



Structures Engineering

Sign Gantry Guidelines (Level 1 and Level 2 Inspections)

SIGN GANTRY INSPECTION GUIDELINES

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AUTHORISATION

As head of Structures Engineering of Main Roads Western Australia,
I authorise the issue and use of this document.


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SENIOR ENGINEER STRUCTURES

Date: 18/02/2011

Document No. 6706-02-2239

REVISION STATUS

Page No.	Revision No.	Revision Date	Revision Description	Approved By	Signature
All	1	16/08/13	Updated work items. Adjustment of definition. General update.	A Lim	

All controlled copies shall be marked accordingly

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1.0 INTRODUCTION

This document details the management of sign gantry inspections. A gantry is defined as an overhead structure spanning, or partially spanning (if cantilevered), a road carriageway for the specific purpose of carrying regulatory, advisory, warning, variable message sign (VMS) or directional signs.

1.1 Level 1 Inspections

Routine visual bridge inspections are carried out on an annual cycle and are the responsibility of the asset owner. They are visual in nature. They are intended to check on the overall safety and performance of the structure and the identification of any major accident damage or incident and any obvious failure of structural components. They are also important in ensuring maintenance works are being carried out.

Documentation requirements generally entail completion of a pro-forma with comments on most aspects of the gantry's condition and includes photographs of distress and defects. Data is generally qualitative in nature.

Routine inspections should be carried out by the structure owner following reports of impact damage, large storm events or other natural phenomena to ensure the structure is safe for its intended service level and function. This triggered inspection may serve as the scheduled (annual) inspection.

1.2 Level 2 Inspections

Detailed inspections for condition assessment are carried out on a 7-year cycle and are the responsibility of Structures Engineering. They are detailed in the information collected. Quantitative data on structural components are collected for use in engineering analyses and deterioration models, and every structural aspect is reported.

The Level 2 inspection is a detailed visual inspection where all components are inspected closely (within 1.0 m) with the aid of an elevated work platform and lane closure(s) as required. Special instruments to measure steel thickness and protective coatings are also necessary. Given access issues, inspection of welds shall be undertaken with specialist instruments and/or personnel at the same time as the detailed visual inspection.

Documentation requirements entail the preparation of a detailed report on the condition and safety of the structure including photographs, and quantitative data for every individual structural component. Defects are assessed and the location and extent reported. Condition state ratings are also assigned.

2.0 PURPOSE

This document is intended to assist the Inspector when carrying out inspections on all sign gantries by providing the following:

- An explanation of terminology used in the Routine Visual Sign Gantry (Level 1) Inspection report forms and Detailed Sign Gantry (Level 2) Inspection report forms;
- Guidance on preparation needed prior to gantry inspection field trips;
- Prompts and guidance on what aspects need to be considered in inspecting each component of the sign gantry to enable a consistent approach to inspection, evaluation and condition assessment;

- An explanation of work items, priorities and Condition States; and
- References to other relevant detailed information to assist with the assessment.

3.0 OTHER REFERENCES

Other references relevant to this document are:

- Refer to the *Structures Inspection and Information Management Policy*, document 6706-01-202 for general information about inspection types, extent of inspections and general inspection data requirements.
- Refer to the *Structures Engineering Management System, Part 3 – Procedure for the Management of Bridge Inspections*, document 3912/01/03, for a description of the management process for the inspection, investigation and subsequent recording of maintenance or management requirements for bridges and associated structures.
- Refer to the *Structures Engineering Management System, Part 4 – Procedure for the Management of Bridge Data & Information*, document 3912/01/04, for the process to be followed in the storage and maintenance of bridge data and information used for the management of the structures asset.
- Refer to the *Detailed Visual Bridge Inspection Guidelines for Timber Bridges (Level 2 Inspections)*, document 6706-02-2231, for all details in relation to timber component inspection.
- Refer to the *Detailed Visual Bridge Inspection Guidelines for Concrete and Steel Bridges (Level 2 Inspections)*, document 6706-02-2233, for additional details in relation to non-timber component inspection.

PART 1

4.0 GENERAL GANTRY INSPECTION PROCEDURES

The following section applies to both Routine (Level 1) and Detailed (Level 2) Sign Gantry Inspection Procedures.

4.1 Preparation for Site Inspections

Prior to commencing site inspections, it is recommended that the Inspector collates relevant documentation. Documentation could include a copy of the previous inspections (Level 1 and 2 if available); sign gantry hard data from the Integrated Road Information System (IRIS) such as number, road name etc. that are unlikely to change but can be easily verified on site; the appropriate inspection report forms; sign gantry location information, structural drawings and a copy of these guidelines.

Just as important is the planning of access, parking and requirement of the provision of traffic management. Access equipment will be needed for all Level 2 inspections and specialised traffic management shall be organised by the Inspector.

At some sites it may be difficult to find a safe parking location, especially at sites on major roads and highways where the traffic volumes and speeds are high or where there is insufficient room within the roadside. It is important that the position of the Inspector's parked vehicle does not block road sight distances to motorists in both directions. In some situations parking at the sign gantry itself may not be safe and alternate parking locations and a walk to the site may be needed.

Visual observation involves using the eye to detect defects or evidence of defects in the sign gantry components. Some basic equipment will also prove useful in the completion of the routine visual inspection. The following is a list of equipment recommended for routine visual inspections:

- personal protective equipment (PPE) including a high visibility vest and safety boots;
- first aid kit;
- signage for traffic management purposes as required;
- inspection report proforma, notebook and clipboard;
- torch;
- binoculars;
- tools such as hammer(s), a long thin screwdriver, spirit level, shovel and wire probe;
- tape measure;
- crack gauge;
- camera with flash;
- keys to maintenance access ladder (if applicable);
- GPS unit; and
- chalk and permanent marker pens.

In addition to the equipment recommended above, Level 2 sign gantry inspections should include the following supplementary equipment:

- tools to remove maintenance access hatch (if applicable);
- access equipment as required such as 6 m extension ladder, cherry picker, moveable scaffolding or safety harness/belt;

- wire brush to clean joints and connections;
- special instruments to measure steel thickness and weld crack detection; and
- Denso paste or Denso tape for treatment of all exposed anchor bolts and associated fixings.

Note: Specialist weld inspectors should be sought who also arrange preparation of the test area with paint and rust removal as well as restoration of the paint as per MRWA Specification 835, following weld and steel thickness testing. Gantry colour is commonly G11 'Bottle Green' as defined by AS 2700.

4.2 Operational Safety

All inspection procedures and operations must comply with the relevant rules and regulations of the Occupational Safety and Health Act 1984 and appropriate MRWA operational safety guidelines and documents.

Where inspections are to be carried out on structures located over the assets of other Authorities, the relevant regulations and Codes of Practice relating to work on or close to their assets must be adhered to, and where necessary, referred to in the procedures developed for the inspection. This is particularly important when inspecting sign gantries near electrified railways.

4.3 General Inspection Reporting Requirements

A systematic and organised approach is required when undertaking gantry inspections. The procedures adopted should be efficient, effective, thorough and repeatable and cover all aspects of the structure and potential safety issues. The report must be clear, concise, complete and accurate.

All defective components must be clearly identified with comments including the location and extent of the defect. Reference should be made to Part 4 and Appendix A for appropriate terminology to be adopted for the various component defects and material defect types.

4.4 Sign Gantry Component Identification

Refer to the diagrams in Appendix A for terminology to be adopted for the various gantry components. Gantry component descriptions should be made consistent with this terminology.

The location of the gantry components is based upon the direction of the road the gantry spans (refer to Appendix A for relevant diagrams):

- The direction of Straight Line Kilometre (SLK) (refer to Section 6.1 for definition of SLK) for each road can be found within the relevant MRWA Region Structures Location Map Books. These can be found in www.mainroads.wa.gov.au selecting "Building Roads", "Standards and Technical", then "Structures Engineering", "Asset Management" and refer to the required Region's map book.
- The left and right hand side of the gantries are then determined from facing in this direction (i.e. the direction of increasing SLK).
- For gantries with two columns on each side, the legs closest to the start of the road (lower SLK value) are designated column 1, the columns further along the road are designated column 2.

4.5 Photographic Records

It is not mandatory to take general photographs of each gantry when undertaking a routine visual inspection. However, to ensure appropriate identity it is recommended to always take a photograph of the general view of the road from the start of the road (end 1), as well as a side view of the gantry.

Photographic records of the detailed visual gantry inspection are a vital part of the inspection reporting process. Photographs are to be taken at the time of the inspection. They are used to provide site information and to support comments on the condition of the gantry reported by the Inspector. The following photographs are to be taken and included in the Detailed Sign Gantry Inspection report:

- (i) View from end 1
- (ii) View from end 2
- (iii) View of the gantry from the left-hand side
- (iv) View of the gantry from the right-hand side

It is vital that any structural component showing signs of structural distress or visual defects that has either not been previously recorded or has altered since the last routine visual inspection is photographed. Issues identified in a detailed visual (Level 2) inspection must be supplemented with a clear photograph and/or sketch of the specific concern.

If the defect is not immediately obvious within the photograph, diagrammatic shapes (arrows, circles etc.) highlighting the defect areas should be added to the report's photographs where needed. When photographing defects, include a reference object in the picture, e.g. a crack gauge or portion of a measuring tape to allow a better appreciation of the defect size and distribution.

Each photograph is to be numbered. Photograph numbers are referenced in the "Photograph No." column of the Detailed Sign Gantry Inspection report. Each photograph included on the Photo Sheet(s) must have a caption. The caption must provide a clear description of the photograph using terminology as outlined in Part 4 and Appendix A. It should also be as brief as possible.

The quality of the photographs must be ensured before leaving site. Clarity, focus, exposure and contrast are all important.

PART 2

5.0 LEVEL 1 ROUTINE VISUAL GANTRY INSPECTION PROCEDURE

The annual inspection process is essentially visual in nature and serves as an intermediate check between scheduled detailed visual inspections (Level 2). They provide an opportunity for the early identification of structural issues. Such issues, when detected, must be clearly identified with comments including the location and extent of the defect. They must be noted and photographed as they may be the first indications of underlying problems.

Where the condition of some components is not clear during the routine visual inspection, a further detailed inspection (Level 2 and/or 3) may be necessary to confirm the status and identify any problems. The need for additional inspections must be noted in the visual inspection report.

5.1 Extent of Inspections for Level 1 Sign Gantry Inspections

The scope of a routine visual inspection includes:

- inspection of the gantry and associated components; barriers to gantry columns, gantry beams, gantry columns, footings, anchor bolts and mortar grout pads, maintenance access, static signs and variable message signs;
- particular close inspection to ascertain the effectiveness and condition of previous repairs and maintenance treatments (noting any loose fittings or connections);
- noting any non-structural installations fitted since the previous inspection (retrofitted services, cameras, speed cameras, meteorological devices, etc.);
- recommendation of a detailed inspection (Level 2) if it is warranted by observed distress, impact damage or unusual behaviour of the gantry; and
- identification of routine maintenance requirements.

Components that are not accessible without specialist equipment (e.g. an elevated work platform) are to be checked from as close as practicable using binoculars.

Components that need *not* be inspected as part of routine visual inspections include:

- the inside of gantry beams and columns; and
- gantry columns and foundations below ground level.

These components may be inspected as part of Level 2 or Level 3 inspections.

6.0 LEVEL 1 ROUTINE VISUAL GANTRY INSPECTION FORM

The Sign Gantry Routine Visual Inspection Report (Level 1) is compiled on a standard form. Inspection items include:

- Barriers
- Gantry Columns
- Anchor Bolts and Mortar Grout Pads
- Static Signs
- Gantry Beams
- Footings
- Maintenance Access
- Variable Message Signs (VMSs)

The blank template is available on Main Roads Western Australia's (MRWA's) internet site www.mainroads.wa.gov.au selecting "Building Roads", "Standards and Technical", then "Structures Engineering", "Asset Management" and refer to the "Sign Gantry Routine Visual Inspection Report Form – Level 1 Inspections" Word document. Two examples of completed Sign Gantry Routine Visual Inspection Reports (Level 1) are given in Appendix B.

The routine visual inspection form has standardised headings. The headings are explained in the following sections with general information on what to look for. Refer to Appendix B for completed examples.

The sign gantry components referenced in the routine visual inspection form are defined in Appendix A.

6.1 General Information

Certain general information heads the routine visual inspection form. Most of this data does not change over time and can be entered from IRIS, drawings or previous inspections prior to the site visit. The following information is required:

- Structure Number
- Road Name
- Road Number
- SLK: The Straight Line Kilometre (SLK) distance defines the location of a point on a road to reference items on or adjacent to the road. SLK is a distance measure (to 2 decimal places) that maintains an historical reference of road points as road realignments introduce changes to the true distance measure
- Local Authority
- Responsibility Area: The MRWA Region responsible for the management of the structure
- Latitude: The Latitude Coordinate is to be taken in decimal degrees (to 5 decimal places) and must be noted as a minus number (i.e. -32.78472), measured from Column 1, LHS. Coordinates must be measured using Global Positioning System (GPS) equipment set to the GDA 94 datum
- Longitude: The Longitude Coordinate is to be taken in decimal degrees (to 5 decimal places)
- Inspected By
- Inspection Date

6.2 Barriers

This refers to the condition of any barriers protecting the gantry columns. Some specific aspects that should be checked for and reported where applicable include:

- Note if barriers are present or not
- Impact damage
- Loose connections
- Barrier misalignment
- Corrosion/cracking/spalling or other material defects

6.3 Gantry Beams

This refers to the main structural gantry component spanning, or partially spanning (if cantilevered), the road and includes the connections to the gantry columns. This can come in many forms including: simple rectangular hollow section beams; and beams with diaphragms and trusses. They are typically made of steel.

Some specific aspects that should be checked for and reported where applicable include:

- Any structural damage (e.g. impact damage from oversized vehicles)
- Any deflections visible to the eye, particularly for cantilevered gantries
- Corrosion to components, particularly at welds and connections to columns
- Condition of flexible sealant (if present) at connections to columns
- Condition of coatings/paintwork
- Presence of graffiti

The gantry beam does not include the signs or sign connections, lights or light connections or any maintenance access, ladders or balustrades; these are covered in later sections.

6.4 Gantry Columns

This refers to the main structural gantry components supporting the gantry beam down to and including the base plate/gusset. These are nearly always made of steel and consist of either rectangular or circular hollow sections. The number and location of supports depends on the gantry type.

Some specific aspects that should be checked for and reported where applicable include:

- Any impact damage, signs of buckling or leaning
- Corrosion to components, particularly at welds and connections to the gantry beam, base plates/gussets
- Cracked welds, particularly around the base plate to column and gusset plate connections
- Warping or bending in the base plate
- Condition of coatings/paintwork
- Presence of graffiti

If the column extends below ground level and cannot be fully inspected this should be noted in the report.

6.5 Footings

This refers to any component below the base plate, not including the anchor bolts or mortar grout pads.

Some specific aspects that should be checked for and reported where applicable include:

- Movement or settlement of the footing
- Cracking, delamination, spalling or exposure of reinforcement to concrete footing

If the footing is below ground and thus does not need to be inspected as part of a Level 1 inspection, or the ground is unable to be excavated for a subsequent Level 2 inspection (e.g. under roadway or footpath) this should be noted in the report.

6.6 Anchor Bolts and Mortar Grout Pads

This refers to the anchor bolts, nuts and washers and levelling nuts and all associated fixings connecting the base plate and gantry column to the foundation. It also includes the mortar grout pads under the base plate.

Fatigue of column anchor bolts due to cyclic wind loading has historically been one of the major failure mechanisms of sign gantries. As such, the anchor bolts and mortar grout pads are important components to be checked during an inspection.

Some specific aspects that should be checked for and reported where applicable include:

- Failed or missing holding down bolts
- Washers missing or insufficiently covering the hole
- Nuts missing, not fully tightened or unevenly seated
- Nuts with less than 1.5 thread pitches including the thread chamfer above the top of the nut. Thread projections less than this may result in improper engagement of nut and bolt
- Cross-threaded nuts (if visible)
- Corrosion to steel components
- Cracked, incomplete or missing mortar or grout under base plates

If the anchor bolts and mortar grout pads are below ground and thus do not need to be inspected as part of a Level 1 inspection, or the ground is unable to be excavated for a subsequent Level 2 inspection (e.g. under roadway or footpath) this should be noted in the report.

6.7 Maintenance Access

This refers to any access ladders, access hatches into hollow beams, walkways or balustrades along the gantry beam. What components (if any) are present depends on the individual gantry.

Some specific aspects that should be checked for and reported where applicable include:

- Any material defects or obvious damage
- Corrosion to steel work
- Condition of coatings/paintwork
- Presence of graffiti
- Missing locks to access ladders
- Missing or jammed access hatch
- Hatch seating, seals and bolts

6.8 Static Signs

This refers to the signs, sign lights and their connections (including support angles) to the gantry beam.

Some specific aspects that should be checked for and reported where applicable include:

- Corrosion to steel work
- Broken sign lights
- Missing or loose bolts at connections
- Fading of reflective paint on sign and general readability of sign
- Presence of graffiti
- Impact damage to sign

6.9 Variable Message Signs (VMSs)

This refers to any variable message signs, their connections, hazards associated with electrical components (i.e. exposed wires) and protective coating systems.

