

**Drafting and Design Presentation Standards
Volume 3: Structural Drafting Standards**

Chapter 21: Major Sign Structures

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Chapter 21 Amendments

Revision register

Issue/Rev No.	Reference Section	Description of Revision	Authorised by	Date
1	-	First Issue	Team Leader (Structural Drafting)	Oct 2017

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21 VMS Cantilever Signs

21.1 Glossary of terms

For a complete glossary of terms refer Chapter 1 - *Introduction*.

21.2 Figures and examples shown in this volume

The figures and examples shown in this volume are for presentation purposes only, and may contain some details that are now superseded. These details have been included for ease of reference, to illustrate typical solutions, and to show the required standard of drafting presentation. The details are not to be used without an engineering check and certification by a Structural RPEQ to confirm that the details are appropriate for the specific project.

21.3 Associated publications

- TN174 *Purchasing Guidelines for TMR Major Sign Structures*
- *Design Criteria for Bridges and Other Structures* manual

Note: inclusive of other documents referenced in the above publications

21.4 General

This chapter provides a basis for the minimum detailing requirements of large gantries for installation within the department's road network.

This chapter informs Transport and Main Roads design procurement expectations and requirements of the designer. Gantry design is required to balance WH&S requirements, safety in design and fit for purpose ideals that meet the site specific requirements - including the design environment such as wind speed, earthquake zone, and geotechnical and built environment.

21.5 Design

For Transport and Main Roads Design parameters refer to the *Design Criteria for Bridges and other Structures* Chapter 10 – *Gantries and support structures*.

21.6 Design Components

1. Footing – structural and geotechnical
2. Steel componentry – structural design for impact, wind loading, durability, installation, maintenance and inspection
3. Site specific requirements – clearance, location, barriers, obstructions / clear line of sight, services
4. Electrical
5. WH&S for installation & maintenance (ladders, site access and walkways)

Steel, electrical & WHS componentry may be considered for type approval for certain design parameters such as wind speed zones.

Figure 21.6(a) - Single Post Cantilever Gantry

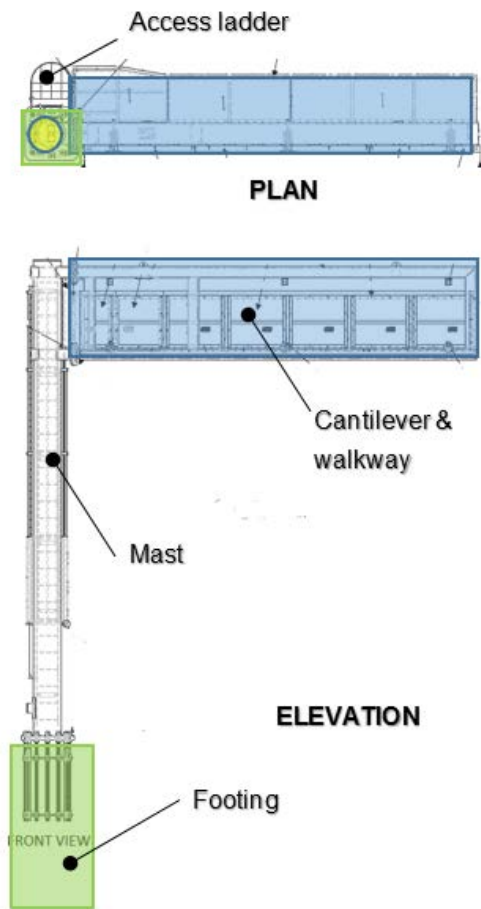
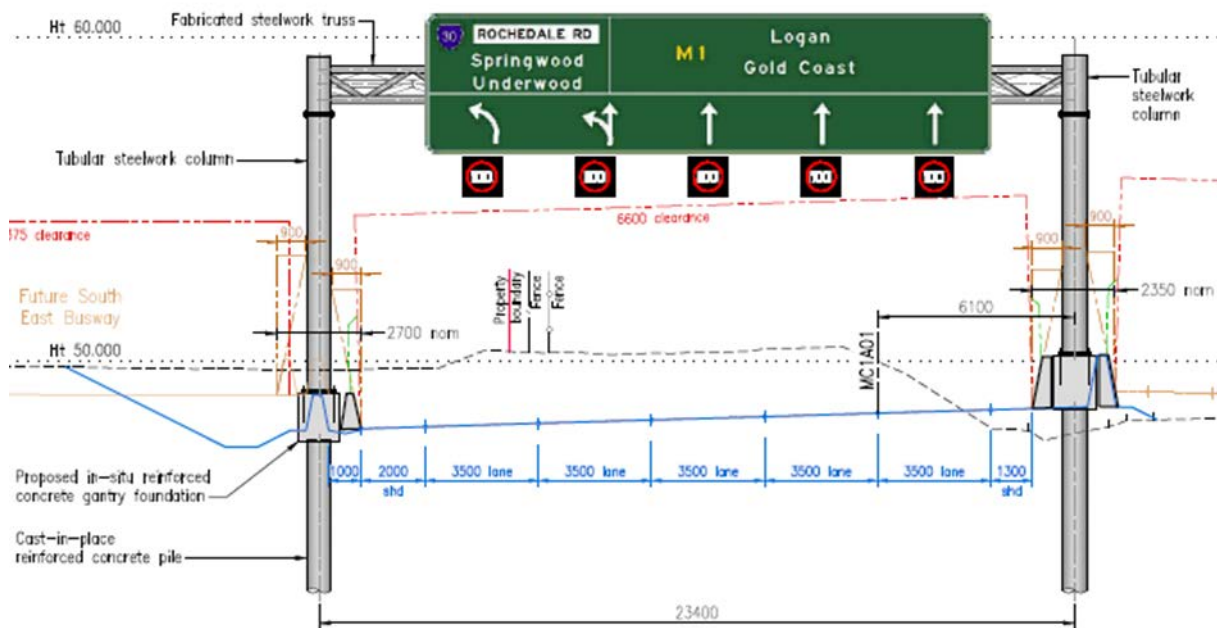


