements can be met

Site design wind speed

Site design wind speed for standard solution signs, determined in accordance with AS/NZS1170.2, shall not exceed 49 metres per second.

Structure importance level (AS/NZS 1170.0)

The standard solution sign "structure importance level" (refer to AS/NZS 1170) shall be:

- Category 3 for signs greater than 12 square metres (Regional VMS are usually smaller than this, but become Category 3 if they are located over the carriageway)
- Category 2 for signs between 4.7 and 12 square metres
- Category 1 for signs less than 4.7 square metres

For design loadings and other details relating to structure importance, refer to Table 5 of these Notes.

"Frangible" structures

Frangible structures must have an impact performance that meets NCHRP 350, or is deemed by the NZTA's Traffic and Safety Manager to meet the standard.

The following requirements shall also apply:

- The maximum weight of the above ground support structure and sign is 270kg.
- The post mass must be no more than 27kg per metre.
- Each leg of the structure must incorporate an approved slip base <100mm above ground level.
- Where an impact is likely to come from multiple directions, a multi directional slip base is required.
- The underside of the sign enclosure must be 3.0 metres above ground on a flat site. (The standard design for sloped ground specifies 3.0 metres for the downhill end, and allows the uphill end to be >2.5 metres)
- The roadside post shall incorporate an approved hinge located immediately below the sign enclosure. (Refer to the comment below concerning the NZTA's P24).
- The power cable shall allow the slip base to function as intended in an impact.
- When a roadside cabinet is mounted behind a post, its position must allow a clear space of at least 3 times the width of any slipbase for the slipbase to activate in an impact. The width of the slipbase is measured in the plane parallel to the road.

Refer to the standard frangible design for a two line, 200mm high character sign, (Type D) supported on two posts that may be used for situations within the design criteria.

The following risk based principles have been applied to the two post Standard Design solution for Sign Type D:

- The roadside leg is significantly more vulnerable to collision than the boundary leg.
- If the boundary leg is located at the edge of the road reserve it has a significantly lower risk from collision.
- Because the two legs are approximately 3 metres apart, it is unlikely both will be hit simultaneously.
- Both legs require slipbases
- The roadside leg also requires a hinge.
- Due to the limitations of hinge performance, in a collision the enclosure must be supported on the remaining boundary leg post.

In some specific situations, the NZTA may deem the risk of injury to pedestrians and cyclists from breakaway signposts exceeds the risk to the vehicle occupants. In that case certain requirements of this section may be waived.

5.1.4 Specific engineering design

General

Specific engineering design is required for the following situations:

- Gantry signs
- Cantilever signs
- Single post centre mounted signs not meeting the requirements for use of a Standard Solution
- Dual post mounted signs not meeting the requirements for use of a Standard Solution

Where specific engineering design is required, the design engineer must seek approval of the final sign support design from the NZTA's Regional Office. The following information must be submitted for this approval:

- Producer Statement Design, in accordance with the requirements of the New Zealand Building Code.
- Construction drawings
- Construction specification
- Design Calculations

Access ladder and platform for motorway VMS

For Motorway VMS applications, the design of the support structure shall include an external access ladder and platform over the full width of the enclosure. The truss structure shall be 2m high to provide safe head room. An integral ladder hoop is to be provided to the top of the truss. The walkway floor shall consist of checkerboard and be free of trip hazards. The walkway shall include a kickboard and a minimum of two rails on each side. A suitable mesh shall be included on each side to prevent tools and small parts from dropping through to the ground below. The design shall ensure that the enclosure doors are not obstructed by any section of the platform or fittings and are capable of being fully opened. The access ladder shall be capable of being securely locked and the ladder cage shall include measures to prevent trespassers climbing up the external face.

Motorway VMS suppliers may offer enclosures with side entry doors which fully enclose the hardware and any maintenance staff. This has the advantage of allowing maintenance in all weather conditions and fully mitigating any risk of dropped items. For this design, the support structure will only require the access ladder and cage and possibly a small platform.

