Technical Note 123


September 2014
1 Purpose

This technical note aims to assist project managers and designers to steer the development of projects to a unified approach to ITS supporting infrastructure across the Queensland road network.

This technical note should be used to generate capital cost savings and future cost avoidance through the selection of structures where access from the verge improves access and reduces ongoing maintenance costs. Where portal structures are provided, the technical note guides a whole of life review to consider the benefits of accessible or non-accessible support structures against the traffic management costs of maintenance.

2 Background

The requirements for selection of appropriate ITS devices and the support structures required to position them are given in different Transport and Main Roads Manuals and Specifications. In order to aid the selection process, the attached flow charts have been prepared. These flow charts do not take precedence over the requirements in the documents. They should be used as an aid to finding the relevant documents.

3 Assumptions and limitations

It is important to note that one solution may not apply to all projects or sites. The assumed basis for the starting point to use this technical note is as follows:

a) the scheme has started some level of development

b) the ITS level of provision is known (ITS devices to be deployed are known, guidance and policy for locating ITS assets are in place)

c) designers and project managers are aware of the design criteria contained in the various specifications and standards of TRUM, Managed Motorway Policies and AustRoads Guidelines

d) the impacts of wider policies to be adopted on the projects are known

e) as the intricacies of projects and gantry sites are likely to vary, a single fit solution may not be achievable – rather this technical note aims to address the following operational situations:

i. the note is applied on a per site basis and aggregated to all sites to consider the overall approach needed

ii. traffic management policies in place on some routes may dictate the eventual mounting arrangements adopted, regardless of the leading this note may suggest

iii. in some instances, project managers and designers may develop innovative approaches which maintain the ethos of safe and efficient ITS infrastructure

iv. some real world constraints are not discernible through the yes and no of the design note – project managers and designers need to consider their projects in a holistic light armed with the principles and guidance offered by this note.

v. consult the wider Engineering and Technology support network available whose experience and understanding of the intent for this note may help further guide the project design process for the selection of ITS support structures.
Listed below are some of the design considerations that need to be considered:

a) cost including delay cost, maintenance cost and capital cost
b) road design requirements including geometry and medians
c) road user and maintenance team safety
d) supporting infrastructure and cabling including cabinets, and
e) equipment requirements including tolerances, reliability and sensitivity to vibration.

4 Referenced documents

Table 3 below lists referenced documents in this technical note.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport and Main Roads Manual</td>
<td>Design Criteria for Bridges and Other Structures</td>
</tr>
<tr>
<td>Transport and Main Roads Manual</td>
<td>Road Planning and Design Manual: Volume 5 – Intelligent Transport Systems</td>
</tr>
<tr>
<td>Transport and Main Roads Manual</td>
<td>Traffic and Road Use Management Manual, Technical Note 1.46 Co-location of Gantry Mounted Variable Speed Limit Signs with Static and Dynamic Signs on Motorways</td>
</tr>
<tr>
<td>Transport and Main Roads Manual</td>
<td>Traffic and Road Use Management Manual, Technical Note 2.18 Permanent placement of variable speed limit and lane control signs for motorways, long bridges and tunnels</td>
</tr>
<tr>
<td>Transport and Main Roads Manual</td>
<td>Design Guide for Roadside Signs</td>
</tr>
<tr>
<td>AS 3000</td>
<td>Australian Wiring Rules</td>
</tr>
<tr>
<td>ACIF/AS 009</td>
<td>Customer Cabling Rules</td>
</tr>
<tr>
<td>MRTS61</td>
<td>Mounting Structures for ITS Devices</td>
</tr>
<tr>
<td>MRTS91</td>
<td>Conduits and Pits</td>
</tr>
<tr>
<td>MRTS95</td>
<td>Switchboards and Cables</td>
</tr>
<tr>
<td>MRTS201</td>
<td>General Equipment Requirements</td>
</tr>
<tr>
<td>MRTS202</td>
<td>Provision of Variable Message Signs</td>
</tr>
<tr>
<td>MRTS206</td>
<td>Provision of Variable Speed Limit and Lane Control Signs</td>
</tr>
<tr>
<td>MRTS210</td>
<td>Provision of Mains Power</td>
</tr>
<tr>
<td>MRTS225</td>
<td>Imaging Equipment</td>
</tr>
<tr>
<td>MRTS226</td>
<td>Telecommunication Field Cabinets</td>
</tr>
<tr>
<td>MRTS228</td>
<td>Provision of Electrical Switchboards</td>
</tr>
<tr>
<td>MRTS232</td>
<td>Provision of Field Processors</td>
</tr>
<tr>
<td>MRTS234</td>
<td>Provision of Telecommunications Cables</td>
</tr>
<tr>
<td>MRTS245</td>
<td>Principal's Telecommunications Network</td>
</tr>
</tbody>
</table>
5 Provision of ITS devices