Figure 21.6(b) - Multi Post Gantry (lightweight gantry shown)



21.7 Reference documents

The following documents are relevant for reference when tendering or designing a VMS cantilever gantry. All referenced documents are to be the latest available version at the time of tender award.

Table 21.7 – Reference documents

Reference	Title
-	<i>Design Criteria for Bridges and Other Structures</i>
MRTS61	<i>Mounting Structures for ITS Devices</i>
SD1573	<i>ITS gantries - Lane control/Variable speed limit signs - Without maintenance platform</i>
SD1577	<i>ITS gantries - Lane control/Variable speed limit signs - Walk on gantry</i>
SD1581	<i>ITS - Cantilever - Cantilever structure</i>

21.8 Site Specific Design

1. Footings
2. Section showing minimum vertical clearance / roadway carriageways including future carriageways, the section is to reflect actual site sectional profile including surveyed heights (Australian Height Datum), proposed footing heights, existing or proposed barriers and types (to protect sign structure from vehicle impact and associated failure risks), services including numbers, sizes and locations, minimum clearance of services to footings or noted approximate locations with a note the actual locations are to be determined on site prior to commencement of work.
3. Wind speed
4. Earthquake region
5. Existing services locations and proposed relocation / protection

21.9 Typical Drawing Set

1. **Drawings** may be submitted for approval in two sets simultaneously containing:
 - a) Engineering Drawings
 - b) Shop Drawings
2. **Engineering Drawings** are to contain as a minimum:
 - a) **Site plan and drawing index** including all drawings and current revision numbers for type approved drawings.
 - b) **General arrangement** – Section, plan and end view, locating the structure, calling up general parts and showing clearances and services locations. Footing assembly details including anchor bolts, sizes, grades, nuts and washer details, grout thickness and other details relevant to the assembly of the complete gantry for example - construction sequence.

c) **Footing details** – Plan, section, dimensions, reinforcement details, location of footing centre point if not shown elsewhere, bolt layout, projection and orientation in plan, concrete grade, depth of footing, heights and geotechnical requirements, for example, 2500 deep into slightly weathered greywacke or 4000 into sand.

3. **Shop drawings or fabrication drawings** are to contain all other relevant information not covered by the engineering drawings for the fabrication of structural steelwork including dimensions, material grades, sizes, lengths and surface treatments.

21.10 Design and Construction Contract for VMS Gantry

The design and construction of a singular Cantilever VMS Gantry may be summarised as follows:

<p>Step 1 Design Tender</p>	<p>Design to be undertaken only by BD#3 prequalified design consultant</p> <p>Relevant documents for tender and design include but are not limited to</p> <ul style="list-style-type: none"> • TMR Design Criteria for Bridges and Other Structures • TMR Structural Drafting Standards • MRTS 61, 63, 63A, 70 , 71 & 78 • TMR Standard Drawings
<p>Step 2 Fabrication</p>	<p>Fabrication shall not commence until final review / acceptance of the design details by TMR Structures (refer "<i>Design Criteria for Bridges and Other Structures</i>")</p> <p>Fabrication to be undertaken by a TMR prequalified fabricator to MRTS78</p> <p>Inspections and material test certificates apply</p>
<p>Step 3 Erection</p>	<p>Erection to be undertaken only after</p> <ol style="list-style-type: none"> 1 Peer Review of engineering drawings as per the process described in the Design Criteria for Bridges and Other Structures (As above) 2 Geotechnical and services investigations undertaken 3 Certified design of footing for the site specific geotechnical conditions 4 Design and installation of appropriate barriers <p>Technical Note TN68 VMS Gantry Installation Procedure applies to the gantry installation</p>

21.11 Detailed Design Drawings Checklist

The following table is supplied for designers and Regional Managers to address minimum design requirements are detailed prior to submission for peer review by structures