Applicable design standards

Design of VMS signs and support structures shall be in accordance with the following standards:

AS 1111: ISO metric hexagon bolts and screws

AS 1163: Structural steel hollow sections

AS/NZS 1170: Structural design actions

AS/NZS 1252: High strength steel bolts with associated nuts and washers for structural engineering

AS/NZS 1554: Structural steel welding

AS/NZS 1664: Aluminium structures

AS/NZS 1866: Aluminium and aluminium alloys – Extruded rod, bar, solid and hollow shapes

AS/NZS 2312: Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings

AS/NZS 3678: Structural steel- hot rolled plates, floor plates and slabs

AS/NZS 4506: Metal finishing – Thermoset powder coatings

AS/NZS 4671: Steel reinforcing materials

NZS 3104: Specification for Concrete Production

NZS 3124: Specification for concrete construction for minor works

NZS 3404: Steel Structures Standard

NZS 4680: Hot-dip galvanised coatings (zinc) on fabricated ferrous articles

Foundation design

For the purpose of determining soil foundation capacity, a strength reduction factor (Φ) shall be applied to calculated ideal ultimate soil foundation capacities as follows:

- For signs greater than 12 m^2 face panel area, or designated as structure importance level 3, a specific engineering assessment of the soil strength reduction factor (Φ) is required
- For signs of up to 12 m^2 face panel area, that are designated as structure importance category 2: Φ = 0.45
- For signs of up to 4.7m^2 face panel area, that are designated as structure importance category 1: Φ = 0.6

Design loadings

Derivation of design wind and earthquake loading is to be based on the following table:

Table 1: Design loadings

Sign description	Structure importance level (AS/NZS1170)	Design wind event return period (yrs)	Design earthquake return period event	Design life (yrs)
High Value Sign – Sign face area ≥ 12 m^2 or located over carriageway. (Includes gantry and cantilevered signs).	3	1000	1000	50
Normal Sign – Sign face area between 4.7m² and 12 m^2 and sign not over carriageway.	2	500	500	50
Minor Sign – Low traffic volume rural road, sign face area < 4.7m^2, and sign not over carriageway.	1	250	100	25

Design wind speed

The design wind speed shall be derived in accordance with AS/NZS 1170.2: 2002, with the following specific requirements:

m. The design wind speed shall be taken as non-directional

n. The Terrain Category of a particular site shall be taken as either 2 (Exposed Rural Terrain) or 1 (Exposed Open Terrain). The value of the Terrain Height Multiplier ($M_{Z, Cat}$) used must not be not less than that given in Table 4.1 of AS/NZS 1170 for Terrain category 2.

Structure serviceability requirements

Under serviceability limit state wind loadings, the top of the sign shall not deflect more than 0.05h where h is the height from ground level to the top of the face panel.

Low temperature performance

Except as noted below, structural steel components in signs located in areas where the LODMAT (Lowest Observed Daily Mean Air Temperature) temperature is below 0^0 Celsius, as detailed in Figure 2.6.3.1 of NZS 3404: 1997, shall satisfy the low temperature performance requirements detailed in Section 2.6 of NZS 3404: 1997.

Note: UB and RHS sections that have no welded or bolted connections at their junction with the foundation(s), meet low temperature requirements.

Durability requirements

All components of the sign support structure and foundations are to be constructed such that a period of at least 25 years to first maintenance can be achieved in the specific site environment. For steel components this will normally require galvanising.

The designer must consider:

- Surface corrosion protection zone (Refer AS/NZS 2312 or AS/NZS4506)
- Whether the post needs to be painted and if so any finished colour requirements

5.1.5 Building consent requirements

As part of implementation of each VMS sign, whether or not a standard solution is adopted, application shall be made to the Territorial Local Authority for exemption from requiring Building Consent.

If the Territorial Local Authority advises that Building Consent is required, this shall be obtained prior to construction commencing.

5.2 Construction

5.2.1 Site set-out

Before construction commences the contractor will satisfy the NZTA's representative that the foundation construction methodology will achieve optimal alignment of the LED viewing angle for approaching motorists.

Horizontal alignment of the VMS shall be achieved by correct alignment of the gantry span for gantry mounted Motorway VMS, or support posts for Regional VMS.