ITS devices consist of:

a) Variable Speed Limit Signs (VSLS)

b) Lane Control Signs (VSLS/LCS)

c) Variable Message Signs (VMS)

d) Enforcement and Tolling Devices.

The requirements for the design of signs and sign faces are given in the *Manual of Uniform Traffic Control Devices*.

The *Road Planning and Design Manual: Volume 5 – Intelligent Transport Systems* outlines basic design requirements to be considered by planners and designers in the delivery of ITS for rural and urban road infrastructure.

The requirements for the permanent placement of and the mounting arrangements for VSLS and VSL/LCS are given in the *Traffic and Road Use Management Manual*, Technical Note 2.18 *Permanent placement of variable speed limit and lane control signs for motorways, long bridges and tunnels*.

The requirements for the permanent placement of and the mounting arrangements for VMS are given in the *Traffic and Road Use Management Manual*, Technical Note 2.9 *Variable Message Signs: Use and Operation*. Detailed design and installation requirements are given in MRTS202 * Provision of Variable Message Signs*.

The requirements for the use of and placement of enforcement and tolling devices are made in the planning stages of a project in consultation with regulatory authorities.

The design, details and requirements for ITS devices are given in general and specific ITS specifications as shown in Table 10.2. The provision of various ITS components such as Variable Speed Limit (VSL), Lane Use Management System (LUMS) and other applicable ITS technology for use with gantries are shown in the specifications. Depending on the application of technology, other specifications may also be applied.

6 Supports for small signs

Note that supports for traffic signs and tolling systems on the side of the road up to 7.5 m wide or 8 m high up to a maximum area of 40 m² may be designed in accordance with the Transport and Main Roads manual *Design Guide for Roadside Signs*.

7 Types of gantries and support structures

ITS gantries may not be required in some locations. ITS gantries can consist of:

- Single post
- Cantilever
- “Walk on” gantry
- “Light gantry” gantry without maintenance platform.

Typical gantries are detailed in Standard Drawing 1573, 1577 and 1581.

When required, combined VSLS/LCS are mounted over relevant lanes.
Cameras for CCTV and web applications are usually mounted on existing structures such as overpasses, fixed and swing poles, or rooftops adjacent to the corridor. If a tilt pole is used, an area on the outer verge is needed to tilt the pole safely without affecting traffic.

Automatic Number Plate Recognition (ANPR) systems use optical character recognition in order to capture number plate information. Due to the operating nature of these and other enforcement devices, special attention needs to be given to structures, mounting supports or poles to ensure that vibration effects are minimal.

Maintenance access is an important consideration for ITS devices. Access to the site and access to the devices both need to be considered.

8 Conclusion

Gantries for ITS devices can be a significant cost and it is important to ensure that options are explored while not compromising the requirements for placement of devices. This technical note helps to consider possible options.
**ITS Gantries selection flow charts**

- **Variable Speed Limit Signs (VSL)**
  - VSLS is the provision of variable speed limit signs. These are typically to replace the static speed signs located in the verge.
  - (small, can be beside road way)
  - Go To Flow Chart A

- **Variable Message Signs/ Information Signs (VMS)**
  - Information signs provide dynamic and variable messages to road users. These are typically large sign faces with electronic display or changeable/mechanical plate.
  - (large overhead)
  - Go To Flow Chart B