Some specific aspects that should be checked for and reported where applicable include:

- Corrosion to steel work
- Missing or loose bolts at connections
- Obvious electronic safety hazards (exposed wires)
- General readability of sign (Some VMSs only operate at certain times and may not be operational at the time of inspection. This shall be noted in the report)
- Presence of graffiti
- Impact damage to sign

PART 3

7.0 LEVEL 2 DETAILED VISUAL GANTRY INSPECTION PROCEDURE

7.1 Objective of Level 2 Sign Gantry Inspection

The objective of the sign gantry inspection is to ensure that the structure continues to perform its function under acceptable conditions of safety and with minimised cost of maintenance. The Level 2 inspection is undertaken to ensure the following specific objectives:

- Ensure that the structure continues to satisfy present service and safety requirements for road users;
- Record the current physical and functional condition of the gantry;
- Confirm that any previous repairs carried out are functioning satisfactorily;
- Identify any inventory changes from the previous inspection;
- Provide feedback to design, construction and maintenance engineers;
- Provide information to determine the need for establishing or revising the structural capacity of the gantry (under wind loads);
- Determine maintenance needs and identify anticipated future problems; and
- Establish a history of performance.

7.2 Extent of Level 2 Sign Gantry Inspection

The Level 2 Detailed Visual Inspection is a close visual inspection supplemented with specialist testing of certain components and must cover all components of the gantry structure above ground and footings, anchor bolts and mortar grout pads within 500 mm of ground level.

The individual components of the structure must be inspected at close range, i.e. from within 1 m of any surface of the component. The surface of the component shall be in sufficient good natural or artificial light to observe even the smallest cracks or defects.

Steel components may require thickness gauge measurements to assess residual plate thickness if corrosion is reported as being active.

Inspection of structural welds shall be undertaken with specialist instruments and/or personnel as required.

Components that are *not* required to be inspected in Level 2 inspections are:

- gantry columns and foundations more than 500 mm below ground level.

If required, these components may be inspected as part of a Special Inspection and Investigation (Level 3).

Where it is not possible to inspect a component of the gantry completely, this fact shall be recorded on the inspection report, stating the percentage of the component not inspected and the reason why it cannot be fully observed. (Refer to Section 8.3 viii).

Clear and precise photographs form an essential part of the inspection report. It is important that the location of the defect, its severity, size and extent are all identifiable. This may require multiple photographs – distant and close-up. An extension of a tape measure, a ruler or any other object allowing reasonable scaling of the defect shall be incorporated in the photograph. Photographs of components with Condition State rating of 3 or 4 shall be taken within 3 m of the surface of the component or equivalent using a telephoto lens. Further guidance on photographic requirements is provided in Section 4.5.

Refer to Sections 8 and on for further details of inspection requirements.

7.3 Outputs of Level 2 Sign Gantry Inspection

The outputs of a Level 2 Detailed Visual Sign Gantry Inspection include:

- A detailed condition assessment report on the condition and extent over which the particular Condition State rating applies for each structural component;
- Identification of components of a structure which warrant a Special Inspection and Investigation (Level 3) because of a rapid change in structural condition or deterioration to Condition State rating 4. (Refer to Section 10 for explanation of Condition State rating);
- Components rated at Condition States 3 and 4 need comments regarding possible maintenance or repair requirements and their urgency;
- Identification of components which require closer condition monitoring and observation at the next inspection because they have deteriorated to Condition State rating 3 or have shown rapid deterioration or other features which warrant reporting;
- Identification of work items;
- Identification of supplementary testing as appropriate; and
- A photographic record of the structure.

8.0 LEVEL 2 DETAILED VISUAL GANTRY INSPECTION FORMS

The Detailed Visual Sign Gantry Inspection Report is compiled on a series of standard forms or worksheets. They consist of:

- General Information and Gantry Structural Geometry sheet (Cover Sheet) (most of this can be completed in the office prior to the inspection but must be verified on site). Refer to Sections 8.1 and 8.2 for explanation of individual items.
- Site Access (“Site Conditions”) sheet (Note: This only needs to be filled out once for a gantry and updated, if required.) Refer to Section 8.4 i) for explanation of individual items.
- Inspection for each “Group” (i.e. each for Barriers, Gantry Beams, Gantry Columns, Footings, Anchor Bolts, Mortar Grout Pads, Maintenance Access, Static Signs, and Variable Message Signs). A “Group” can be deleted from the report or marked ‘N/A’ in the report if not present in the structure. Refer to Section 8.3 for details.
- Work Items – Summary
- Sign Gantry Inspection Summary “Detailed Sign Gantry Inspection Summary” sheet
- Location Map sheet
- Photo Sheets
- Sketch Sheet(s) as required

An example of a completed Gantry Detailed Visual Inspection Report (Level 2) is given in Appendix C.

8.1 General Information

The general sign gantry information requires the Inspector to input the details to identify the sign gantry and its precise location. The following information is required:

- Structure Number
- Structure Name
- Road Name
- Road Number
- SLK: The Straight Line Kilometre (SLK) distance defines the location of a point on a road to reference items on or adjacent to the road. SLK is a distance measure (to 2 decimal places) that maintains an historical reference of road points as road realignments introduce changes to the true distance measure
- Local Authority
- Responsibility Area: The MRWA Region responsible for the management of the structure
- Latitude: The Latitude Coordinate is to be taken in decimal degrees (to 5 decimal places) and must be noted as a minus number (i.e. -32.78472), measured from Column 1, LHS. Coordinates must be measured using Global Positioning System (GPS) equipment set to the GDA 94 datum
- Longitude: The Longitude Coordinate is to be taken in decimal degrees (to 5 decimal places)

8.2 Gantry Structural Geometry

The gantry structural geometry information requires the Inspector to input the details to identify the type of the sign gantry and its main structural component details. The following information is required:

- **Gantry Span:** The internal width of the gantry or width to the end of the cantilever measured along the gantry beam (i.e. on skew) measured in metres to two decimal places. Refer to Sketch 1 in Appendix A.
- **Minimum Vertical Clearance:** The minimum vertical distance from the lowest point of the sign gantry (including signs) to the crown of the road measured in metres to two decimal places. Refer to Sketch 1 in Appendix A.
- **Skew:** This is the angle between the longitudinal centreline of the sign gantry beam and a line perpendicular to the road centreline. It is measured in degrees. The skew can be positive or negative and this should be indicated on the form. Refer to Sketch 3 in Appendix A.

Gantry Beams

- **Type:** The gantry beam shall be selected from the following common types – angles, box beam, channel(s), I-beam or solid beam. If the gantry beam type is not one of these standard types, details shall be written in the report.
- **Material:** The gantry beam material type, either concrete, steel or timber.
- **Steel Section Size:** If steel, nominate the section size.

Gantry Columns

- **Type:** The gantry columns shall be selected from the following common types – concrete filled steel tube or box, hollow steel tube or box, in situ circular concrete, in situ square concrete, precast circular concrete, precast square concrete, prestressed precast concrete, round timber, square sawn timber or steel H-pile. If the gantry columns are not one of these standard types, details shall be written in the report.
- **Heights (m):** The distances from the ground line near the base of the gantry columns to the underside of the gantry beam for each column, measured in metres to two decimal places. Refer to Sketch 1 in Appendix A.
- **Material:** The gantry column material type, either concrete, steel or timber.
- **Steel Section Size(s):** If steel, nominate the section size(s).

Gantry Diagram

- The gantry diagram is for a typical sign gantry with two columns on each side. This drawing shall be amended by the Inspector to best represent the inspected gantry structure.
- **To:** For each direction away from the sign gantry, give a landmark or intersection description to assist with the location and orientation of the structure. Usually the name of the nearest road intersection is suitable for a description in each direction.
- **Show North:** An arrow to show the direction of North is to be drawn in the circle provided.

8.3 Gantry Component Inspection Details

The detailed inspection form has standardised headings. The headings are explained in i) to xv) below. Refer to Appendix C for an example of a completed inspection report.

i) Group

The main aspects of the gantry are defined as separate Groups. “Group” types are:

- Barriers
- Gantry Beams
- Gantry Columns
- Footings
- Anchor Bolts
- Mortar Grout Pads
- Maintenance Access
- Static Signs
- Variable Message Signs

ii) Component

A “Component” is essentially a component of the “Group”. For example: the base plate is a Component of the Group: Gantry Columns. The standard components are listed on the inspection form.

iii) Component Location

Where more than one “Component” exists for a particular Group, for example: a gantry column (Group) having multiple columns (Component), each of the columns is described by its “Component Location” (i.e. LHS1, RHS1, LHS2, RHS2). Refer to Section 4.4 and Appendix A for details on sign gantry component identification and terminology.

iv) Component Material

The type of material from which the Component is constructed, e.g. concrete or steel.

v) Modification Status

A “Modification Status” is recorded for each Component. The “Modification Status” advises whether the component is part of the original structure or otherwise. The “Modification Status” selection includes the following choices:

- Original (where it can be seen that the component is part of the original structure, unchanged)
- Existing (where the component appears to be original but the Inspector is not certain or where the component was previously recorded as ‘new’)
- Modified (where modifications to the component have occurred since it was initially built)
- New (a new component since the previous inspection, not previously recorded) (in the next inspection, this component shall be recorded as an ‘existing’ component)
- Replacement (replaces an existing or original component)
- Superseded (a component that has been made redundant by the placement of a new component)

vi) Unit

Each Component has a specified basis for measurement. The “Unit” selection includes the following choices as the basis for measurement for that component:

- Each
- m²
- linear m

Refer Section 10 for more details on the units and measurement of Condition State.

vii) Percentage of Inspected Component in Each Condition State

The Inspector is required to assess the structural condition of the key components of the sign gantry. The components that require assessment are:

- Gantry Beams: Beams and Connections
- Gantry Columns: Columns and Base Plates/Gussets
- Footings
- Anchor Bolts: Bolts, Nuts and Washers
- Mortar Grout Pads
- Static Signs: Mounting Brackets
- Variable Message Signs: Mounting Brackets

For guidance on how to determine the Condition State of the components refer to Section 10.

viii) Not Inspected (%)

In some circumstances it may not be possible to inspect an entire component of the sign gantry. This may be due to inaccessible foundations, for example. It is important that the Inspector accesses as much of the structure as possible for inspection. Where the Inspector has been unable to inspect the entire structure, the estimated percentage *not* inspected must be recorded for each particular item and in the comments section give the reason why it cannot be fully observed. (The Condition State recorded is that for the inspected area only and must still add up to 100%.) If the entire component cannot be inspected, e.g. a buried footing, then no Condition State shall be assigned. The percentage ‘Not Inspected’ is then 100%.

ix) Comments

The Inspector is required to give a full description of the component’s condition including any defects – type, magnitude and extent. This includes details of crack widths and extents. If works have been proposed this “Comments” section must also include enough details for the Asset Owner to assess repair options and prepare estimated costs.

x) Sketch Number

Where the Inspector considers that a sketch is useful to further show or explain an issue, the sketch is to be given a reference number (i.e. 1, 2, 3, etc.). The sketch’s reference number(s) is to be written in the table in the appropriate location that is relevant to a particular item and comment.

xi) Photograph Number

All photographs taken of the sign gantry are to be given a reference number (i.e. 1, 2, 3, etc.). The photograph’s reference number(s) is to be written in the table in the appropriate location that is relevant to a particular item and comment.

xii) Work Required? (Y/N)

Where a defect has been observed relating to a particular inspection item that requires repair, a “Y” for yes, is to be written in the “Work Required?” section of the inspection form. If no work is required, an “N” is to be written in the box.

xiii) Work Item Number

Where the Inspector considers that maintenance or other further work is required, the standard work item description code(s) is to be written in this section of the inspection form. Information and background regarding work items is provided in Section 11.

xiv) Work Description

Where the Inspector has designated that maintenance or further work is required, the standard work item description needs to be written in the “Work Description” box. Further description and details required to be able to determine estimated costs shall be added to the “Comments” section of the inspection form.

xv) Priority

For all work that has been reported as being required, a suitable priority needs to be allocated by the Inspector and written in the “Priority” box. Refer to Section 12 for details. The Inspector should note that any defect that has a critical safety deficiency (i.e. that has the potential of resulting in sudden failure and is of immediate threat to public safety) must have its work requirement allocated as a ‘0’ Priority rating.

8.4 Attachments

There are mandatory attachments that supplement the inspection form and other items that may be required to complete the report, depending on what has been identified in the inspection process (i.e. the level and/or severity of defects encountered).

i) Site Conditions Sheet

This is a mandatory requirement but only needs to be filled out once and updated only if required. The following information is required:

- Drive Through: The clear visible line of sight for a driver approaching the sign gantry from either direction.
- Traffic Control: Location of traffic management signage and controls from both sides if different to details in the generic traffic management plan. Refer also Section 4.1.
- Parking Position: The safest position to park a vehicle close to the sign gantry, distance and location.
- Access to Columns: Describe the access conditions and any special equipment used to access each column of the sign gantry. General vegetation should be noted if impeding access.
- Headroom: The maximum and minimum headroom to assist in determining the appropriate access equipment needed for inspection.
- Potential Hazards: Any hazards identified that may affect the safety of the sign gantry inspection.
- Fences: Details of any fences attached to or located near the sign gantry which prevent inspection or affect the safety of the inspection.
- Powerlines: Proximity of powerlines that may impact the use of special access equipment in the safe inspection of the sign gantry.

ii) Sign Gantry Summary

This is a mandatory requirement, to summarise the inspection findings in a one page summary.

iii) Work Items – Summary

The Work Items – Summary sheet summarises all of the required work items identified throughout the report. Each work item listed is allocated a priority. The “Comments” field is to be used to identify the location for the required works.

iv) Location Map Sheet

This is a mandatory requirement. Map sheet or Location sheet must show the location of the sign gantry on the road network. It should provide adequate information to ensure that the structure can be located from the map sheet. This should be extracted from the MRWA Structures Location Map Book, refer Section 4.4 for source.

v) Photo Sheets

This is a mandatory requirement. A photographic record is a very important part of the Level 2 inspection process. The Inspector must include as many photographs of the sign gantry as necessary to adequately cover all damage or defects identified. It is very important to ensure appropriate quality of the photographs – clarity, focus, exposure and contrast. Refer to Section 4.5 for further details of photographic requirements.

vi) Sketch Sheet(s)

To be used (usually in addition to photographs) where a sketch will be useful to help show a problem observed in detail. Sketches of cracking patterns are often useful. The sketch sheet should be titled with the structure number and inspection date for reference.

vii) Other (specify)

Any other additional useful information that provides further information regarding the current condition of the sign gantry. This could, for example, be a page of additional comments, or additional pages for commenting on further components when there has been inadequate space on the standard form.

Other information may include attachment of specialist reports such as weld inspection testing.

9.0 CHECKLIST FOR INSPECTING GANTRY COMPONENTS

The comments, supporting photos and sketches that the Inspector provides throughout the inspection report are critical to the recording of the sign gantry's current condition. This information is vital as it enables comparison of condition with previous inspections and it is used in the decision making process for any maintenance requirements and replacement needs. Thorough and concise information must be provided in conjunction with accurate assessment of Condition State of the key structural components.

The Inspector should refer to the following checklist and prompt items to ensure that the condition of all the components has been reviewed thoroughly as part of the inspection process.

Refer to Appendix A for sign gantry component identification and terminology and Section 13 for more information on common issues found in sign gantry components.

9.1 Barriers

This refers to the condition of any barriers protecting the gantry columns. Detail the type of railing present including the terminal end types (if present).

Check for and comment on:

- Condition of barriers. Provide description of barriers present (including terminal end types)
- Alignment of barriers
- Quality and condition of welds/bolts, loose connections
- Post connection
- Rail condition
- Accident damage
- Corrosion/cracking/spalling or other material defects

9.2 Gantry Beams

This refers to the main structural gantry component spanning, or partially spanning (if cantilevered), the road and includes the connections to the gantry columns. This can come in many forms including: simple rectangular hollow section beams; and beams with diaphragms and trusses. They are typically made of steel.

Check for and comment on:

- Any structural damage (e.g. impact damage from oversized vehicles)
- Any deflections visible to the eye, particularly for cantilevered gantries
- Shear cracks at beam ends, near connection to columns, size and extent of cracks
- Fatigue cracks near holes, cut-outs or connections
- Corrosion to components, particularly at welds, connections to gantry columns and the gantry beam soffit (where moisture can accumulate)
- Condition and tightness of connections to gantry columns
- Condition of flexible sealant (if present) at connections to gantry columns
- Condition of coatings/paintwork
- Presence of graffiti
- Steel thickness as measured where moderate to high corrosion is evident

- Weld cracks as detected using specialist techniques

The gantry beam does not include the signs or sign connections, lights or light connections or any maintenance access, ladders or balustrades; these are covered in later sections of the sign gantry inspection form.

9.3 Gantry Columns

This refers to the main structural gantry components supporting the gantry beam down to and including the base plate/gusset. These are nearly always made of steel and consist of either rectangular or circular hollow sections. The number and location of supports depends on the gantry type.

If the column extends more than 500 mm below ground level (as indicated by probing) or the ground is unable to be excavated (e.g. under roadway or footpath), this should be noted on the report. Corrosion is typically more prevalent at and just below ground level. Only if corrosion is evident within the first 100 mm below ground level is further excavation required to a maximum 500 mm depth.

The Inspector is to report on the visible parts of the component(s) and ensure that the "Not Inspected (%)" is recorded in the report.

Check for and comment on:

- Any impact damage, signs of buckling or leaning
- Corrosion to components, particularly at welds and connections to the gantry beam, base plates/gussets
- Cracked welds, particularly around the base plate to column and gusset plate connections
- Warping or bending in the base plate
- Condition of coatings/paintwork
- Presence of graffiti
- Cracks in the columns, size and extent
- Spalled concrete and exposed reinforcement
- Steel thickness as measured where moderate to high corrosion is evident – corrosion is typically more prevalent at and just below ground level and steel thickness measurements shall be taken at the most critical location(s)
- Weld cracks as detected using specialist techniques

Any excavation must be backfilled and thoroughly compacted by the Inspector prior to leaving site.

9.4 Footings

This refers to any component below the base plate, not including the anchor bolts or mortar grout pads.

If the footings are more than 500 mm below ground (as indicated by probing) they do not need to be inspected as part of a Level 2 inspection. A note of this should be made in the report. If the ground can be excavated and the footings are less than 500 mm below the surface, the top of the footings should be exposed to allow inspection of the column bases and connections.