5.2.2 Motorway VMS

The optical axis of Motorway VMS shall be aligned 5 degrees below the line of sight from the VMS to the driver's eye height at the maximum reading distance (350-400m).

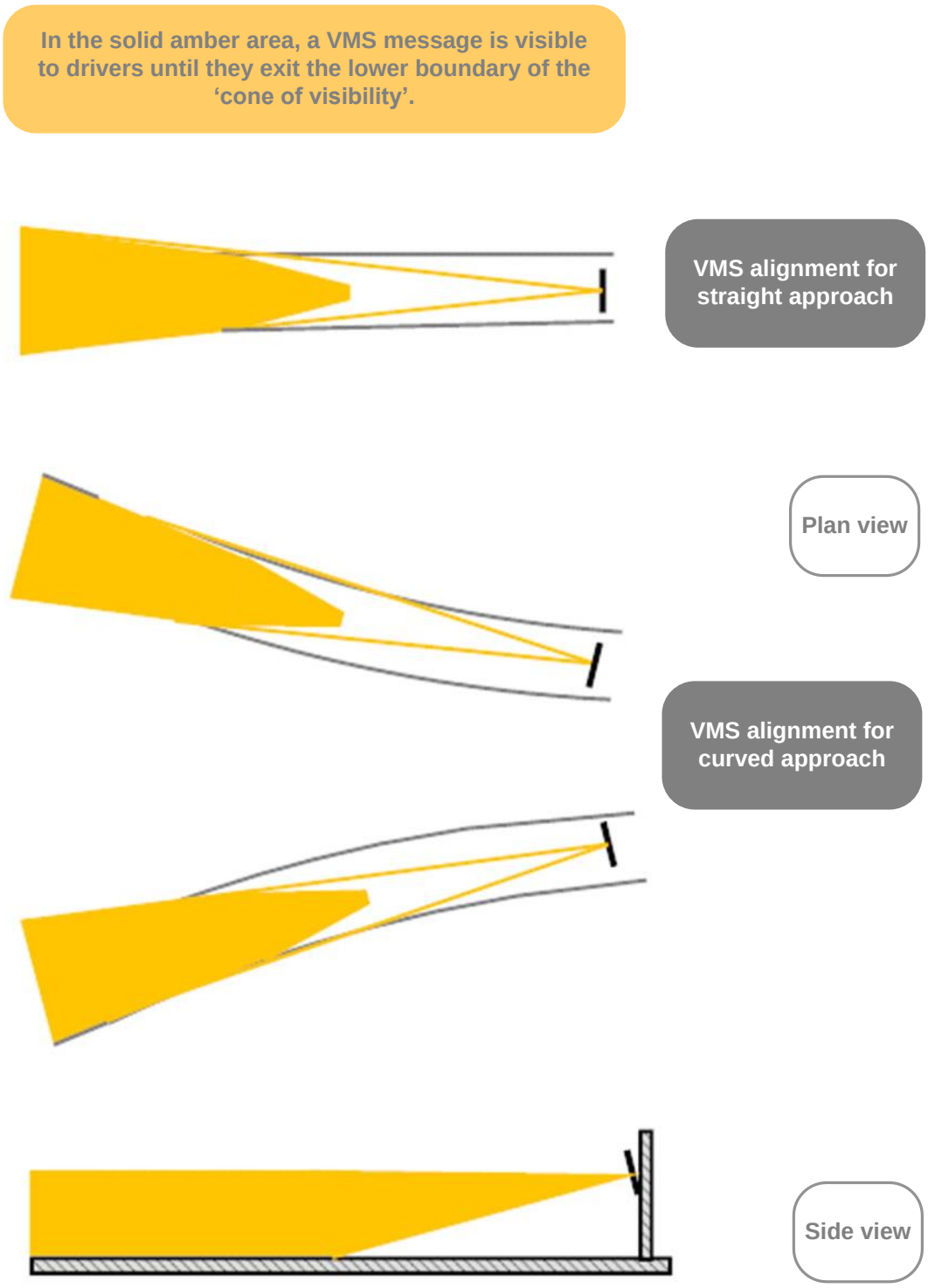
The vertical alignment can be achieved in most situations by using an enclosure having a front face angled down 5 degrees or having a mounting arrangement with the capability for at least 5 degrees adjustment downwards from horizontal. The vertical alignment for gantry mounted VMS can be achieved by setting the offsets to the top and bottom mountings to align the front face of the sign at the correct vertical angle for the road vertical alignment.