- **Lane Use Management Signs (LUMS)**
  - Lane Use Management Signs are provided over each lane and provide operators with the ability to dynamically manage the traffic in each lane – allowing the TMC operators the ability to close lanes, provide diversionary information from closed lanes and amend speeds for each lane dependent on the scenario.
  - (must be over each lane)
  - Go To Flow Chart C

- **Enforcement Devices**
  - Enforcement devices typically include Cameras and Speed Detection equipment. Where used as speed enforcement these are connected to the Variable Speed Limit Signals to configure the speed limit as the signals change. These devices are more prone to vibration and sway as they are used in regulatory proceedings.
  - (specific design criteria)
  - Go To Flow Chart D

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**Note:**
Requirements for signs design refer to Manual of Uniform Traffic Control Devices.
Flow chart A

START

Additional Equipment^ To be Included?

No

Are there more than 5* lanes?

No

Is it a single lane ramp?

Yes

Mount Device to Post in the Verge

Yes

Mount Devices to Posts in the Verge and median

Consider:
- Design Costs
- Deviations from standards to implement
- Access Requirements
- Mounting arrangements and clearance
- Wider Barrier provision impacts
- Sightlines

Is it cost effective to locate a post in the median?

No

Yes

Go To Flow Chart C

Notes:
# Refer to Existing Guidelines for location, Spacing, Sightlines & Design Criteria
^ Additional equipment refers to the Future provision of potential RUC or C-ITS equipment.
* Refer TRUM 2.18

TRUM 2.18 Consider Requirements for: Placement, Sightlines, Legibility, buffers/tolerances etc

Consider cantilever or Portal Structure

Is it a single lane ramp?

Yes

Mount Device to Post in the Verge

No

Is it cost effective to locate a post in the median?

Yes

Consider:
- Design Costs
- Deviations from standards to implement
- Access Requirements
- Mounting arrangements and clearance
- Wider Barrier provision impacts
- Sightlines

Go To Flow Chart C

Is it a single lane ramp?

Yes

Mount Device to Post in the Verge

No

Is it cost effective to locate a post in the median?

Yes

Consider:
- Design Costs
- Deviations from standards to implement
- Access Requirements
- Mounting arrangements and clearance
- Wider Barrier provision impacts
- Sightlines

Go To Flow Chart C

Is it a single lane ramp?

Yes

Mount Device to Post in the Verge

No

Is it cost effective to locate a post in the median?

Yes

Consider:
- Design Costs
- Deviations from standards to implement
- Access Requirements
- Mounting arrangements and clearance
- Wider Barrier provision impacts
- Sightlines

Go To Flow Chart C

Is it a single lane ramp?

Yes

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No

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Yes

Consider:
- Design Costs
- Deviations from standards to implement
- Access Requirements
- Mounting arrangements and clearance
- Wider Barrier provision impacts
- Sightlines

Go To Flow Chart C

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- Design Costs
- Deviations from standards to implement
- Access Requirements
- Mounting arrangements and clearance
- Wider Barrier provision impacts
- Sightlines

Go To Flow Chart C

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Is it cost effective to locate a post in the median?

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Consider:
- Design Costs
- Deviations from standards to implement
- Access Requirements
- Mounting arrangements and clearance
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- Design Costs
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- Design Costs
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- Design Costs
- Deviations from standards to implement
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Go To Flow Chart C

Is it a single lane ramp?

Yes

Mount Device to Post in the Verge

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Is it cost effective to locate a post in the median?

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Consider:
- Design Costs
- Deviations from standards to implement
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Go To Flow Chart C

Is it a single lane ramp?

Yes

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Consider:
- Design Costs
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Go To Flow Chart C

Is it a single lane ramp?

Yes

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Consider:
- Design Costs
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Go To Flow Chart C

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Consider:
- Design Costs
- Deviations from standards to implement
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- Mounting arrangements and clearance
- Wider Barrier provision impacts
- Sightlines

Go To Flow Chart C

Is it a single lane ramp?

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Consider:
- Design Costs
- Deviations from standards to implement
- Access Requirements
- Mounting arrangements and clearance
- Wider Barrier provision impacts
- Sightlines

Go To Flow Chart C

Is it a single lane ramp?