With footings, a large proportion may not be visible as they will most likely be partially (or possibly completely) buried. The Inspector is to report on the visible parts of the component and ensure that the "Not Inspected %" is recorded in the report. Assessment of Condition State is to be given for the visible areas only.

Check for and comment on:

- Movement or settlement of the footing
- Cracking, delamination, spalling or exposure of reinforcement to concrete footing, size and extent

Any excavation must be backfilled and thoroughly compacted by the Inspector prior to leaving site.

9.5 Anchor Bolts

This refers to the anchor bolts, nuts and washers and levelling nuts and all associated fixings connecting the base plate and gantry column to the foundation. If the anchor bolts are more than 500 mm below ground they do not need to be inspected as part of a Level 2 inspection. A note of this should be made in the report.

Fatigue of column anchor bolts due to cyclic wind loading has historically been one of the major failure mechanisms of sign gantries. As such, the anchor bolts are important components to be checked during an inspection.

Check for and comment on:

- Failed or missing holding down bolts
- Washers missing or insufficiently covering the hole
- Nuts missing, not fully tightened or unevenly seated
- Nuts with less than 1.5 thread pitches including the thread chamfer above the top of the nut. Thread projections less than this may result in improper engagement of nut and bolt
- Cross-threaded nuts (if visible)
- Corrosion to steel components

The Inspector shall treat all exposed bolts and associated fixings. Steel surfaces shall be cleaned with a wire brush to remove loose rust and debris. All exposed bolts and associated fixings shall be liberally coated with Denso paste (or suitable alternative) or wrapped with Denso tape (or suitable alternative) in accordance with manufacturer's guidelines. Any excavation must then be backfilled and thoroughly compacted by the Inspector prior to leaving site.

9.6 Mortar Grout Pads

This refers to the mortar grout pads under the base plate. If the mortar grout pads are more than 500 mm below ground they do not need to be inspected as part of a Level 2 inspection. A note of this should be made in the report.

Fatigue of column anchor bolts due to cyclic wind loading has historically been one of the major failure mechanisms of sign gantries. The failure of the mortar grout pad is often the first sign of deterioration. Identifying failure early may prevent overstress on the anchor bolts. As such, the mortar grout pads are important components to be checked during an inspection.

Check for and comment on:

- Cracked, incomplete or missing mortar or grout under base plates

9.7 Maintenance Access

This refers to any access ladders, access hatches into hollow beams, walkways or balustrades along the gantry beam. What components (if any) are present depends on the individual gantry. Maintenance access is often locked. Keys will need to be acquired before the inspection.

Check for and comment on:

- Any material defects or obvious damage
- Corrosion to steel work including galvanic corrosion
- Condition of coatings/paintwork
- Presence of graffiti
- Missing locks to access ladders
- Missing or jammed access hatch
- Hatch seating, seals and bolts

9.8 Static Signs

This refers to the signs, sign lights and their connections (including support angles) to the gantry beam.

Check for and comment on:

- Corrosion to steel work
- Broken sign lights
- Missing or loose bolts at connections
- Fading of reflective paint on sign and general readability of sign
- Presence of graffiti
- Any material defects or damage
- Impact damage to sign

9.9 Variable Message Signs (VMSs)

This refers to any variable message signs, their connections, hazards associated with electrical components (i.e. exposed wires) and protective coating systems.

Check for and comment on:

- Corrosion to steel work
- Missing or loose bolts at connections
- Obvious electronic safety hazards (exposed wires)
- General readability of sign (Some VMSs only operate at certain times and may not be operational at the time of inspection. This shall be noted in the report)
- Presence of graffiti
- Any material defects or damage
- Impact damage to sign

10.0 DETERMINATION & MEASUREMENT OF CONDITION STATE

10.1 Determination of Condition State

A Condition State rating of 1 to 4 or combination of ratings is to be assigned by the Inspector to gantry components of structural importance. As the condition of any component may be varied at different locations, there may be more than one Condition State for each component. The assignment of Condition States is an important part of the inspection process as it gives a qualitative and quantitative measure of the components' individual condition and the overall condition.

The gantry components that require assessment of a Condition State and recording in the inspection form by the Inspector are as shown in the table below.

Group	Component *	Condition State Assessment Required? (Y/N)
Barriers	Barriers	N
Gantry Beams	Beams	Y
	Connections	Y
Gantry Columns	Columns	Y
	Base Plates/Gussets	Y
Footings	Footings	Y
Anchor Bolts	Bolts, Nuts, Washers	Y
Mortar Grout Pads	Grout Pads	Y
Maintenance Access	Access Ladders	N
	Access Hatch	N
	Walkway	N
	Balustrades	N
Static Signs	Signs	N
	Mounting Brackets	Y
Variable Message Signs	VMS	N
	Mounting Brackets	Y
	Electrical Cables	N

* Note: Where a component is concealed by permanent external formwork (e.g. sacrificial steel casing around reinforced concrete columns) the Inspector will need to observe the condition of the external formwork to best determine the Condition State of the hidden component. If the permanent formwork is providing full protection to the component it is covering, a Condition State of 2 shall be assigned to the concealed component. If the permanent formwork is deteriorated, the condition of visible parts of the component could be used to determine the Condition State. The Inspector should record the methodology used in the inspection report.

Guidance in determining the Condition State of the sign gantry components is provided in the table below.

The measurement of the extent of each Condition State of components is also required. Refer to Section 10.2 for the appropriate method of measurement for components.

Supporting information gathered prior to the site visit, including previous special inspections and investigations (Level 3), may provide additional information to assist in assigning appropriate Condition States that will not be visible during a detailed inspection. This specific information shall be used to override visual inspection.

In the inspection report form, allocate the percentage of the component that is in each Condition State (leave blank for zero percent). The combined percentage in each Condition State must add up to 100% of the whole component.

Condition States				
Component	CS1	CS2	CS3	CS4
1. Gantry Beams & Gantry Columns Steel	<p>In good condition with little or no deterioration.</p>	<p>There may be surface corrosion.</p>	<p>There is active surface corrosion throughout and there is pitting in isolated areas with loss of section.</p>	<p>There is severe surface corrosion resulting in substantial loss of section.</p> <p>Residual out-of-plane deformations exhibited. Cracks evident.</p>
<p><i>Coating defects are not necessarily serious or structural but they are indicative of potential weaknesses in the coating system and eventual loss of protection to the coated surface. It is rare for a protective coating system to outlast the life of the structure and therefore it should be thoroughly inspected and asset managed accordingly.</i></p>				
Concrete	<p>In good condition with little or no deterioration.</p> <p>Hairline cracking (≤ 0.1 mm) may be present.</p> <p>Cracks are widely spaced and are very infrequent.</p> <p>There is no cracking in the fully prestressed component.</p> <p>There is no pattern of tension cracking.</p>	<p>Fine cracking (> 0.1 & ≤ 0.3 mm) and spalling may be present.</p> <p>There may be fine longitudinal cracks and spalls but no exposure of reinforcement.</p> <p>There is no cracking in the fully prestressed component.</p> <p>A pattern of tension cracks may be present with hairline cracks (≤ 0.1 mm).</p>	<p>Medium cracking (> 0.3 & ≤ 0.7 mm), fretting and spalling may be present.</p> <p>Active corrosion in reinforcement resulting in loss of section of reinforcement or prestressing strands. Isolated rust staining may be evident.</p> <p>Cracking is evident in the fully prestressed component.</p> <p>A pattern of tension cracks may be present with fine cracking (> 0.1 & ≤ 0.3 mm).</p>	<p>Heavy cracking (> 0.7 mm) with fretting and spalling may be present.</p> <p>Severe corrosion of the reinforcement over large areas, resulting in substantial loss of section. Stressing strands may be broken or exhibit signs of advanced corrosion.</p> <p>A pattern of tension cracks may be present with medium cracking (> 0.3 & ≤ 0.7 mm).</p>

Component	Condition States			
	CS1	CS2	CS3	CS4
Timber	<p><i>Timber components of sign gantries are inspected and assessed by Structures Engineering. Refer Detailed Visual Bridge Inspection Guidelines for Timber Bridges (Level 2 Inspections), document 6706-02-2231.</i></p>			
2. Gantry Beam Connections & Gantry Column Base Plates/ Gussets & Sign Mounting Brackets	<p>In good condition with little or no deterioration.</p> <p>All welds, bolts, rivets are in good condition with no movement of plates or sections in the component.</p>	<p>There may be surface corrosion.</p> <p>All welds and fasteners are in good condition with no cracking. There may be very minor corrosion of connections but they are tight.</p>	<p>There is active surface corrosion and pitting in isolated areas suggesting loss of section.</p> <p>Welds may have non-continuous hairline cracks. Corrosion of fasteners is evident but connections remain tight. Riveted plates may have very minor movement of 1 mm to 2 mm but rivets are generally sound.</p>	<p>There is severe surface corrosion resulting in substantial loss of section.</p> <p>Welds are cracked. Fasteners are severely corroded with loss of section. Some may be loose or missing, allowing extensive movement.</p>
	<p><i>Flexible sealing defects between the gantry beam and gantry columns are not necessarily serious or structural but they are indicative of potential weakness and eventual loss of water proofing and protection to these structural components and their connections.</i></p>			
3. Footings	<p>In good condition with little or no deterioration.</p> <p>There may be only hairline cracking (≤ 0.1 mm). Cracks are widely spaced and are very infrequent.</p>	<p>Fine cracking (> 0.1 & ≤ 0.3 mm) evident with minor localised spalling.</p>	<p>Medium cracking (> 0.3 & ≤ 0.7 mm) and/or spalling. Exposed reinforcement exhibiting active corrosion with some loss of section. Rust staining is evident.</p>	<p>Heavy cracking (> 0.7 mm) and/or spalling with advanced corrosion of reinforcement with substantial loss of section.</p>
4. Anchor Bolts – Bolts, Nuts, Washers	<p>All bolts, nuts and washers are in good condition with no deterioration.</p> <p>Bolts, nuts and washers are tight.</p>	<p>All bolts, nuts and washers are in good condition. There may be very minor corrosion evident.</p> <p>Bolts, nuts and washers are tight.</p>	<p>Active surface corrosion is evident suggesting loss of section.</p> <p>Bolts, nuts and washers are tight.</p>	<p>There is severe surface corrosion and pitting resulting in substantial loss of section.</p> <p>Some bolts, nuts or washers may be loose or missing.</p>

Component	Condition States			
	CS1	CS2	CS3	CS4
5. Mortar Grout Pads	<p>In good condition with little or no deterioration, tight against the base plate.</p> <p>Hairline cracks (≤ 0.1 mm) may be present.</p> <p>Cracks are widely spaced and very infrequent.</p>	<p>The mortar grout pad may have very minor cracks, but is still structurally sound.</p> <p>Some fine cracking (> 0.1 & ≤ 0.3 mm) evident.</p> <p>Cracks are widely spaced and infrequent.</p>	<p>The mortar grout pad may show medium cracking and some mortar loss under the plate allowing flexure of the plate.</p> <p>Medium cracking (> 0.3 & ≤ 0.7 mm) evident.</p> <p>Medium cracks widely spaced and infrequent or fine cracks that are frequent and regularly spaced.</p>	<p>The mortar grout pad is extensively cracked, broken or otherwise unsound. There is evidence of loss of integrity of mortar blocks.</p> <p>Medium cracks are frequent and regularly spaced.</p>

10.2 Measurement of Condition State

The extent of each Condition State in a component is measured as a percentage of the whole component. That is, the combined percentage in each Condition State (1, 2, 3 and 4) must add up to 100% of the whole component.

Percentages recorded are to be rounded to the nearest 5% increment for all components.

Where a component cannot be completely inspected (i.e. there is a “Not Inspected %”) the Condition State recorded is that for the part of the component that can be inspected only. The combined percentage of the inspected section of the component must still add up to 100%. If the entire component cannot be inspected, e.g. a buried footing, then no Condition State shall be assigned.

The *unit of measurement* applicable to each component for which a Condition State assessment is required is given in the table below. This is the basis for determining the percentage of each Condition State of the component.

The assessment of each component is quantified in terms of one of the following measurements:

(i) Area of the Component (m²)

Where the unit of measurement is based on area, the percentage of the component in each Condition State is:

$$\frac{\text{Area in Condition State}}{\text{Total Area of Component}} \times 100 \%$$

When assessing areas of deteriorated concrete, the damaged area shall be taken as an area of ¼ m all around the spall or crack. On this basis, cracking at 0.5 m centres or less will effectively designate the entire area as the Condition State of the damaged area.

For example: A crack is 1 m long in a 3 m long concrete footing. The area affected is therefore: ¼ m on both sides of a crack x [length of the crack + ¼ m at both ends of the crack]. So the area affected is ½ m wide x 1½ m long = ¾ m². If the footing area is 3 m² say, the crack affects an area of (0.75/3) x 100%, i.e. approximately 25%.

See also (iv) Special Case.

(ii) Whole Component (each)

This is a “per whole component” basis of measurement. The most severe condition observed in a component determines the Condition State for the whole component.

For example: A beam connection is assessed as having small areas of Condition State 4, small areas of Condition State 2, with the remainder in Condition State 1. The overall assessment for this component is 100% Condition State 4.

(iii) Length of the Component (linear m)

Where the unit of measurement is based on linear metres (length), the percentage of the component in each Condition State is:

$$\frac{\text{Length in Condition State}}{\text{Total Length of Component}} \times 100 \%$$

See also (iv) Special Case.

Component	Measurement Unit
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Gantry Beams	
Beams	Linear m See also (iv) <i>Special Case</i>
Connections	Each
Gantry Columns	
Columns	Linear m See also (iv) <i>Special Case</i>
Base Plates/Gussets	Each
Footings	
Footings	m ² See also (iv) <i>Special Case</i>
Anchor Bolts	
Bolts, Nuts, Washers	Each
Mortar Grout Pads	
Grout Pads	Each
Static Signs	
Mounting Brackets	Each
Variable Message Signs	
Mounting Brackets	Each

(iv) *Special Case*

Any component with measurements in linear metres or m², where the component is:

- badly cracked or broken; or
- has defects or cracks in welds

such that its strength is affected to the extent that the whole component requires replacing, the *entire component* is in this case considered damaged and is assigned a Condition State of 4 to the whole component (e.g. 100% in Condition State 4) with appropriate comments outlining this assignment.

This consideration needs to be made to components where replacement is the only solution appropriate and local repairs are not an option.

Judgement is obviously required as to whether a particular component meets this Special Case, what the likely repairs would be and whether this repair approach would be feasible. If there is any doubt, the Inspector shall assign Condition State 4 to the whole component and make comments supporting this decision.

11.0 WORK ITEM CODES AND DESCRIPTIONS

The Work Item Numbers and Work Descriptions in the inspection form shall be selected from the standard work items. These items have a number code that identifies them in the MRWA Bridge Management System (BMS). The table below lists all the standard work items and their codes that are applicable to sign gantries. These codes are to be used in the inspection report by the Inspector where any works are identified.

11.1 General Supporting Activities

Work Item No.	ITEM DESCRIPTION
G003	Bridge - Detailed Inspection – Non-Timber (L2)
G005	Bridge - Durability Survey (L3)
G009	Bridge - Load Rating
G010	Bridge - Monitor Defect

11.2 Preventative Maintenance

Work Item No.	ITEM DESCRIPTION
P102	Bridge - Maintain Fastener

11.3 Routine Maintenance

Work Item No.	ITEM DESCRIPTION
R202	Bridge - Remove Graffiti
R205	Bridge - Clear Debris and Vegetation
R212	Guardrail - Maintain / Repair
R214	Lighting - Maintain
R215	Sign - Maintain

11.4 Specific Works

Work Item No.	ITEM DESCRIPTION
S601	Beam - Repair
S513	Bracing - Replace
S324	Bridge - Control Corrosion
S519	Column - Repair
S534	Footing - Repair
S467	Guardrail - Install
S371	Lighting - Install
S685	Truss - Repair
S392	Walkway - Repair

12.0 PRIORITY CODES FOR WORK REQUIRED

Work that is identified as being required must be allocated a priority code to assist the Asset Manager with suitable programming of the work.

PRIORITY CODE	INDICATIVE TIMEFRAME REQUIREMENT
0 - Critical EMERGENCY action required	Immediate within 6 months
1 - High Priority	Within 3 years
2 - Medium Priority	Within 4-6 years
3 - Low Priority (monitor)	Assess again at next Detailed (Level 2) Inspection (7 years)

PART 4

13.0 COMMON MATERIAL DEFECTS

This section describes the typical defects that can be found in the various materials used to construct sign gantries in Western Australia. Refer to Section 14 for photographs of some common gantry defects.

13.1 Steel

Steel as a structural material when not encased in concrete has defects related to poor quality control, loosening of connections or the aggressive environment in which it is placed.

Condition of Protective Coating – Defects in the protective barrier system (e.g. paint, galvanising) are not necessarily serious or structural but they are indicative of potential weaknesses in the coating system and eventual loss of protection to the coated surface. It is rare for a protective coating system to outlast the life of the structure and therefore it should be thoroughly inspected and asset managed accordingly.

The loss of topcoat through age is the main item requiring maintenance. Breakdown of paint or loss of galvanising is inevitable and should be anticipated. The rate of breakdown is dependent on a number of interrelated factors with “time of wetness” being the most important. This usually results from condensation and may be increased by absorption of the moisture by windborne salts settling as a residue in the areas not subjected to rain washing. Accumulations of debris, bird droppings, flaking paint etc., will all retain moisture and promote corrosion.

In addition to eventual failure of a coating system by weathering, premature failure may result from loss of coating adhesion due to faulty specification or application, incompatibility of successive coats, subsurface rusting due to inadequate surface preparation, localised failure due to mechanical damage, and/or inadequate film build-up on sharp edges, welds and paint “shadow areas”.