The horizontal alignments for straight and curved approaches are illustrated below.

For curved approaches, the VMS must be aligned to ensure:

- At the *maximum reading distance* the *inside edge* of the curve is within the cone of visibility, and
- Approaching the VMS, the *outside edge* of the curve remains within the cone of visibility for as long as possible

Figure 3: Optimum alignment for a motorway VMS on an overhead gantry

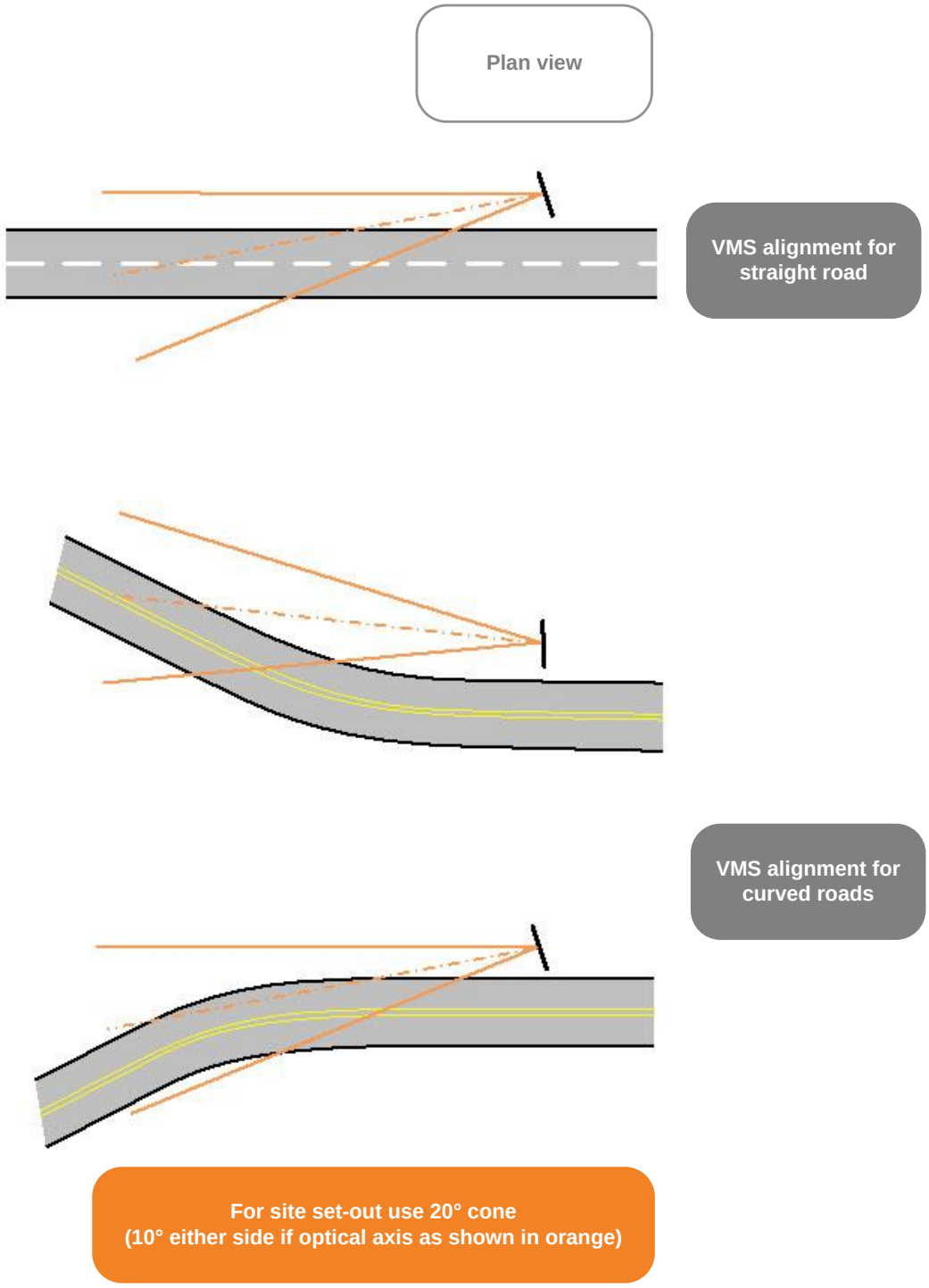


5.2.3 Regional VMS

Regional VMS are normally mounted on the side of the roadway on the left hand side of approaching traffic, For a straight approach, the offside edge of the cone of visibility should be aligned down the road reserve parallel with the road.

For VMS mounted some distance beyond a left or right hand curve, alignment should maximise the time that travellers remain within the cone of visibility as illustrated below.

Figure 6: Optimum alignment for a regional VMS on a roadside support structure



5.2.4 Unforeseen foundation conditions for regional VMS

The Contractor is to be familiar with the foundation soil properties assumed in design of each sign, as detailed in the contract documents and these Notes.

If the foundation soil properties encountered during construction differ from those assumed in design, the Contractor is to immediately cease work at the site and bring this to the attention of the NZTA's representative, who will assess the unforeseen conditions and advise how construction is to proceed.

In practice, for scala penetrometer testing (where this is appropriate for the soil type), the foundation soil is considered adequate if at least three blows are required to advance 100 mm depth, to a minimum depth of one metre below ground level.

In addition to the minimum bearing strength requirement, the foundation soil must fulfil the following requirements:

- Ground water table is below the proposed foundation depth (unless specifically allowed)
- Topsoil, very soft or very loose surface sediments shall not be included in the embedment depth given above. In no case should this be greater than a depth of 200mm
- No peat is present
- No soft clay is present
- There is no loose fill present

5.2.5 Construction verification

At completion of the works, the contractor shall supply a Producer Statement – Construction covering the construction of all support structures.