Item	Category	Detailed description
1.0	Design	The structure shall be designed and detailed in accordance with current versions of the following: <ul style="list-style-type: none"> • MRTS61 <i>Gantries and Support Structures</i> • <i>Design Criteria for Bridges and Other Structures</i> • Transport and Main Roads Structural Drafting References
1.1	Layout and general info	Site layout, Drawing index, Road Name and Section with offsets and clearances, barriers, wind loads - including region.
1.2	Certification and WHS	<ul style="list-style-type: none"> • Designer to RPEQ certify on the drawings that the design complies with AS 1657 • Fabrication carried out using only RPEQ certified drawings • All details of the fall arrest system are shown
1.3	Notes	Standard notes from <i>Structural Drafting Standards</i> , Chapter 5 - <i>Notes</i> utilised: <ul style="list-style-type: none"> • General • Foundation and Footings • Reinforcement & cover • Concrete • Welding Consumables & Welding • Steel • Material grades
1.4	Clearance	Minimum vertical clearance of structure as per <i>Design Criteria for Bridges and other Structures</i> (most cases 6500 +100 tolerance)
1.5	Vertical deflection	<ul style="list-style-type: none"> • The design vertical deflections of the horizontal member / arm under self-weight of the complete structure is shown on drawings. • The structure shall be designed and pre-cambered so that the horizontal member / arm is in an upwards orientation under permanent load, and not in a sagging position.
1.6	Presentation & Archival	Transport and Main Roads Title Blocks & drawing No's
1.7	Materials	Materials grades, thicknesses, sectional properties and dimensions including plate thicknesses
1.8	General	General presentation standards as per the DDPSM – for example, 3.5 mm text at A1 size, dimensioning and arrowheads sizes, scales...etc

Item	Category	Detailed description
1.9	Design Loads	<ul style="list-style-type: none"> The design Region and wind speed shall be selected by the designer for the specific site. The ultimate and serviceability limit state wind speed shall be noted on the drawings. Design Live Load for walkways and service platforms is in accordance with <i>Design Criteria for Bridges and Other Structures</i>. The platform is designed with minimum Design Loads: <ul style="list-style-type: none"> i. Design Live Load of 2.5 kPa ii. 1 kN concentrated load over 300 mm² patch located anywhere on the platform floor iii. with simultaneous local Moving Live Load of 5 kPa applied over 1 m² Design Loads are shown on the RPEQ certified drawings
2.0	Design Loads	Fatigue Design: Whole structure design for fatigue in accordance with LRFD Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals.
2.1	Foundations & Footings	<ul style="list-style-type: none"> Footings to be certified by an RPEQ geotechnical engineer for the site specific conditions Sufficient information to locate footings is supplied - for example, Easting, Northing for set out point in centre of footing Orientation of base plate shown for correct orientation of hold down bolts
2.2	Foundations & Footings	All bored piles / cast-in-place piles are to have steel liners
2.3	Foundations & Footings	Cast-in-piles shall comply with MRTS63 <i>Cast-in-Place Piles</i>
2.4	Foundations & Footings	<ul style="list-style-type: none"> Holding down anchors / bolts are positioned within the confines of the pile reinforcing cage - not outside Holding down bolts are defined in length, grade, setting out and penetration
2.5	Foundations & Footings	Concrete strength, exposure classification and cover appropriate for footing site
2.6	Reinforcement	<ul style="list-style-type: none"> Drawing states: "All reinforcing shall be ACRS Certified" All reinforcement bars labelled as per <i>Structural Drafting Standards</i>
5.0	Steel Fabrication	All weld symbols are detailed on drawings and welding notes - current version
5.1	Steel Fabrication	Full penetration butt welds shall be used instead of fillet welds for all tubular CHS, SHS and RHS connections.
5.2	Steel Fabrication	<ul style="list-style-type: none"> All steelwork is hot dip galvanised to the requirements of AS/NZS 4680 Engineering drawings show all galvanising vent holes Painted gantry structures require approval from the Director of Bridge Design

Item	Category	Detailed description
5.3	Steel Fabrication	<ul style="list-style-type: none"> • Short lengths of steel joined together are not permitted by Transport and Main Roads • Full length members without any joints are to be used
5.4	Steel Fabrication	12 mm thick plate is placed over all slotted holes in the base plate when the holding down bolts are installed
6.0	Erection Procedure	A detailed erection and installation procedure including all requirements for tightening of hold down bolts prior to grouting and prior to attachment of the outreach arm is needed for review by the department.
6.1	Erection Procedure	<ul style="list-style-type: none"> • The structure is supported by mortar and not by levelling nuts during service. If levelling nuts are used initially, they shall be backed off to transfer the dead load onto temporary packers prior to casting of grout. The temporary packers shall be removed after the grout has been cured and remaining voids grouted. • TN68 <i>VMS Gantry Installation Procedure</i> applies.
7.0	Protection of Structure from traffic impact	Form of protection provided for gantry is detailed in accordance with the <i>Design criteria for bridges and other Structures</i> .
7.1	Protection of Structure from traffic impact	Risk assessment to determine barrier requirements has been conducted
7.2	Minimum Views required	<ul style="list-style-type: none"> • Elevation of gantry showing road profile, minimum vertical clearance, services, footing and labelling major components. • Plan and end elevation of gantry showing major components including overall dimensions such as walkway widths. • Details of all connections, end plates, vent hole sizes numbers and locations. • Details of all major components not sufficiently detailed on the other views.