The protective coating can suffer from various forms of deterioration. Principal forms of deterioration for paint systems are: chalking, blistering, rust staining and flaking. Deterioration of galvanising may be seen in the form of: chalking, abrasion, blisters, spots of zinc oxidation and rust staining.

In some cases expert advice may be required to establish the cause of the breakdown and recommend a suitable remedial action.

Corrosion – Corrosion, or rusting, will only occur if the steel is not protected or if the protective coating wears or breaks off. Corrosion on carbon steel is initially fine grained, but as rusting progresses it becomes flaky and delaminates, exposing a pitted surface. The process continues with progressive loss of section.

The degree, type and rate of corrosion are also highly dependent on the surrounding environment. This dominates both the rate of corrosion and the type of corrosion.

Assess the extent of corrosion of the steel components, the location and its form (e.g. blisters, flaking, scale, pitting, etc.). Give particular attention to: junctions of steelwork with other structural materials; and mating and rubbing surfaces.

Permanent Deformations – Steel member permanent deformations can take the form of buckling, kinking, warping and waviness, or any combination of these. Bending deformation generally occurs in the direction of the applied loads whereas buckling deformation generally occurs in a direction perpendicular to the applied load.

Fracture – Fractures are breaks in members and components and would be an indication of severe issues. They are usually initiated at points of stress concentration (e.g. sharp corners, holes, connections and changes in cross-section).

Cracking (including Welds) – Cracks represent a linear fracture in the steel and are generally caused by fatigue and can lead to brittle fracture. Brittle fracture is a complete material disintegration through the component. This usually occurs without prior warning or plastic deformation. Cracks in steel should never be treated lightly and all details must be recorded with recommendation for urgent further investigations. The most common locations for crack initiation are at weld joints, bolt holes, section changes and other connections.

Welded details are more prone to cracking than bolted or riveted details. Grinding off the weld reinforcement, so it is smooth or flush with the joined metal surfaces, improves fatigue resistance. Once cracking has occurred in a weld, it can propagate through the mother metal, and possibly lead to a brittle fracture.

Bolted or riveted connections may also develop fatigue cracking, as the holes may also become the stress concentrators. Bolted and riveted connections are also susceptible to cracking or tearing resulting from prying action, or from a build-up of splitting forces between parts of the connection due to corrosion.

Common locations susceptible to cracking are illustrated in Section 14, Sketches 1 and 2.

Since cracks may be concealed by rust, dirt or debris, the suspect surfaces should be cleaned prior to inspection.

Loose Connections – Loose connections are pertinent to both bolted and riveted connections and may be caused by corrosion of the connector plates or fasteners themselves, excessive vibration, overstressing, cracking or failure of individual components.

Loose connections may not always be detectable by visual inspection but the indications should be investigated. Cracking, excessive corrosion of the connector plates or fasteners, permanent deformation of the connection or members framing into it, all may serve as an indication of a loose connection. Tapping the connection with a hammer is one method of determining if the connection is loose.

These will need close inspection to detect looseness unless there is some accompanying movement or noise. There can be symptomatic cracks that appear in the paint films between cover plates and main members.

Condition Inside Closed Members – Accumulation of water due to leakage or condensation needs to be checked as this can lead to potential corrosion. If a member has been sealed, comment on the effectiveness of the seal.

13.2 Concrete

Concrete is used in structures as mass concrete or normally it is combined with steel reinforcement or with prestressing steel. Defects in concrete are often related to the lack of durability resulting from the composition of the concrete, poor placement practices, poor quality control, insufficient curing or the aggressive environment in which it is placed.

Sign gantries are commonly constructed from steel but with concrete footings and barrier walls.

Cracking – It is recognised that in reinforced concrete, such as gantry footings, cracks will form in tension zones. These fine structural cracks are considered harmless but as reinforcement is further stressed the initial cracks open up and progressively spread to longer and wider cracks.

The causes of cracking can be numerous. Cracking may be indicative of a particular cause or it may be due to complex issues present that require careful evaluation. Types of cracking and what it may be due to:

- Shrinkage cracking is often fine cracking that usually occurs in a structured pattern. This cracking may be a reflection of poor quality of material or workmanship, usually inadequate curing.
- Temperature cracking usually appears between one day and three weeks after placement and is seen on top of exposed concrete components. The pattern may be either diagonal or perpendicular. Cracks may resemble shrinkage cracks but are generally larger in size.
- Construction cracks from inadequate curing or cold joints (inadequate bonding of two segments). Often seen at the tops of columns.
- Cracking is often confused with other types of cracking. Cracking occurs whenever a weak layer is formed on the surface and this weak surface layer is unable to withstand quite small stresses. Cracks are only surface deep and as such, the depth needs to be investigated to determine whether the visual cracks are only superficial.
- Corrosion of reinforcement.
- Diagonal cracking which may indicate developing shear failure occurring near supports.
- Vertical cracks which may indicate overstress due to bending. Cracks are wider at the tension face.
- Cracking in a substructure component may indicate excessive or differential foundation movement.
- Fretting is usually caused by movement of the concrete component and cracking off of edges of the concrete will be evident.
- Cracking due to Alkali Aggregate Reactivity (AAR) also known as Alkali Silica Reaction (ASR), is usually small closely spaced map or block type cracking and can occur in areas of little or no stress. Cracking does not follow lines of reinforcement.

Cracks should be photographed to enable historical recording of crack propagation and growth. Common crack locations in concrete are given in Section 14, Sketch 1.

Scaling and Disintegration – Scaling is the gradual and continuous flaking or loss of surface mortar and aggregate over irregular areas to a depth of approximately 5 mm. It is prone to occur in poorly finished or overworked concrete where too many fines and not enough entrained air is found near the surface. Loss of this cement rich layer on the surface may lead to a significant reduction in overall durability of the member.

Scaling is distinguished from spalling due to the difference in concrete depth affected – scaling is rather superficial, whereas spalling extends through the entire cover to the reinforcement (and possibly deeper). It is most commonly found on horizontal surfaces exposed to the weather, but can also be present elsewhere.

Disintegration is the physical deterioration or breaking down of the concrete into small fragments or particles. The deterioration usually starts in the form of scaling and, if allowed to progress beyond the level of very severe scaling, results in disintegration.

Spalling – A spall is a fragment of concrete detached from the structure between fracture surfaces caused by an external force, thermal action, corrosion of reinforcing steel or local overstressing of the concrete member. Spalling may be a continuation of the corrosion process and represents a serious defect in the concrete, in that the reinforcement is heavily corroded. Spalling may also result from impact damage.

Delamination – Delamination is defined as a discontinuity in the surface concrete, which is substantially separated but not completely detached from the adjoining concrete. Visibly it may appear as a solid surface but can be identified by the hollow sound when tapping with a light hammer. Delamination begins with the corrosion of reinforcement and subsequent cracking of the concrete parallel to the exterior surface.

Surface Defects – Surface defects are not necessarily serious in themselves but are indicative of a potential weakness in the concrete. These include segregation, cold joints, honeycombing, rust stains and general wear.

Patching or Other Repairs – The condition of the repair or patch will indicate whether the underlying problem has been solved or if it has been merely covered up and is actively continuing under the repair. Cracking, delamination, rust stains or spalling in or around the patch indicates the problem still exists and further investigations (Level 3 Inspection) and repairs are needed.

13.3 Timber

Timber is susceptible to significant deterioration but is a material that, combined with appropriate inspection and routine maintenance, can be preserved for a very long life. Sign gantries are not commonly constructed from timber but some exist on the State's network. The detailed inspection (Level 2) drilling of timber components of sign gantries is not part of the requirements of the Inspector of the sign gantry. Structures Engineering has the responsibility of drilling all timbers for all structures.

14.0 COMMON SIGN GANTRY DEFECTS

BARRIERS



Photo 1 - CORROSION TREATMENT REQUIRED TO LEFT HAND SIDE BARRIER
(Indicative photo only, representative of similar defects for a gantry)



Photo 2 - MINOR IMPACT DAMAGE TO BARRIER, CONNECTION STILL OKAY
(Indicative photo only, representative of similar defects for a gantry)

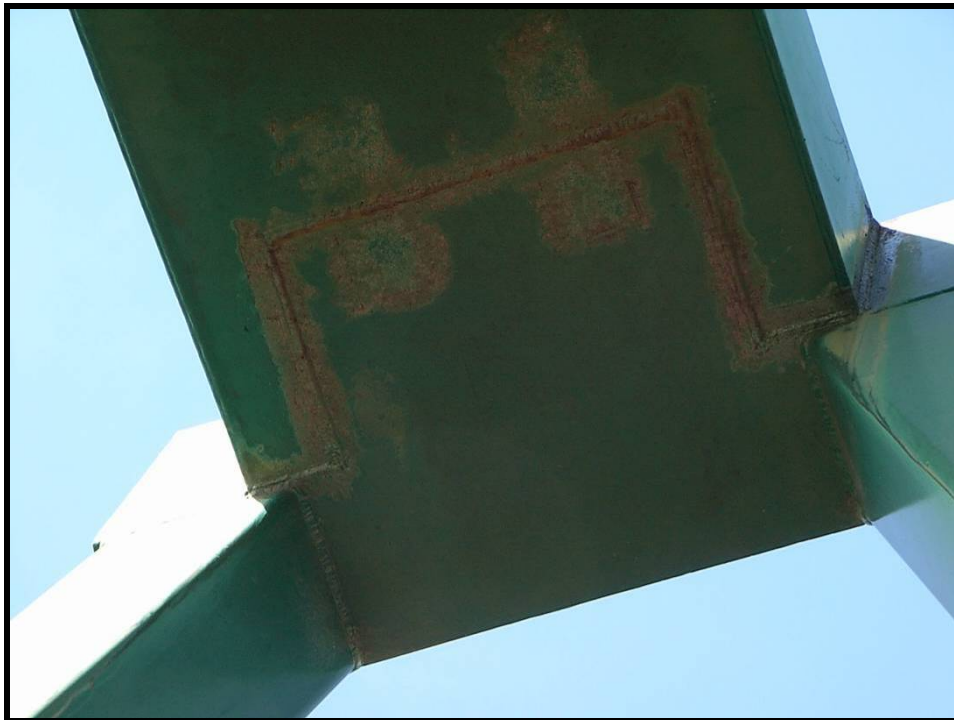


Photo 3 - MINOR IMPACT DAMAGE TO END TERMINAL
(ALSO NOTE, END TERMINAL IS SUB-STANDARD)
(Indicative photo only, representative of similar defects for a gantry)

GANTRY BEAMS



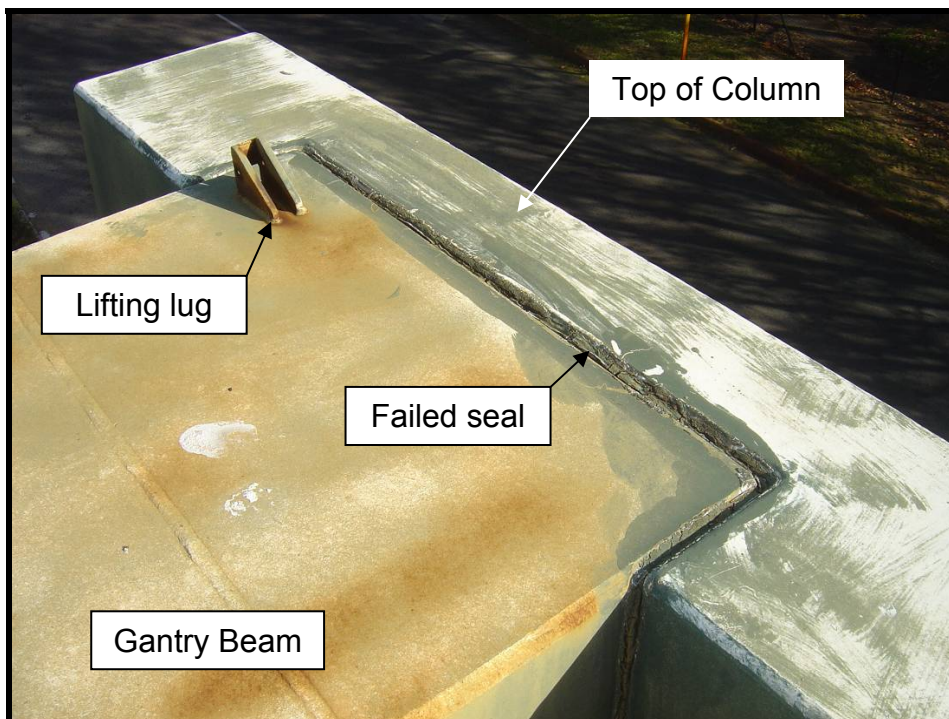
**Photo 4 - ADVANCED CORROSION TO SOFFIT OF GANTRY BEAM
(FOR LEVEL 2 INSPECTION: CS3, PITTING IN ISOLATED AREAS)**



**Photo 5 - CORROSION TO WELDS AT BEAM AND COLUMN CONNECTION
(FOR LEVEL 2 INSPECTION: CS2, SURFACE CORROSION ONLY, NO PITTING OR LOSS OF SECTION)**



**Photo 6 - CORROSION TO WELDS AT BEAM AND COLUMN CONNECTION
(FOR LEVEL 2 INSPECTION: CS2, INSIGNIFICANT SECTION LOSS)**



**Photo 7 - FLEXIBLE SEALANT FAILING AT GANTRY BEAM AND COLUMN
CONNECTION, DETERIORATED PAINTWORK TYPICAL THROUGHOUT**

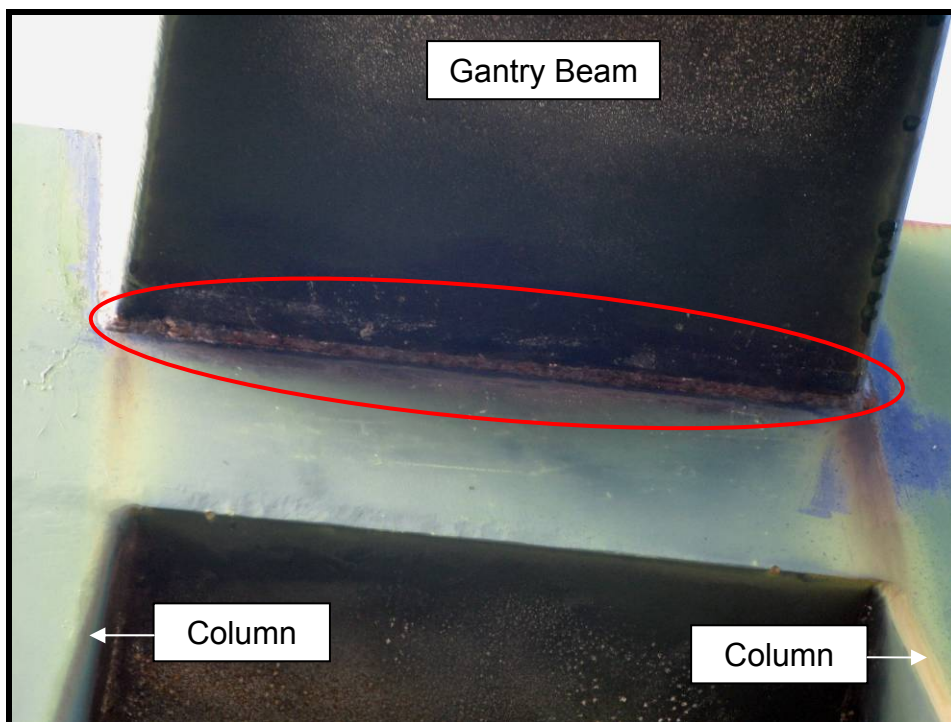


Photo 8 - CORROSION TO WELDED GANTRY BEAM AND COLUMN CONNECTION
(FOR LEVEL 2 INSPECTION: CS2, INSIGNIFICANT SECTION LOSS)

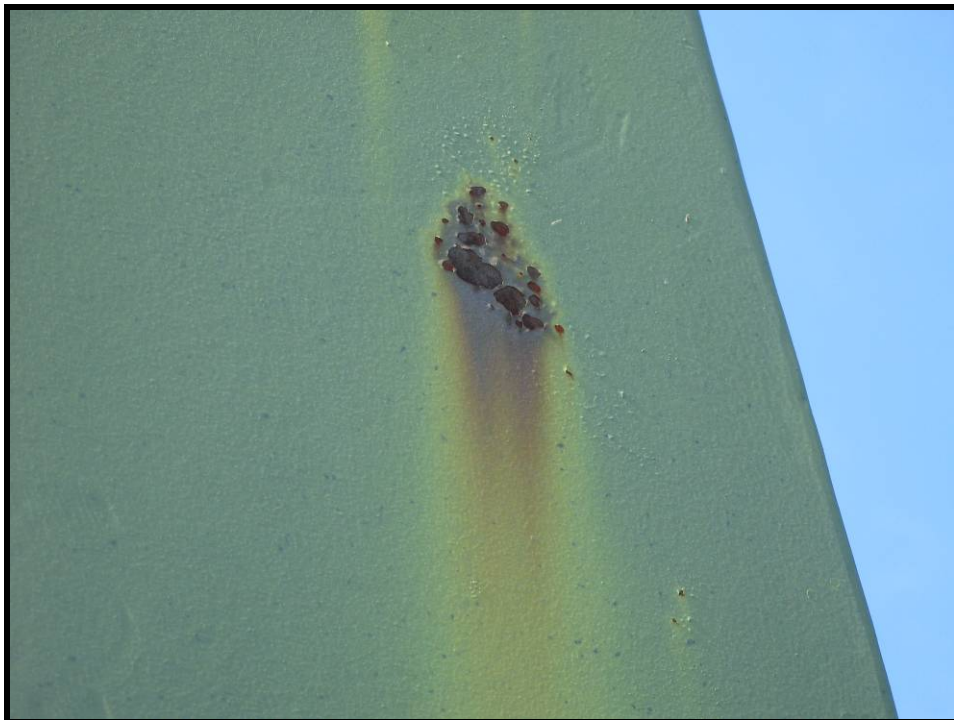


Photo 9 - IMPACT DAMAGE TO SOFFIT, CAUSING CRACK IN WEB/SOFFIT WELD
(REFER FOR ENGINEERING INSPECTION AND ASSESSMENT)
(FOR LEVEL 2 INSPECTION: CS4, STEEL CRACKING)
(Indicative photo only, representative of similar defects for a gantry)