The NZTA's representative shall verify the adequacy and accuracy of the civil works by undertaking a Civil site Acceptance Test (Civil SAT) using the relevant current check sheet. An *example* for Regional VMS can be viewed in Appendix 2.

5.2.6 Traffic management

Temporary Traffic Management (TTM) for the site activities shall conform to the NZTA's *Code of practice for temporary traffic management* (CoPTTM).

6.0 Lane Control Unit (LCU)

6.1 Design

6.1.1 Gantry type

LCU gantry structures shall be truss gantries with the Lane Control Units separately bolted onto the gantry truss.

The Lane Control Units shall be located over the centre of each lane under the LCU gantry.

The LCU gantries shall be portal gantries spanning from the shoulder berm to the motorway median.

6.1.2 Gantry design requirements

LCU gantry structures shall be galvanized steel truss gantries and shall include the following:

a. Steel plate section column detail to prevent the general public from climbing the structure;

b. Access ladder with hoops and padlocked security gate on the gantry shoulder leg;

c. 1.5m deep gantry truss with full width checker plate walkway extending across the truss bay where the median end Lane Signal Unit is mounted.

d. LCU support frames allowing the LCU to be vertically and horizontally aligned to maximise viewing distance;

e. Handrails around the full extent of the walkway and the ends of the LCU support frame;

f. 200mm by 50mm slotted holes in the traffic face of both gantry shoulder leg columns above the base of the leg and above the truss bottom chord for cable access.

The gantry truss shall be level across the carriageway and the minimum clearance to the LCU or the gantry structure shall be from the highest level on the trafficked lanes. For locations where the LSU's share a gantry with other display equipment such as SLVMS, VMS, or static signs, the LCU shall be mounted closest to the motorway.

Load calculations for the gantry structures shall include an allowance for equipment weight plus 25% to allow for future alterations. The design shall in particular comply with the requirements of AS/NZS 1170, NZS 3101, and NZS 3404.

Walkways shall be provided with safety handrails in compliance with NZ Building Code. Access to and along this walkway shall not be obstructed a truss diagonal bracing member at the shoulder leg.

Walkways shall be fitted with integral kick-plates at least 150mm high to completely surround the walkway. Drainage holes shall be provided as required, but shall be fitted with stainless steel mesh.