Yes

Mount Device to Post in the Verge

No

Is it cost effective to locate a post in the median?

Yes

Consider:
- Design Costs
- Deviations from standards to implement
- Access Requirements
- Mounting arrangements and clearance
- Wider Barrier provision impacts
- Sightlines

Go To Flow Chart C
Flow chart B

START

Devices have specific criteria?

Yes

Capture Specific Requirements:
- Security Measures
- Access
- Locations on approaches

No

Is the device to be located over a specific lane?

Yes

Are devices dependent on VSLs or LUMS?

Yes

Go To Flow Chart C

No

Are there other specific criteria?

Yes

W ill maintenance/access be possible from the Verge?

Yes

Mount Device on a verge mounted Cantilever structure

No

Are sightlines maintained to the Verge?

Yes

Capture Mounting Requirements & Go To Flow Chart A

No

Go To Flow Chart C

Consider:
- TRUM 1.46—Collocation of VMS with other Signs
  a. Approval of significant corridor constraints by relevant regions
  b. Compliance with relevant standards and guidelines

Consider:
- Lateral Placement
  Angle of Overbridge
  Other ITS Devices & Signs mounted on structure
  Spacings

Can device be co-located with other Assets?

Yes

Arterial Road

Freeway

No

Is the sign for an Arterial or Freeway?

Capture Mounting Requirements & Go To Flow Chart A

Notes:
- # Refer to Existing Guidelines for location, Spacing, Sightlines & Design Criteria
- 1) Provisions of maintenance parking shall be reviewed

Technical Note, Transport and Main Roads, September 2014 7
Flow chart C

Step 1 Evaluate existing structure

1. Is the Concept Spacing conducive to existing structure locations?
   - Yes
     - Assess new structure
     - Go To Step 2
   - No
     - Review and provide additional protection

2. Can device be maintained from overpass?
   - Yes
     - Review structure for suitability
   - No
     - Cost Effective to Retrofit?
       - Yes
         - Mount on existing structure
       - No
         - New Structure Required
1. Go To Step 2

3. Can device be vandalised on the overpass?
   - Yes
     - Existing gantry
     - Assess maintenance access for new structure
   - No
     - Review structure for suitability

Step 2 New structure

1. Can device be maintained from shoulder?
   - Yes
     - Accessible Structure Required
   - No
     - Non Accessible Structure acceptable

2. Are Lane Closures Permitted?
   - Yes
     - Assess maintenance/access as for new structure
   - No
     - Review structure for suitability

3. Can a cantilever structure be used?
   - Yes
     - Portal structure required
   - No
     - Provisions of maintenance parking shall be reviewed

Notes:
1) Refer to Existing Guidelines for location, Spacing, Sightlines & Design Criteria
2) Review access requirements for special vehicles
3) Consider a large cantilever gantry (Superspan)
4) Review Whole of Life Costs for access/maintenance arrangements
   - Per Site & Overall Project Assessment
   - Maintenance Access costs over period (ITS & Structures)
   - Remedial
   - Median costs for portal structures
   - Review barrier requirement and costs
5) Rigid Structure for Enforcement cameras. Lightweight Structure for Signals and Signs
6) Provisions of maintenance parking shall be reviewed
Flow chart D

Consider:
Lateral Placement
Angle of Overbridge
Other ITS Devices
Signs mounted on structure

START

Devices have specific criteria? Yes

Can device be co-located with other Assets? Yes

Go To Flow Chart A

No

No

Go To Flow Chart A

Capture Specific Requirements:
• Security Measures
• Rigidity
• Cabling/Connections
• Mountings
• Positioning
• Access

Which lanes should the device cover?

Are devices dependent on VSLS or LUMS?

Yes

Capture other specific criteria & Go To Flow Chart C

No

Go To Flow Chart C

Will maintenance be possible from the Verge?

Yes

Mount Device to Post in the verge1 and review Barrier Requirements

No

Go To Flow Chart A

LUMS

VSLS

Notes:

1) Provisions of maintenance parking shall be reviewed

Advise Structures Team of Design Requirements