GANTRY COLUMNS



**Photo 10 - IMPACT DAMAGE, CORROSION AND DETERIORATED PAINTWORK AT GROUND LEVEL OF COLUMN 1 RIGHT HAND SIDE
(FOR LEVEL 2 INSPECTION: CS2, NO DISTORTION OF SHAPE)**



**Photo 11 - LOCALISED CORROSION TO COLUMN 2 ON LEFT HAND SIDE
(FOR LEVEL 2 INSPECTION: CS2, SURFACE CORROSION AND INSIGNIFICANT SECTION LOSS)**

FOOTINGS



Photo 12 - FOOTING GREATER THAN 500 mm BELOW GROUND LEVEL



**Photo 13 - CRACKING TO FOOTING
(FOR LEVEL 2 INSPECTION: CS2, FINE CRACKING WITH NO SPALLING)**



**Photo 14 - SHRINKAGE CRACKING TO CONCRETE FOOTING
(FOR LEVEL 2 INSPECTION OF FOOTING: CS3, MEDIUM CRACKING)**

ANCHOR BOLTS AND MORTAR GROUT PADS



Photo 15 - FAILED ANCHOR BOLTS – NO WASHERS – CRACKED MORTAR UNDER BASE PLATE – MINOR CORROSION TO GUSSET AND BASE PLATES
(FOR LEVEL 2 INSPECTION OF ANCHOR BOLTS: CS4, FAILED BOLTS)
(FOR LEVEL 2 INSPECTION OF MORTAR GROUT PAD: CS3, SOME MORTAR LOSS)
(FOR LEVEL 2 INSPECTION OF GUSSET: CS2, SURFACE CORROSION)

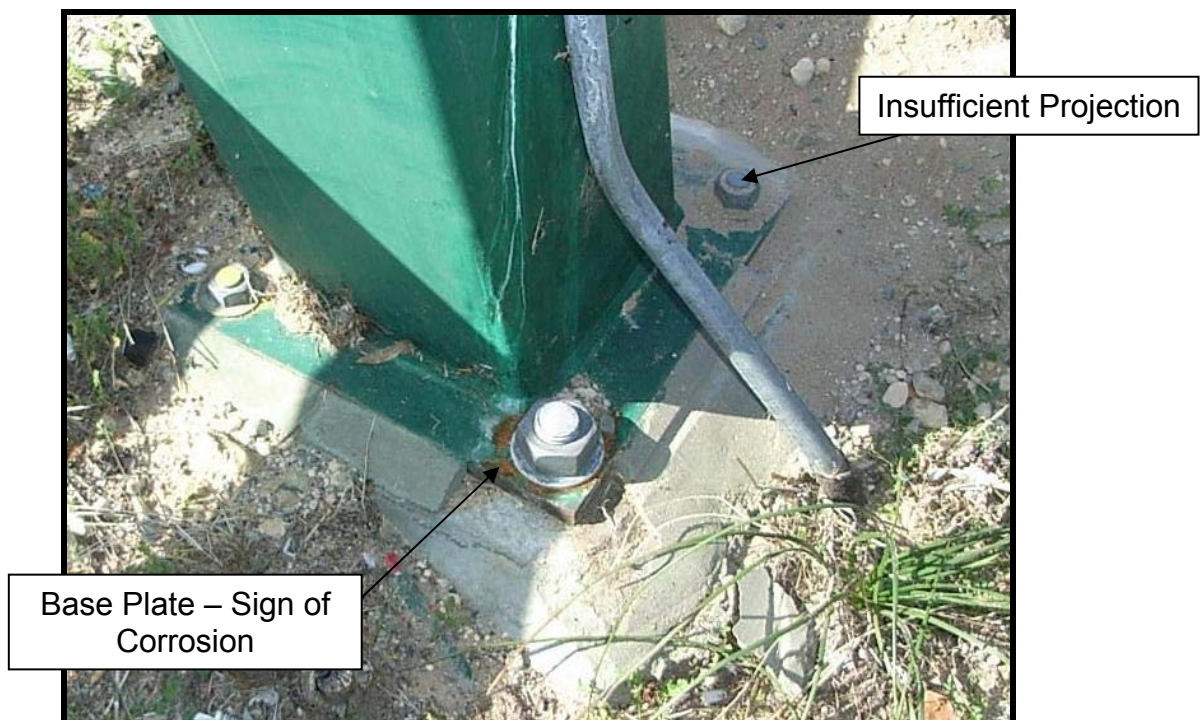


Photo 16 - LOOSE LEVELLING NUTS
(FOR LEVEL 2 INSPECTION OF MORTAR GROUT PAD: CS3, SOME MORTAR LOSS)
(FOR LEVEL 2 INSPECTION OF BASE PLATE: CS2, SURFACE CORROSION)

MAINTENANCE ACCESS

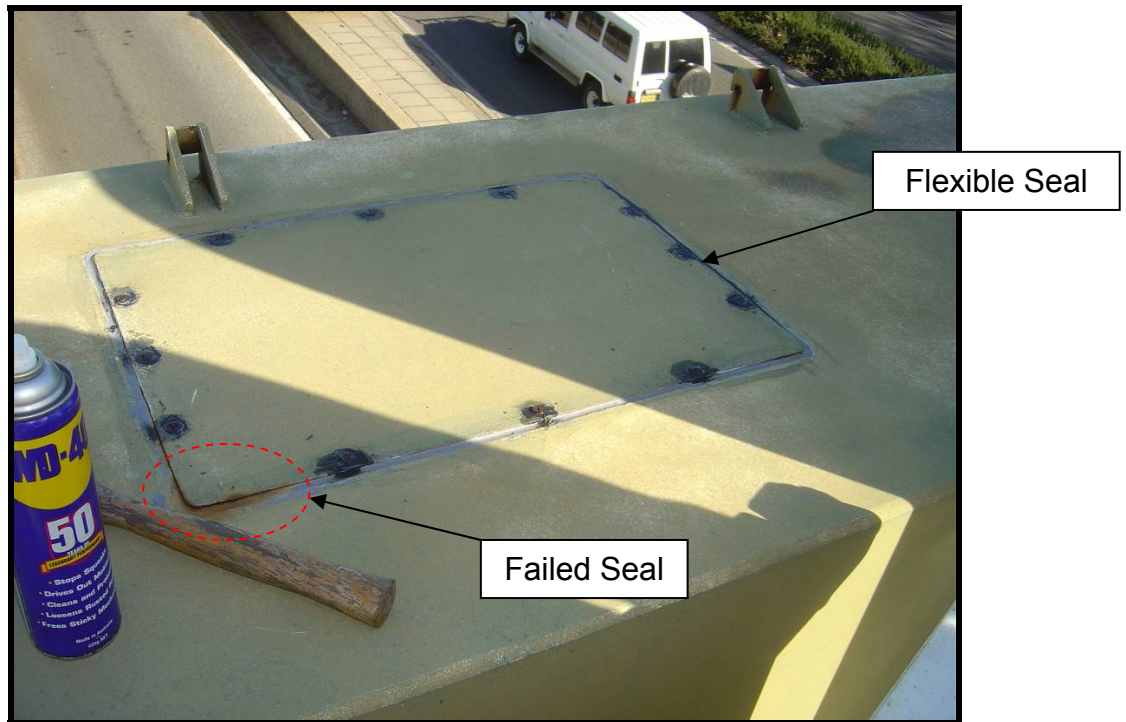


Photo 17 - FAILURE OF FLEXIBLE SEAL TO ACCESS HATCH



Photo 18 - MISSING ACCESS PLATE AT LEFT HAND SIDE OF GANTRY BEAM

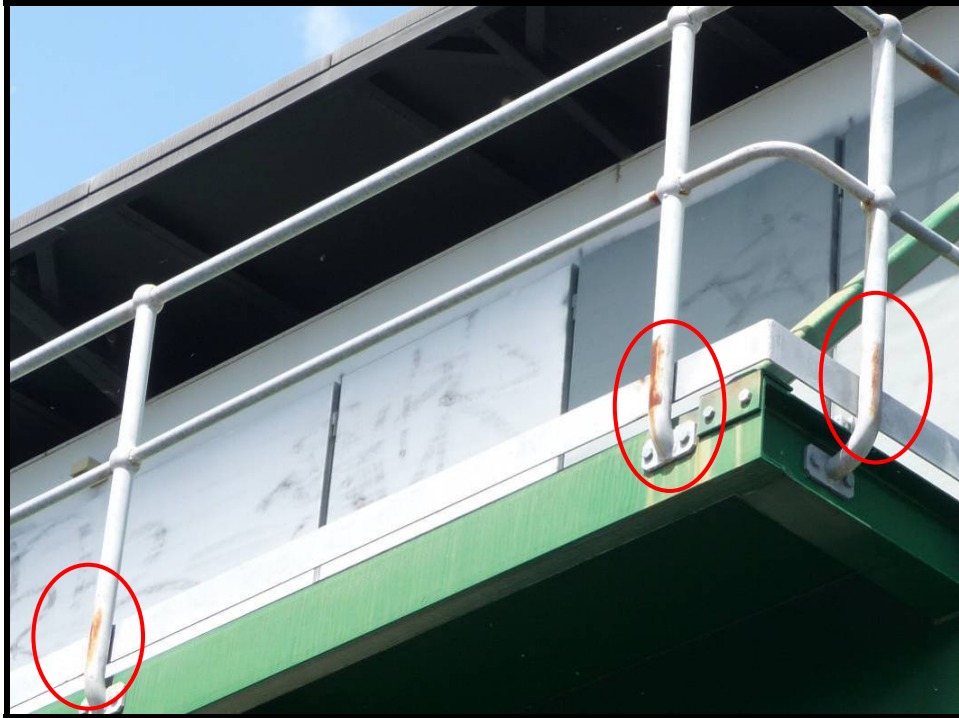
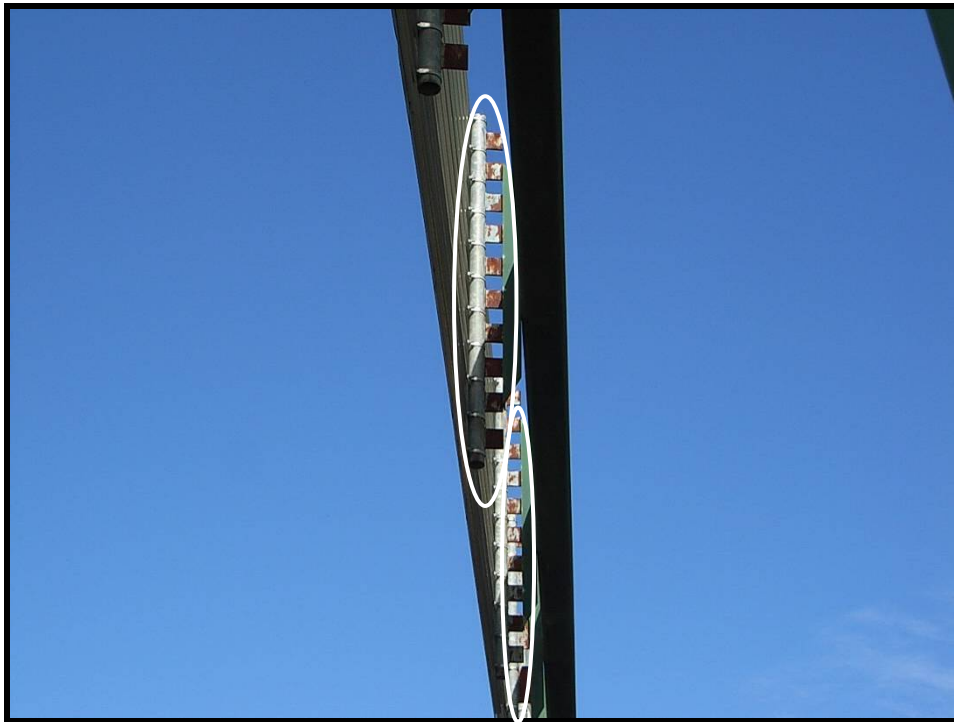


Photo 19 - CORROSION TO MAINTENANCE ACCESS BALUSTRADE

STATIC SIGNS



**Photo 20 - CORROSION TO SIGN MOUNTING BRACKET CLEATS
(FOR LEVEL 2 INSPECTION: CS2, MINOR CORROSION)**



**Photo 21 - CORROSION TO SIGN MOUNTING BRACKET WELDS
(FOR LEVEL 2 INSPECTION: CS2, MINOR CORROSION)**

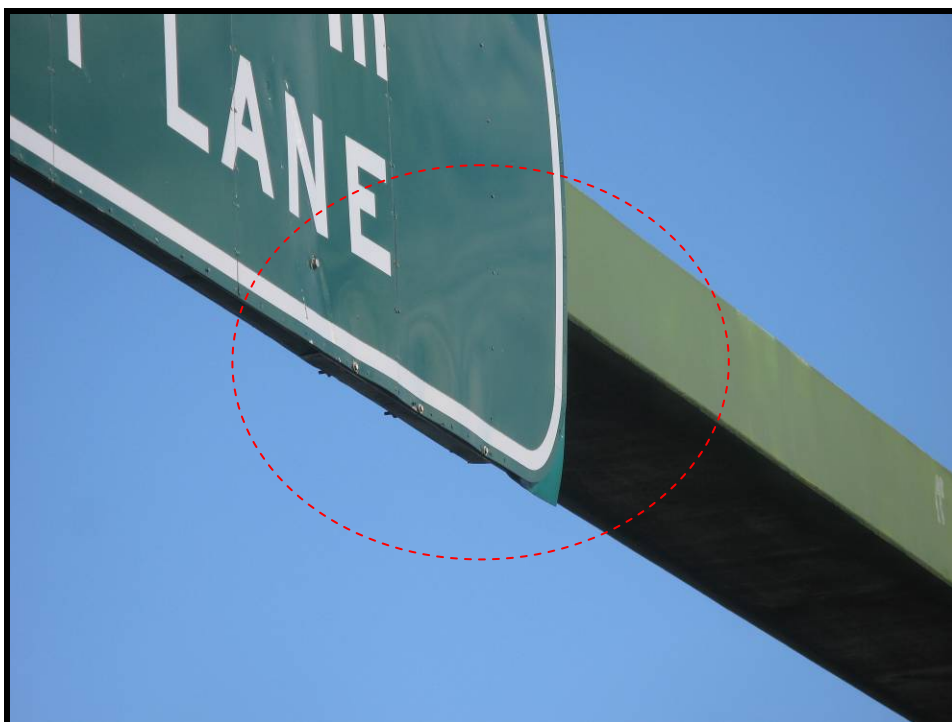


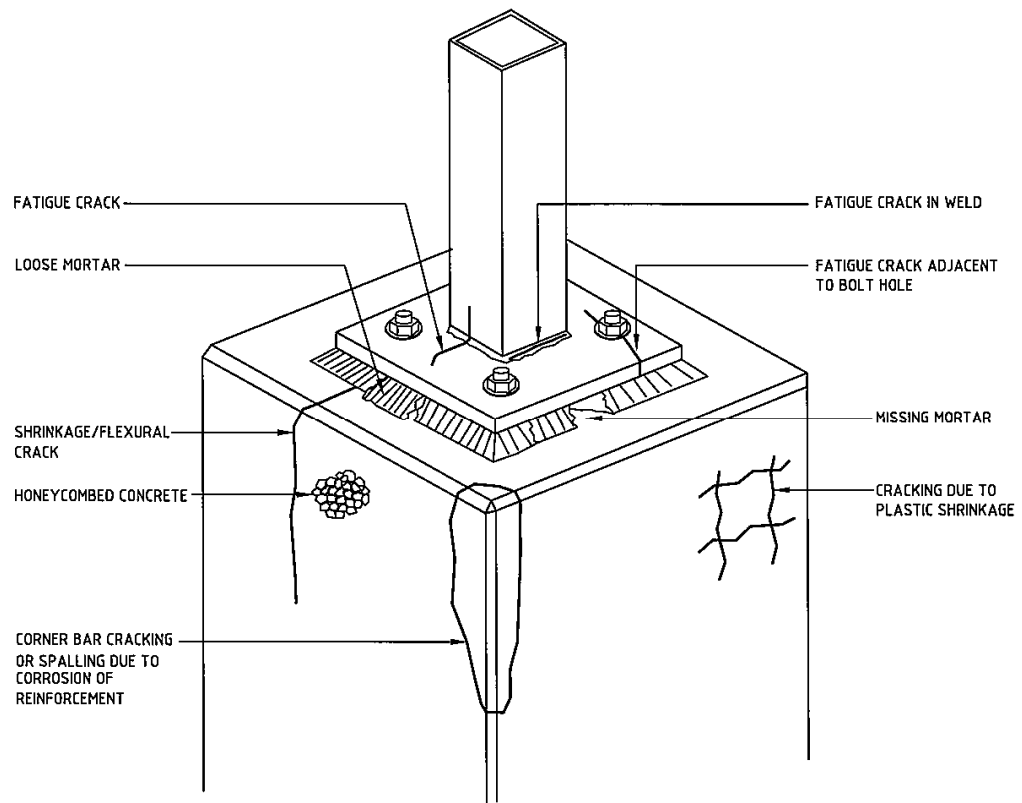
Photo 22 - IMPACT DAMAGE TO SIGN

VARIABLE MESSAGE SIGNS (VMSs)