All steel components shall be hot-dip galvanised.

Shop drawings for the both the LCU support frame and the gantry structure shall be submitted to the Engineer for comment prior to fabrication of the gantry structure.

6.2 Construction

6.2.1 General

The LCU gantry holding down bolts shall be fabricated from High Tensile plain round steel bars with a minimum strength of 830 MPa. Other steelwork shall comply with AS 1204, Grade 250. Steel shall be completely free from defects such as laminations, rust or pitting.

The holding down bolt assemblies shall be supplied with nuts, lock nuts washers and leveling nuts complying with AS 1111, Commercial Grade Bolts.

The holding down bolt assemblies and nuts, lock nuts washers and leveling nuts shall be hot dip galvanised in accordance with T-CES 306. Bolts and nuts shall be centrifuged or otherwise treated, on removal from the galvanising bath, to remove any excess molten zinc and to leave clean threads. Nuts shall be re-tapped to size after galvanising.

On completion of the gantry foundation construction all the holding down bolts shall be completely wrapped in “Denso” tape.

6.2.2 Holding down bolt templates

The holding down bolt assemblies shall be supplied 10mm steel plate templates for setting out the top of the bolts. The templates shall be individually numbered to identify each holding down bolt assembly.

On completion of the gantry foundation construction the holding down bolt templates shall be delivered to the Engineer with a plan indicating the locations on the gantry foundations at which template was used.

6.2.3 Holding down bolt setting out

The holding down bolt assembly shall be positioned and aligned to the following tolerances:

a. *Position:* Shall be (distance to a common reference line) ±20mm.

b. *Level Variation of Top Face:* Bolt types shall be concrete in place to the levels shown ±5mm, with all bolts at the same level ±3mm and correct location relative to any other bolt, ±2mm.

c. *Orientation of Bolt Groups or Base Stubs:* ±0.5 degrees.

The Contractor shall make use of steel templates for the precise positioning of the holding down bolts for the gantry legs.

The Contractor shall bear the cost of any remedial work that is required, if the assembly is placed in the wrong position or moves during the concreting operations.

After completion of concrete placing, the bolt threads shall be cleaned and the nuts run up the full length of thread.

6.2.4 LCU backing boards

The Contractor shall supply to the Engineer detailed drawings and specifications for the supply and installation of the LCU backing boards.

7.0 Ramp Signalling System (RSS)

7.1 Design

7.1.1 Ramp signal poles

Traffic Signal Poles shall be used to mount the Ramp Signal traffic signals. There are a wide variety of poles available to suit a number of installation requirements.

Each post shall be as detailed in the NZTA's *ITS specification: Ramp signalling system standard drawings* (ITS-05-03).

7.1.2 Ramp signal gantries

Dependant on the design criteria a Ramp Signal Installation may require gantry mounted LED Traffic Signal Heads. These will normally be used when a bypass or priority lane has been installed on the on-ramp.

7.1.3 Ramp signal poles and gantries design requirements

All components of the signal support structures shall be constructed such that a period of at least 25 years to first maintenance can be achieved in the specific site environment.

7.1.4 AWS support pole type

The type of Advance Warning Sign (AWS) support pole and bracket will vary dependent on site conditions and installation restraints as detailed in the design.

a. 4.9m Special. For use in areas where viewing height is restricted or ground conditions dictate the need for a taller pole (Design Dependant)
b. 3.5m Standard. For use in standard installation environments.
c. F Type Bracket. For use over walkways or where the installation is in close proximity to the road
d. C Type Bracket. For use in standard installation environments.

Dependant on the design criteria and local conditions these poles shall either be ground planted or shear base (attached to a ground mounted stub).

Dependent on the design criteria and local conditions these poles may either be ground planted or frangible base (attached to a ground mounted stub).

The clearance to the bottom of the AWS from carriageway shall be a minimum of 2.4m.

Each support pole shall be as detailed in the NZTA's *ITS specification: Ramp signalling system standard drawings* (ITS-05-03).

7.1.5 AWS support design requirements

All components of the sign support structure shall be constructed such that a period of at least 25 years to first maintenance can be achieved in the specific site environment.