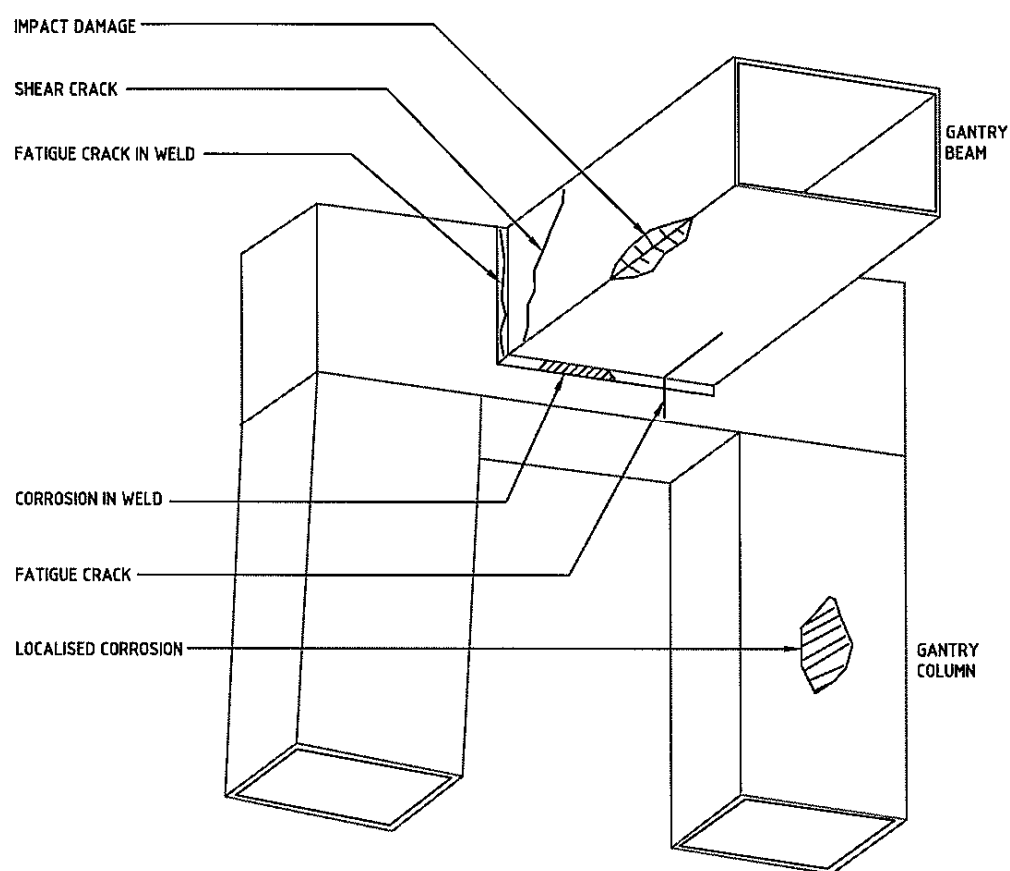
Photo 23 - VARIABLE MESSAGE SIGN – NO DEFECTS OBSERVED

TYPICAL FOOTING DEFECTS



Sketch 1 - TYPICAL FOOTING DEFECTS

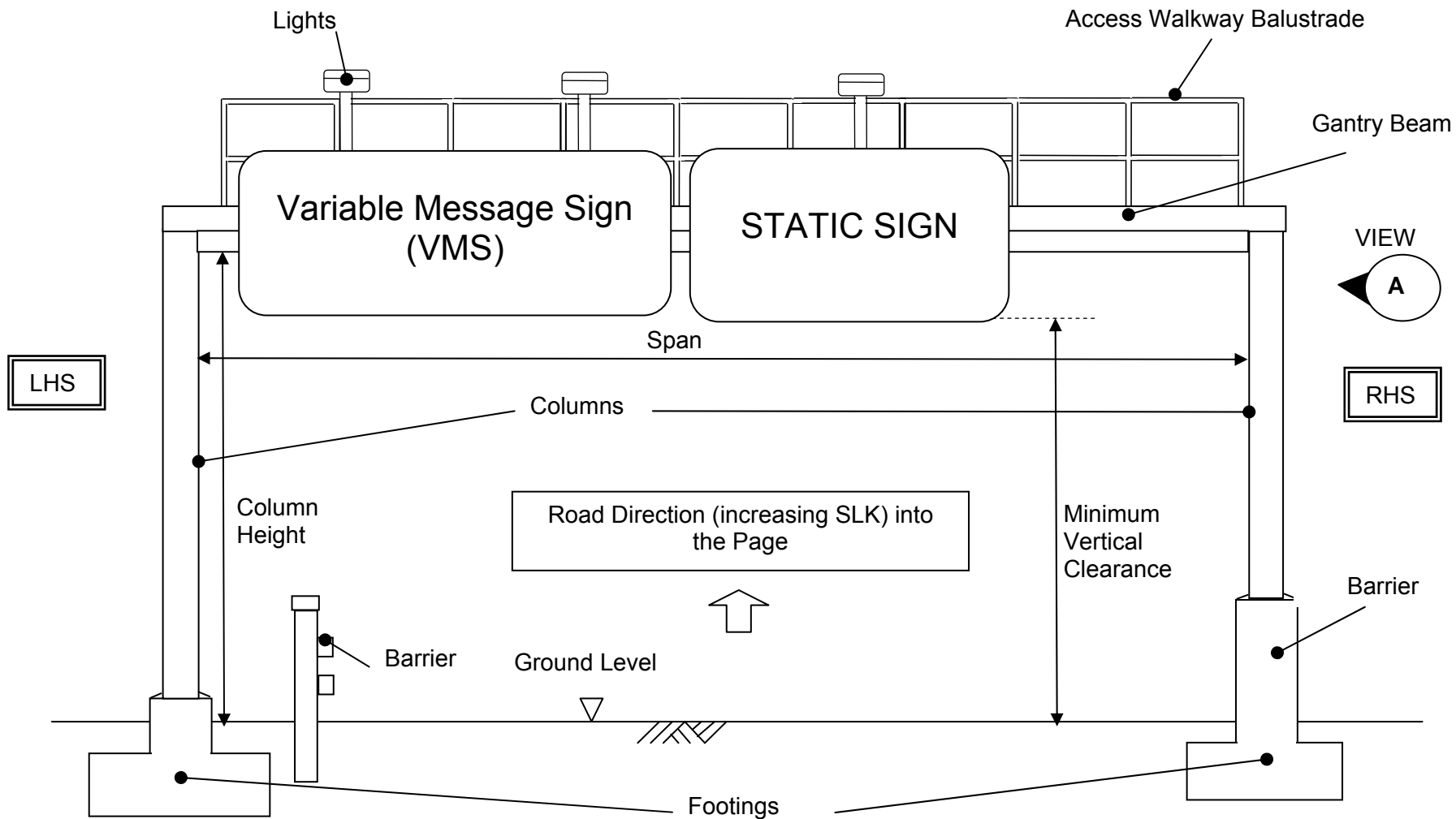
TYPICAL GANTRY COLUMN AND BEAM DEFECTS



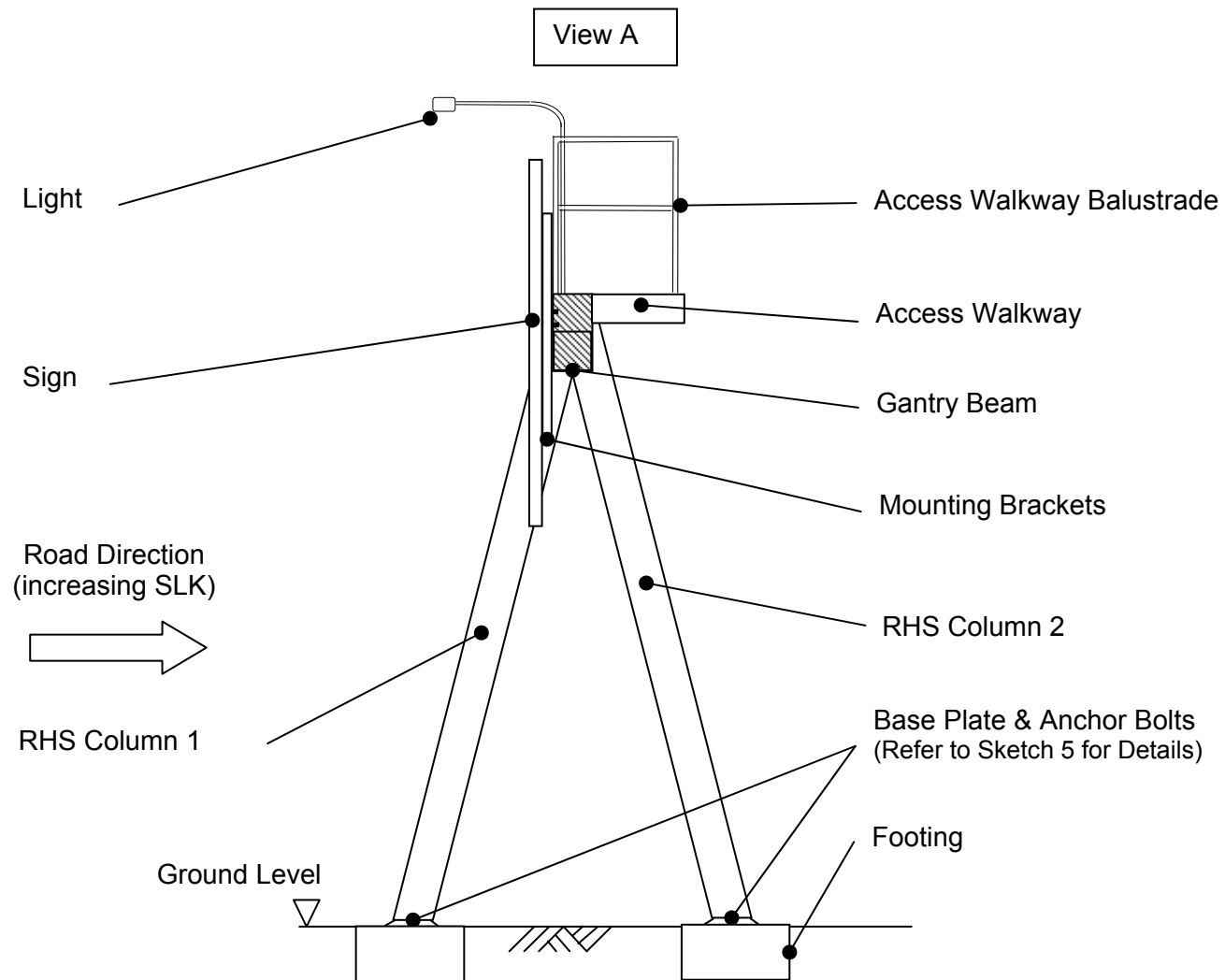
Sketch 2 - TYPICAL COLUMN/BEAM DEFECTS

APPENDIX A

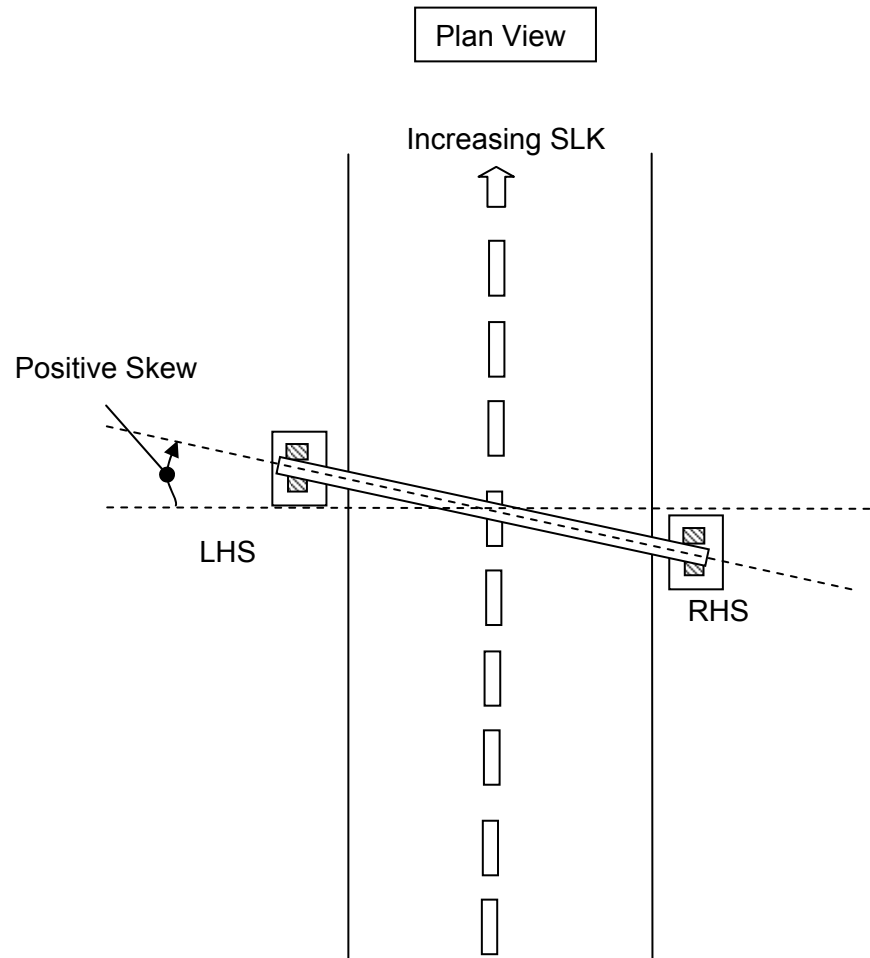
GANTRY COMPONENTS AND TERMINOLOGY



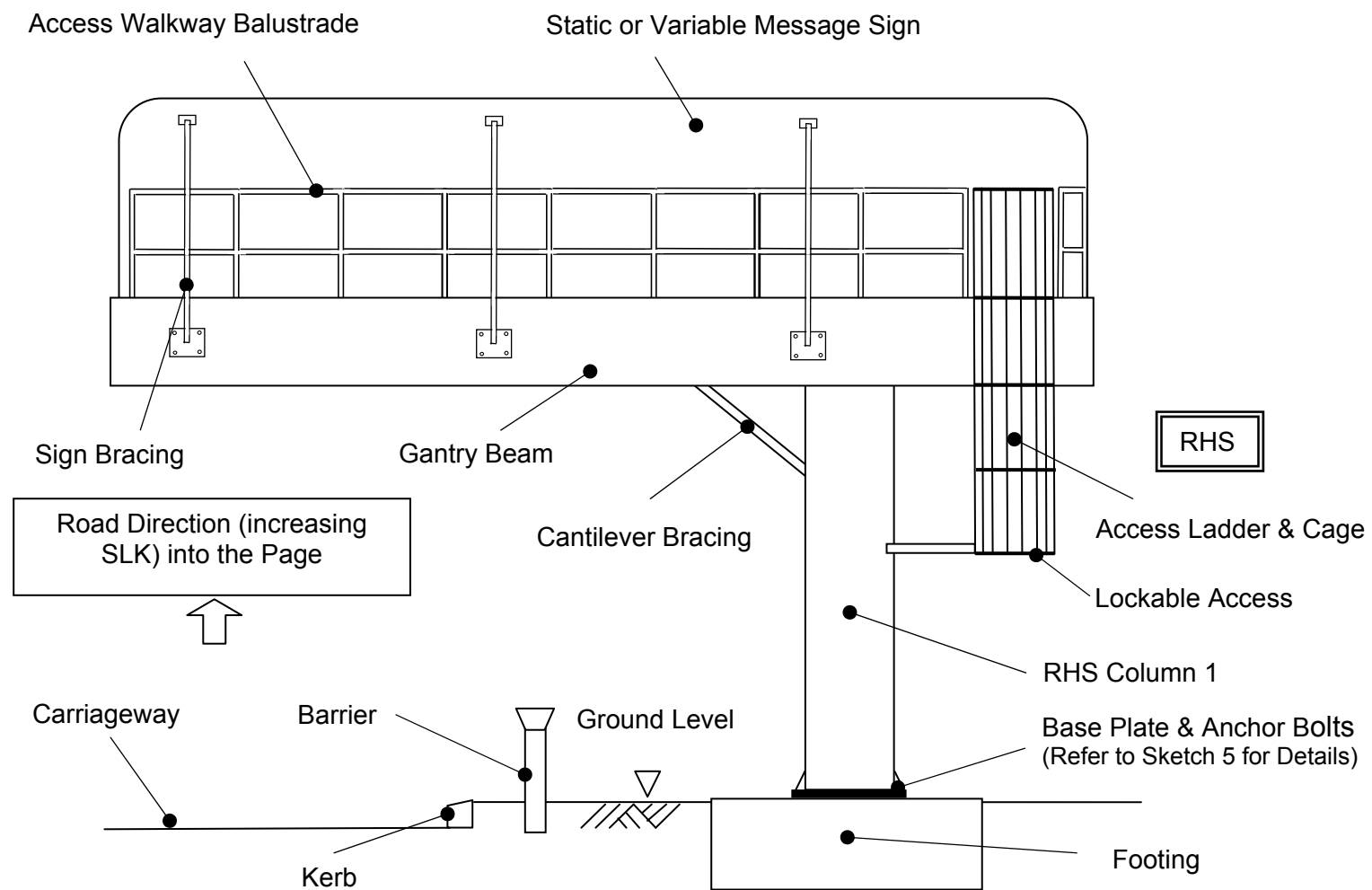
Sketch 1 - SIGN GANTRY COMPONENT TERMINOLOGY – ELEVATION



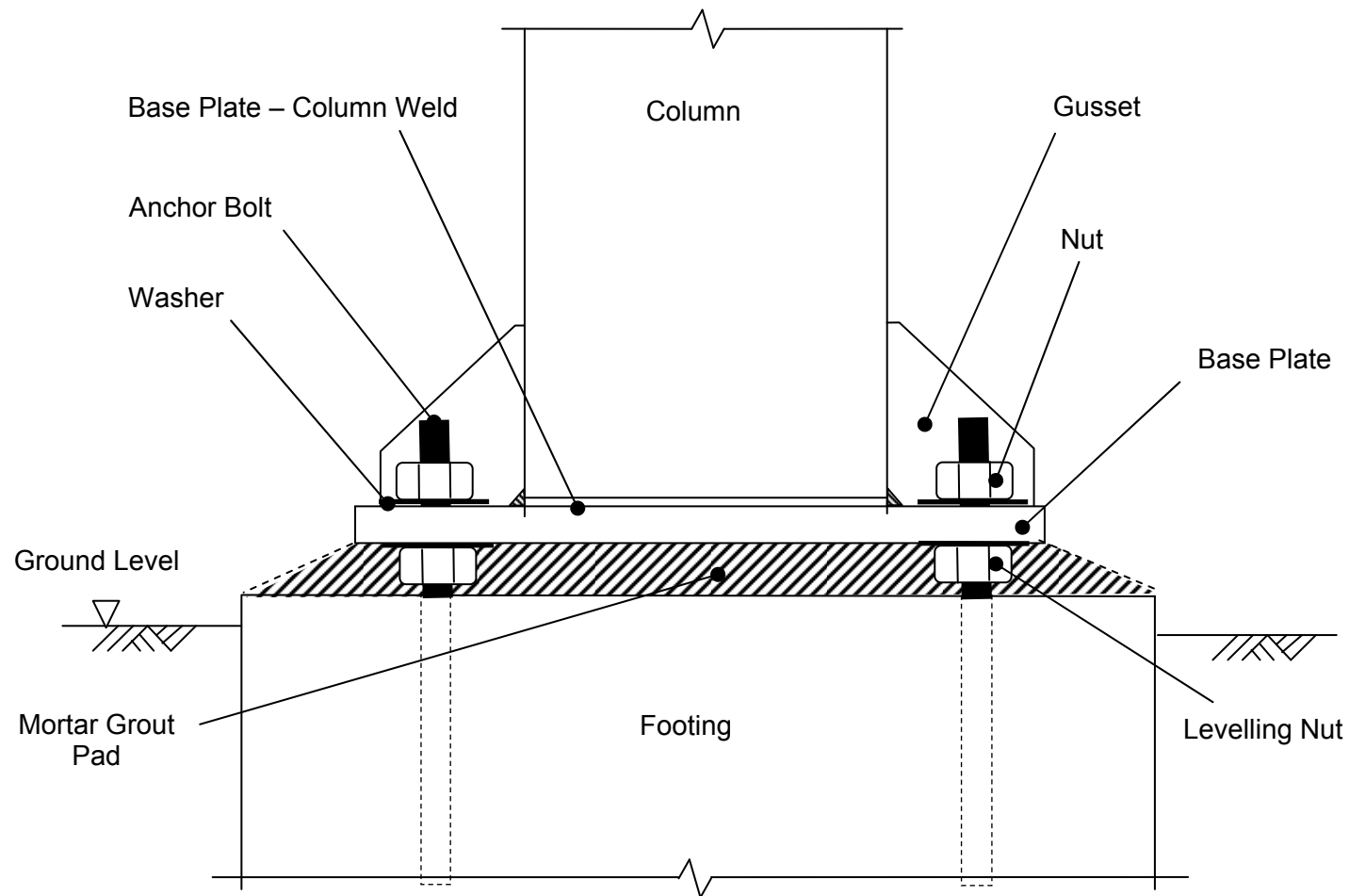
Sketch 2 - SIGN GANTRY COMPONENT TERMINOLOGY – CROSS SECTION



Sketch 3 - SIGN GANTRY COMPONENT TERMINOLOGY – PLAN VIEW



Sketch 4 - CANTILEVERED SIGN GANTRY COMPONENT TERMINOLOGY



Sketch 5 - SIGN GANTRY FOOTING & ANCHOR BOLTS TERMINOLOGY

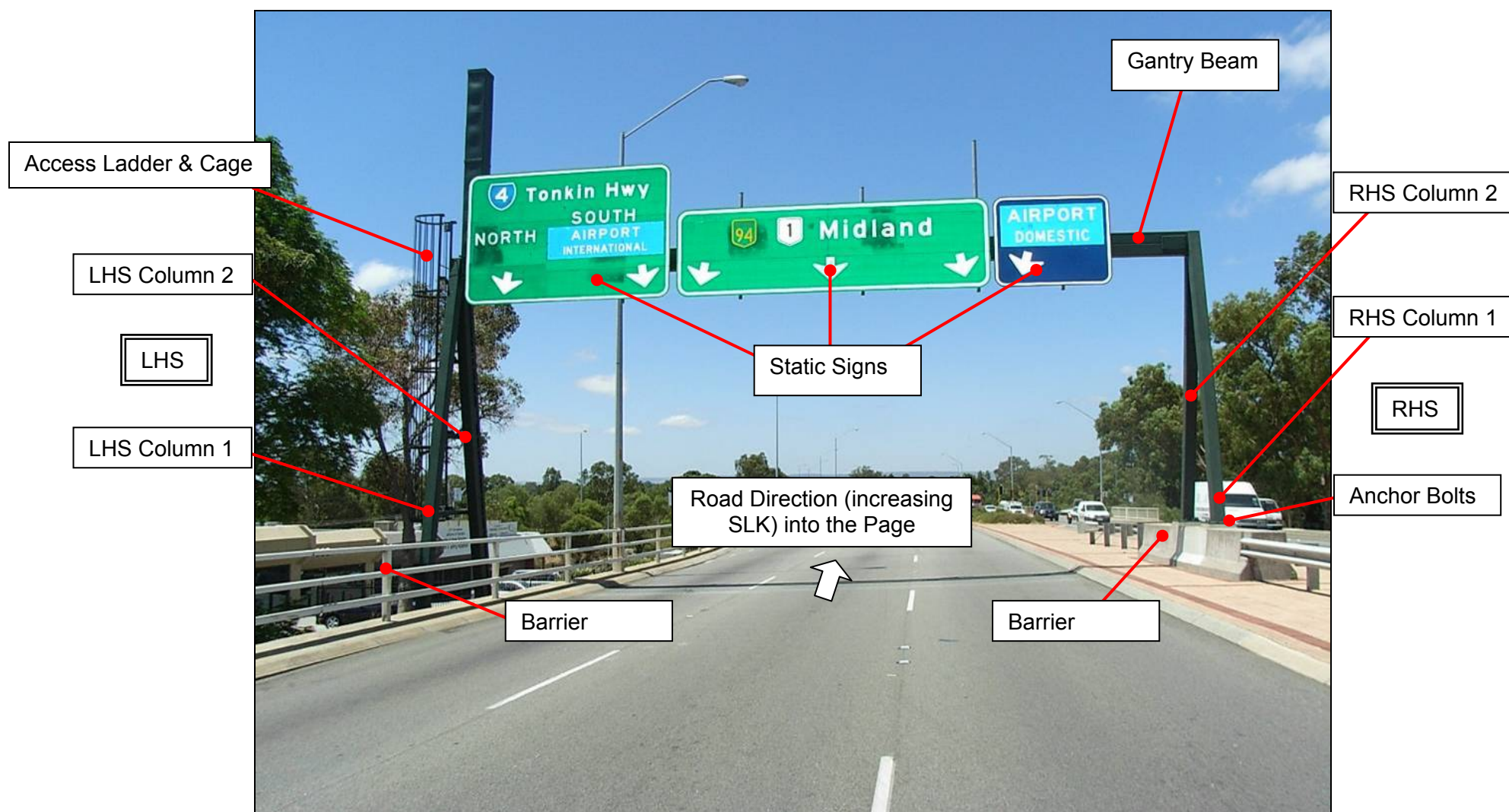


Photo 1 - TYPICAL SIGN GANTRY TERMINOLOGY

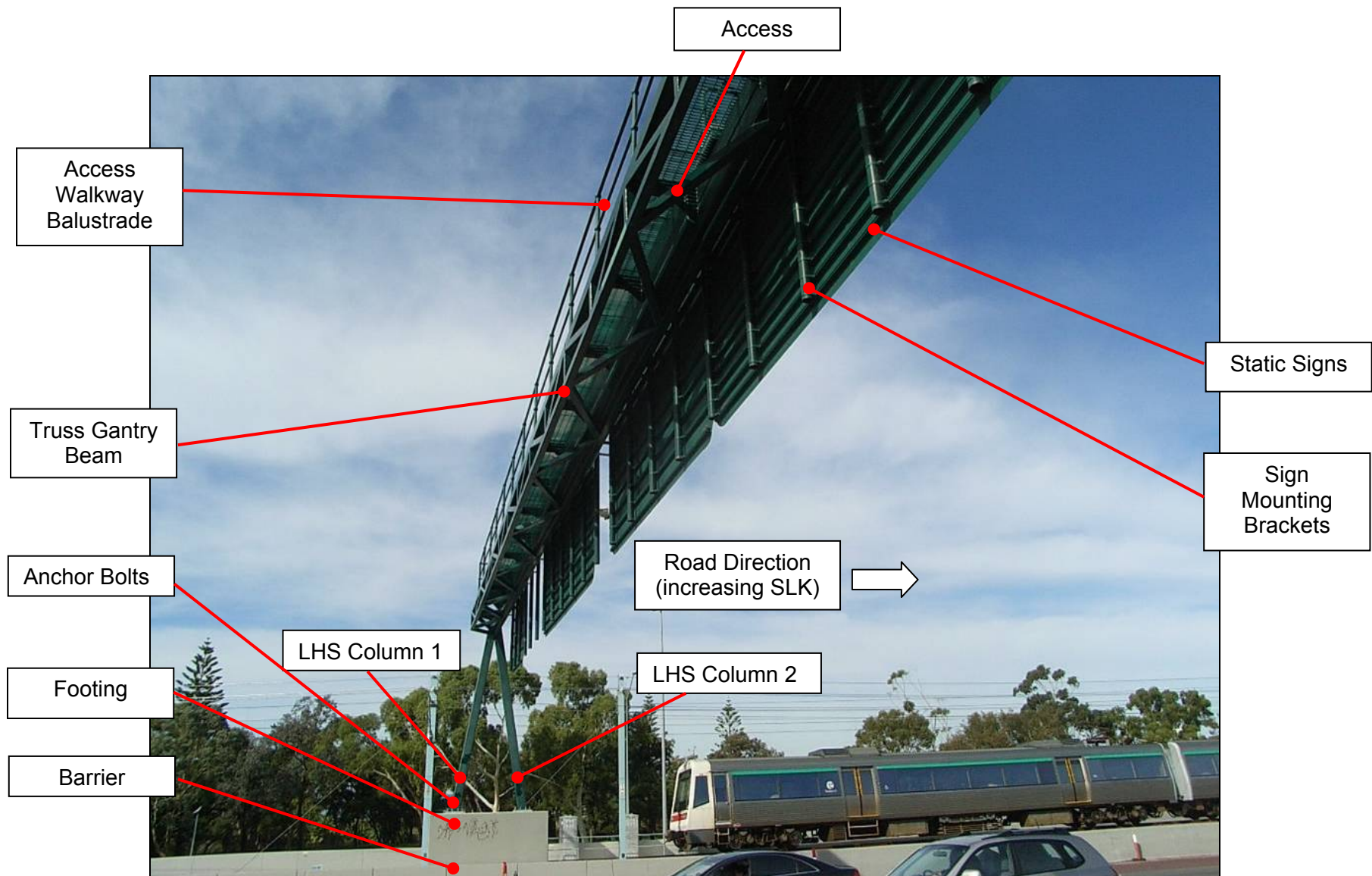


Photo 2 - TYPICAL SIGN GANTRY TERMINOLOGY

APPENDIX B

SIGN GANTRY ROUTINE VISUAL INSPECTION REPORT (Level 1 Inspection)

EXAMPLES



SIGN GANTRY ROUTINE VISUAL INSPECTION REPORT (Level 1 Inspection)



Structure Number:	8012	Road Number:	H547
Road Name:	Manning Rd On – H015 (Northbound)	Local Authority:	South Perth (C)
SLK:	0.04	Latitude:	-32.01403
Responsibility Area:	Metropolitan	Longitude:	115.85878
Inspected By:	P. Kirk & I. Hudson	Inspection Date:	19-08-2010

Have structural issues been found that require further investigation? (Y/N) Y

Inspection Item	Defect		Comments <i>(Including location and extent)</i>	Maint. Required
	Yes	No		
1. Barriers Protection to gantry columns: are they present, accident damage, connections, alignment, material defects	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Paint system is failing and requires localised corrosion treatment, repaint and reinstatement of retroreflective tape No guardrail protection to RHS gantry column	<input checked="" type="checkbox"/>
2. Gantry Beams Main structural component spanning, or partially spanning (if cantilevered), the road and connections to the columns: material defects, impact damage, large deflections, corrosion, flexible sealant, coatings/paint	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Painted steel RHS – corrosion to welded connections to gantry columns and intermittently along edges of beam Beam requires corrosion treatment and new protective coating system	<input checked="" type="checkbox"/>
3. Gantry Columns Columns supporting the beam Base Plates/Gussets: material defects, impact damage, buckling, corrosion, cracked welds, coatings/paint	<input checked="" type="checkbox"/>	<input type="checkbox"/>	RHS columns extend below ground level Numerous small areas of surface corrosion present on both columns Columns require corrosion treatment and new protective coating system	<input checked="" type="checkbox"/>
4. Footings Gantry column foundations: visible; above or below ground? Concrete: material defects, cracking, spalling, movement or settlement	<input type="checkbox"/>	<input type="checkbox"/>	<i>Not inspected</i> Footings below GL and covered by rock pitched batter, held in place by concrete on RHS No signs of distress	<input type="checkbox"/>
5. Anchor Bolts and Mortar Grout Pads Gantry column anchor bolts: visible; above or below ground? Bolts, Nuts, Washers: material defects, missing, corrosion, projection of thread Grout Fill: material defects, cracking or spalling	<input type="checkbox"/>	<input type="checkbox"/>	<i>Not inspected</i> Not accessible (below ground level) No signs of distress	<input type="checkbox"/>
6. Maintenance Access Access ladder, access hatches, walkway, walkway balustrades: material defects, corrosion, missing seals, coatings/paint, locks	<input type="checkbox"/>	<input type="checkbox"/>	N/A	<input type="checkbox"/>
7. Static Signs Static signs, sign lights: material defects, corrosion, mounting brackets (welded, bolted, clipped, etc.), support angles, reflective paint, graffiti, general readability	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2No. aluminium directional signs Corrosion at connections between gantry beam and sign attachments, needs further inspection Surface corrosion to bolts connecting signs to brackets, possibly due to galvanic corrosion	<input checked="" type="checkbox"/>
8. Variable Message Signs (VMSs) Variable Message Signs: material defects, corrosion, mounting brackets (welded, bolted, clipped, etc.), support angles, exposed wires, graffiti, general readability	<input type="checkbox"/>	<input type="checkbox"/>	N/A	<input type="checkbox"/>



**SIGN GANTRY
ROUTINE VISUAL
INSPECTION REPORT
(Level 1 Inspection)**



Defect Descriptions

Material	Defect Descriptions
Concrete	Cracking (hairline: $\leq 0.1\text{mm}$) (fine: > 0.1 & $\leq 0.3\text{mm}$) (medium: $> 0.3\text{mm}$ & $\leq 0.7\text{mm}$) (heavy: $> 0.7\text{mm}$), spalling, corrosion of reinforcement, rust staining, honeycombing
Steel	Bending, buckling, cracking, distortion, corrosion, surface rust, pitting or flaking, protective coating damage/deterioration, loose fasteners
Timber	Splitting, crushing, rot, failure, termites/termite nest
Protective Coating	Cracked, weathered, peeling, flaking, oxidising

General Comments

The paint system on the gantry and barriers is weathered, with areas of surface corrosion on all structural members, including the welded connections between the gantry beam and both columns and the connections between the sign mounting brackets and the gantry beam. Corrosion to date is surface only and does not appear to have resulted in section loss.

There is no collision protection to the RHS column, despite its location within 1.5 m of the edge of the traffic lane.

The traffic signs are in good condition with no signs of impact.

Ancillary Items (such as service attachments, cameras etc.)

This sign gantry has been inspected in accordance with the requirements of the Main Roads Western Australia Sign Gantry Guidelines for Level 1 inspections.