7.2 Construction

7.2.1 Ramp Signal and AWS pole foundations

The Ramp Signal or AWS pole foundation stubs shall be supplied to match the Ramp Signal or AWS pole support columns.

The cable ducts to the roadside control cabinet shall be a 50mm N.B. extra high impact uPVC duct with long radius bends into the pole foundation stub and into the roadside control cabinet. The duct shall be supplied and installed in accordance with the NZTA's *ITS specification: Duct supply and installation* (ITS-02-01).

The top face of frangible pole stubs shall provide clearance for maintenance of the fixing bolts and shall not be more than 100mm above finished ground level.

Appendix A: Standard drawings

Standard ITS drawings

Current to June 2015	
Roadside Control Cabinet	000-0000-0-7104-03-R1
Roadside Control Cabinet & Apron Details	000-0000-0-7104-04-R1
Network Node Cabinet	000-0000-0-7104-05-R1
Network Node Cabinet & Apron Details	000-0000-0-7104-06-R1
CCTV Folding Pole General Layout	000-0000-0-7104-45-R2
CCTV Fixed Pole General Layout	000-0000-0-7104-46-R1
CCTV Pole Foundation Details	000-0000-0-7104-47-R2
VMS Gantry - General Layout	000-0000-0-7104-52-R2
VMS Gantry - Column Details	000-0000-0-7104-53-R2
VMS Gantry - Truss Details	000-0000-0-7104-54-R2
VMS Gantry - Sign Frame & Walkway Detail	000-0000-0-7104-55-R2
VMS Gantry - Ladder and Hoop Detail	000-0000-0-7104-56-R2
VMS Gantry - Vandal Barrier and Gate	000-0000-0-7104-57-R2
VMS Gantry - Shoulder Foundation	000-0000-0-7104-58-R2
VMS Gantry - Median Foundation	000-0000-0-7104-59-R2
LCS Gantry - General Layout	000-0000-0-7104-60-R1
Lane Signal Units	000-0000-0-7104-61-R2
LCS Gantry – LCS Backing Boards	000-0000-0-7104-62-R2
Lane Signal Unit – Support Detail	000-0000-0-7104-63-R2
Lane Signal Unit – Support Frame	000-0000-0-7104-64-R2
VMS Cantilever Gantry – General Arrangement	000-0000-0-7104-67-R0
VMS Cantilever Gantry – Column Details	000-0000-0-7104-68-R0
VMS Cantilever Gantry – Truss Details	000-0000-0-7104-69-R0
VMS Cantilever Gantry – Sign Frame & Walkway	000-0000-0-7104-70-R0
VMS Cantilever Gantry – Ladder & Hoop Detail	000-0000-0-7104-71-R0
VMS Cantilever Gantry – Vandal Barrier & Gate	000-0000-0-7104-72-R0
VMS Cantilever Gantry – Foundation	000-0000-0-7104-73-R0

Disclaimer: The NZ Transport Agency (NZTA) and its employees, agents and consultants do not make any warranties or representations of any kind whatsoever in relation to the accuracy, currency or completeness of any of the content in the attached standard drawings and are under no obligation to update or correct any information shown on the drawings.

The attached standard drawings are made available strictly on the basis that the NZTA and its employees, agents and consultants exclude all liability for any claim made whatsoever (including negligence) by any party arising out of, or relating to the use of these standard drawings, regardless of how the claim arises.

Roadside Control Cabinet

Roadside Control Cabinet &Apron Detail

Network Node Cabinet & Apron Detail

CCTV Folding Pole General Layout

CCTV Pole General Layout

CCTV Foundation Detail

VMS Gantry – General Layout

VMS – Column Detail

VMS – Truss Detail

VMS Gantry – Sign Frame & Walkway Detail

VMS Gantry – Ladder & Hoop Detail

VMS Gantry – Vandal Barrier & Gate

VMS Gantry – Shoulder Foundation

VMS Gantry – Median Foundation

LCS Gantry – General Layout

LCS Gantry – Backing Boards

LCS Gantry – Signal Support Detail

LCS Gantry – Lane Signal Unit Support Frame