Signature:  **Position:** Engineer **Date:** 19-08-2010

GANTRY INSPECTION REPORT PHOTO SHEET

Structure No.:	8012	LGA:	South Perth (C)	Date:	19-08-2010
Road Name:	Manning Rd On – H015 (Northbound)	SLK:	0.04		
Responsibility Area:	Metropolitan	Inspector:	P. Kirk & I. Hudson		



Photo No. 1: Overall view facing west (increasing SLK)



Photo No. 2: Overall view left-hand side

GANTRY INSPECTION REPORT PHOTO SHEET

Structure No.:	8012	LGA:	South Perth (C)	Date:	19-08-2010
Road Name:	Manning Rd On – H015 (Northbound)	SLK:	0.04		
Responsibility Area:	Metropolitan	Inspector:	P. Kirk & I. Hudson		



Photo No. 3: 3-rail Barrier protection to LHS column, note weathered paint condition



Photo No. 4: RHS connection of Gantry Column to Gantry Beam, note corrosion

Structure No.:	8012	LGA:	South Perth (C)	Date:	19-08-2010
Road Name:	Manning Rd On – H015 (Northbound)	SLK:	0.04		
Responsibility Area:	Metropolitan	Inspector:	P. Kirk & I. Hudson		



Photo No. 5: LHS connection of Gantry Column to Gantry Beam, note corrosion

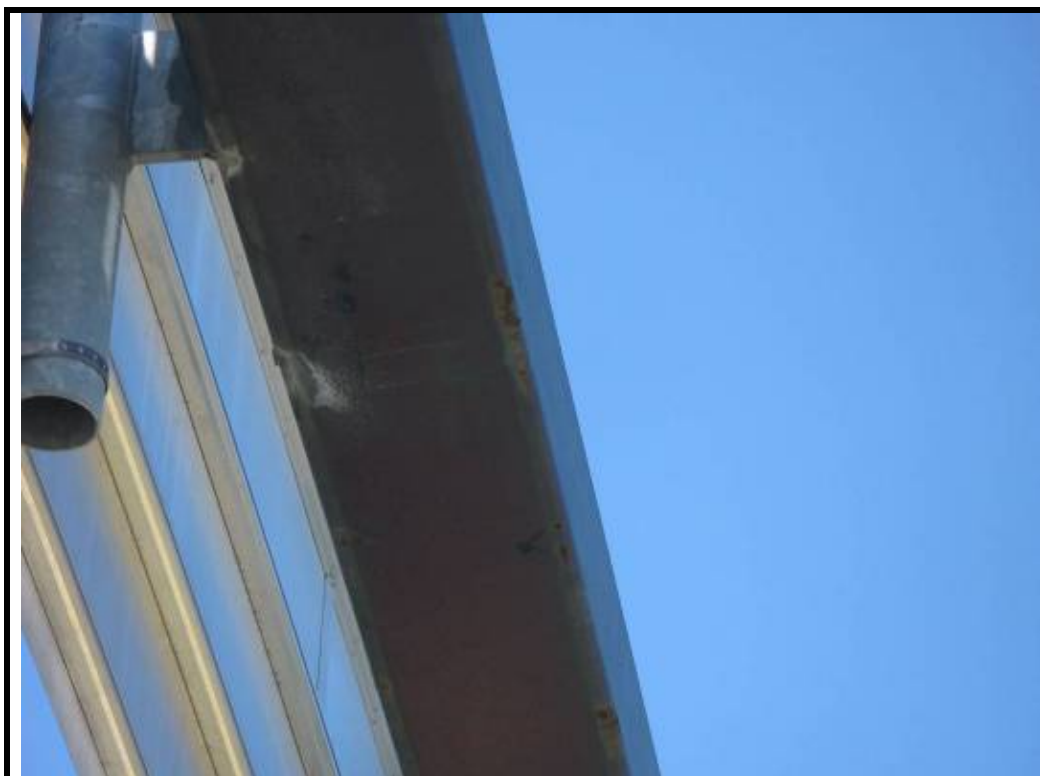


Photo No. 6: Corrosion to Gantry Beam (typical)

GANTRY INSPECTION REPORT PHOTO SHEET

Structure No.:	8012	LGA:	South Perth (C)	Date:	19-08-2010
Road Name:	Manning Rd On – H015 (Northbound)	SLK:	0.04		
Responsibility Area:	Metropolitan	Inspector:	P. Kirk & I. Hudson		



Photo No. 7: Surface corrosion to RHS column, note stone pitching



Photo No. 8: Surface corrosion to LHS column

Structure No.:	8012	LGA:	South Perth (C)	Date:	19-08-2010
Road Name:	Manning Rd On – H015 (Northbound)	SLK:	0.04		
Responsibility Area:	Metropolitan	Inspector:	P. Kirk & I. Hudson		



Photo No. 9: Corrosion between sign fixing bracket and gantry beam (typical)



Photo No. 10: Corroded sign attachment bolts



SIGN GANTRY ROUTINE VISUAL INSPECTION REPORT (Level 1 Inspection)



Structure Number:	8044	Road Number:	H032
Road Name:	South St	Local Authority:	Melville (C)
SLK:	9.49	Latitude:	-32.06598
Responsibility Area:	Metropolitan	Longitude:	115.86053
Inspected By:	P. Kirk & I. Hudson	Inspection Date:	19-08-2010

Have structural issues been found that require further investigation? (Y/N) N

Inspection Item	Defect		Comments (Including location and extent)	Maint. Required
	Yes	No		
1. Barriers Protection to gantry columns: are they present, accident damage, connections, alignment, material defects	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Column protected by 4No. steel bollards 1No. bollard is loose and can be moved by hand, faulty installation. Retroreflective tape is peeling off the same post	<input checked="" type="checkbox"/>
2. Gantry Beams Main structural component spanning, or partially spanning (if cantilevered), the road and connections to the columns: material defects, impact damage, large deflections, corrosion, flexible sealant, coatings/paint	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2No. hot dipped galvanised SHS with bolted flange connection to column Minor corrosion to lower connection plate Some surface staining to underside of beam at cantilever end, possible corrosion – to be investigated at detailed inspection	<input type="checkbox"/>
3. Gantry Columns Columns supporting the beam, Base Plates/Gussets: material defects, impact damage, buckling, corrosion, cracked welds, coatings/paint	<input checked="" type="checkbox"/>	<input type="checkbox"/>	CHS hot dipped galvanised column Generally in good condition. Minor chips to surface, may cause corrosion in medium term – locally treat with zinc rich cold applied paint Base plate and welded connection between base plate and column in good condition	<input checked="" type="checkbox"/>
4. Footings Gantry column foundations: visible; above or below ground? Concrete: material defects, cracking, spalling, movement or settlement	<input type="checkbox"/>	<input type="checkbox"/>	<i>Not inspected</i> Below ground level No signs of settlement or distress Top of footing < 500 mm below ground level	<input type="checkbox"/>
5. Anchor Bolts and Mortar Grout Pads Gantry column anchor bolts: visible; above or below ground? Bolts, Nuts, Washers: material defects, missing, corrosion, projection of thread Grout Fill: material defects, cracking or spalling	<input type="checkbox"/>	<input checked="" type="checkbox"/>	10No. anchor bolts with circular washers Hairline crack observed on west side of mortar surround to base plate – needs to be monitored Gaps between washers and slotted holes in base plate could fill with water – fill void with silicone or Denso Paste Nuts and bolts in good condition but unprotected, maintenance recommended soon	<input checked="" type="checkbox"/>
6. Maintenance Access Access ladder, access hatches, walkway, walkway balustrades: material defects, corrosion, missing seals, coatings/paint, locks	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Steel ladder to west face of column Corrosion to hinges of access cover Small areas of surface corrosion to cage Possible corrosion around weep hole to walkway mesh decking	<input type="checkbox"/>
7. Static Signs Static signs, sign lights: material defects, corrosion, mounting brackets (welded, bolted, clipped, etc.), support angles, reflective paint, graffiti, general readability	<input type="checkbox"/>	<input type="checkbox"/>	N/A	<input type="checkbox"/>
8. Variable Message Signs (VMSs) Variable Message Signs: material defects, corrosion, mounting brackets (welded, bolted, clipped, etc.), support angles, exposed wires, graffiti, general readability	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Not operating at time of inspection No signs of damage Fixing brackets appear to be in good condition, with no signs of obvious problems	<input type="checkbox"/>



**SIGN GANTRY
ROUTINE VISUAL
INSPECTION REPORT
(Level 1 Inspection)**



Defect Descriptions

Material	Defect Descriptions
Concrete	Cracking (hairline: $\leq 0.1\text{mm}$) (fine: >0.1 & $\leq 0.3\text{mm}$) (medium: $>0.3\text{mm}$ & $\leq 0.7\text{mm}$) (heavy: $>0.7\text{mm}$), spalling, corrosion of reinforcement, rust staining, honeycombing
Steel	Bending, buckling, cracking, distortion, corrosion, surface rust, pitting or flaking, protective coating damage/deterioration, loose fasteners
Timber	Splitting, crushing, rot, failure, termites/termite nest
Protective Coating	Cracked, weathered, peeling, flaking, oxidising

General Comments

The sign gantry is generally in good condition.

The loose bollard requires stabilising and may require additional concrete to footing and compaction of surrounding soil.

The areas of corrosion to the gantry beam connection flange plate, underside of the gantry beam, chips to gantry column and access cage should have some preventative maintenance applied soon.

The surface corrosion to the holding down bolts should be treated and consideration given to covering with Denso Paste and Tape.

Consideration should be given to sealing the gaps between the slotted base plate holes and holding down washers with silicone or Denso Paste.

Ancillary Items (such as service attachments, cameras etc.)

This sign gantry has been inspected in accordance with the requirements of the Main Roads Western Australia Sign Gantry Guidelines for Level 1 inspections.

Signature:  **Position:** Engineer **Date:** 19-08-2010

GANTRY INSPECTION REPORT PHOTO SHEET

Structure No.:	8044	LGA:	Melville (C)	Date:	19-08-2010
Road Name:	South St	SLK:	9.49		
Responsibility Area:	Metropolitan	Inspector:	P. Kirk & I. Hudson		



Photo No. 1: Overall view facing east (increasing SLK)



Photo No. 2: Overall view right-hand side

Structure No.:	8044	LGA:	Melville (C)	Date:	19-08-2010
Road Name:	South St	SLK:	9.49		
Responsibility Area:	Metropolitan	Inspector:	P. Kirk & I. Hudson		



Photo No. 3: 4No. Bollards with reflective tape. 1No. Bollard loose



Photo No. 4: Lower bolted connection between beam and column, note minor discolouration

GANTRY INSPECTION REPORT PHOTO SHEET

Structure No.:	8044	LGA:	Melville (C)	Date:	19-08-2010
Road Name:	South St	SLK:	9.49		
Responsibility Area:	Metropolitan	Inspector:	P. Kirk & I. Hudson		



Photo No. 5: Possible corrosion to underside of cantilever end of beam and walkway support



Photo No. 6: Minor chip to column surface (typical)

Structure No.:	8044	LGA:	Melville (C)	Date:	19-08-2010
Road Name:	South St	SLK:	9.49		
Responsibility Area:	Metropolitan	Inspector:	P. Kirk & I. Hudson		



Photo No. 7: Base plate weld to column – also note surface corrosion to HD bolts and gap



Photo No. 8: Hairline crack to mortar

Structure No.:	8044	LGA:	Melville (C)	Date:	19-08-2010
Road Name:	South St	SLK:	9.49		
Responsibility Area:	Metropolitan	Inspector:	P. Kirk & I. Hudson		



Photo No. 9: Possible corrosion to access walkway

APPENDIX C

SIGN GANTRY DETAILED VISUAL INSPECTION REPORT (Level 2 Inspection)

EXAMPLE

DETAILED SIGN GANTRY INSPECTION SUMMARY

Structure No.:	8012	Responsibility Area:	Metropolitan
Road Name:	Manning Rd On - H015 Nth Bnd	Road No.:	H547
Local Authority:	South Perth (C)	SLK:	0.04

1.0 GENERAL

The sign gantry was built in 1982 and is generally in 'fair' condition.

2.0 GANTRY BEAM AND COLUMNS

2.1 Beam

The gantry beam is in fair condition, with small isolated areas of corrosion. The paint system topcoat appears to be inadequate along the edges of the beam, with primer and corrosion visible.

Both welded connections to the columns are in a poor condition, with surface corrosion and evidence of surface slag inclusions within the weld.

2.2 Columns

The gantry beam is supported by a single gantry column at each end. Both columns are in fair condition, with small areas of corrosion. There are a number of scrapes on the RHS column where the paint system is no longer present.

The LHS base plate was exposed as part of the inspection. The base plate and its welded connection to the column is in very good condition.

3.0 FOUNDATIONS AND ANCHORAGE

3.1 Footings

The LHS footing is buried approximately 700 mm below ground level and was not exposed.

The RHS footing is buried below cement stabilised rock protection and was not exposed.

3.2 Anchor Bolts and Mortar Grout Pads

2No. HD bolts on the LHS footing were inspected. Both bolts had minor surface corrosion.

4.0 SIGNS AND ATTACHMENTS

The welded connections between the gantry beam and the sign mounting poles are in very poor condition, with evidence of poor weld fusion.

The connections between the sign and steel mounting brackets all exhibit galvanic corrosion.

5.0 RECOMMENDATIONS

1. Rectify the welded connections between the gantry beam and sign attachments - within 3 years.
2. Replace all bolted connections between signs and mountings. Connections to include nylon washers to remove opportunity for galvanic corrosion - within 3 years.
3. Replace existing paint system on gantry beam, gantry columns and guardrail. Carry out localised corrosion treatment where required - within 4-6 years.
4. Consider provision of guardrail to protect RHS gantry column.

I. Hudson
SENIOR ENGINEER

27 October 2010

WORK ITEMS - SUMMARY SIGN GANTRIES

STRUCTURE No. 8012

(A) GENERAL SUPPORTING ACTIVITIES

BMS Item No.	ITEM DESCRIPTION	WORK REQD	PRIORITY CODE	COMMENTS
G005	Bridge - Durability Survey (L3)			
G009	Bridge - Load Rating			
G010	Bridge - Monitor Defect			

(B) PREVENTATIVE MAINTENANCE

BMS Item No.	ITEM DESCRIPTION	WORK REQD	PRIORITY CODE	COMMENTS
P102	Bridge - Maintain Fastener			

(C) ROUTINE MAINTENANCE

BMS Item No.	ITEM DESCRIPTION	WORK REQD	PRIORITY CODE	COMMENTS
R202	Bridge - Remove Graffiti			
R205	Bridge - Clear Debris and Vegetation			
R212	Guardrail - Maintain / Repair	Y	2	Weld inspection
R214	Lighting - Maintain			
R215	Sign - Maintain			

(D) SPECIFIC WORKS

BMS Item No.	ITEM DESCRIPTION	WORK REQD	PRIORITY CODE	COMMENTS
S601	Beam - Repair	Y	1 1	Sign-Beam Connections, weld repair Beam-Column Connections, weld repair
S513	Bracing - Replace			
S324	Bridge - Control Corrosion	Y	1 2	Signs Other steel
S519	Column - Repair			
S534	Footing - Repair			
S467	Guardrail - Install	Y	3	End terminal LHS Column New protection to RHS Column
S371	Lighting - Install			
S685	Truss - Repair			
S392	Walkway - Repair			

PRIORITY CODE

0 - Critical: EMERGENCY action required
1 - High Priority
2 - Medium Priority
3 - Low Priority (monitor)

INDICATIVE TIMEFRAME

Immediate within 6 months
Within 3 years
Within 4-6 years
Assess again at next Detailed (Level 2) Inspection (7 years)

Note: Add additional standard work items to the above lists as required.



**SIGN GANTRY
DETAILED VISUAL
INSPECTION REPORT**
(Level 2 Inspection)



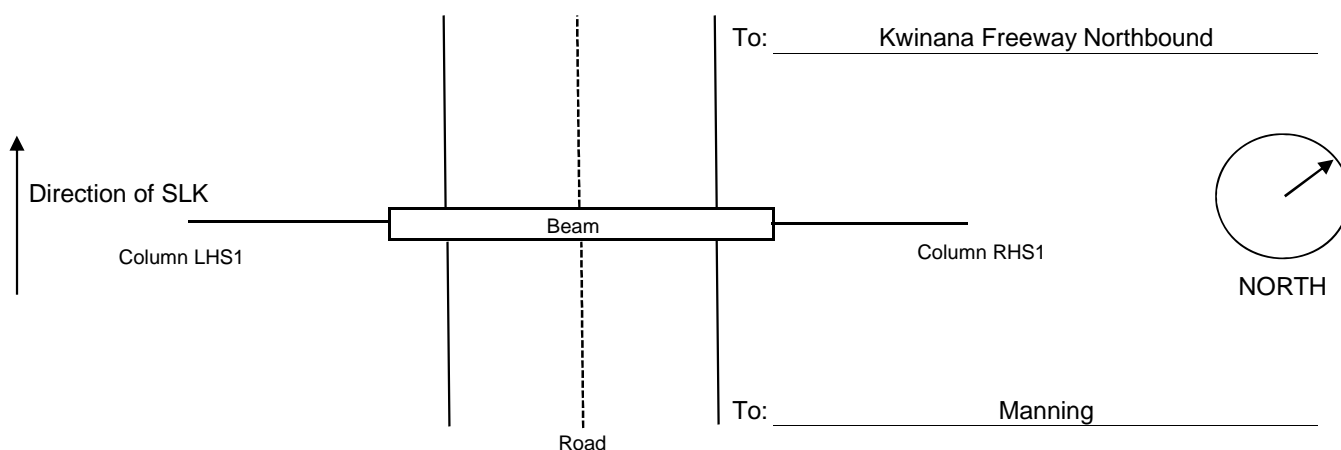
General Information:

Structure Number:	<u>8012</u>	Structure Name:	<u>Sign Gantry Fwy Ramp Manning R</u>
Road Name:	<u>Manning Rd On - H015 Nth Bnd</u>	Road Number:	<u>H547</u>
SLK:	<u>0.04</u>	Local Authority:	<u>South Perth (C)</u>
Responsibility Area:	<u>Metropolitan</u>	Latitude:	<u>-32.01403</u>
		Longitude:	<u>115.85878</u>

Gantry Structural Geometry:

Gantry Span (m):	<u>10.40</u>	Minimum Vertical Clearance (m):	<u>5.30</u>
Skew:	<u>0</u>		
<u>Gantry Beams</u>			
Type:	<u>Box Beam</u>		
Material:	<u>Steel</u>	Steel Section Size(s):	<u>305 x 203 x 9.5 RHS</u>
<u>Gantry Columns</u>			
Type:	<u>Hollow Box</u>	Heights (m):	<u>5.93 (RHS), 5.98 (LHS)</u>
Material:	<u>Steel</u>	Steel Section Size(s):	<u>305 x 203 x 9.5 RHS</u>

The location of the gantry components are based upon the direction of the road the gantry spans in increasing SLK. The left and right hand side of the gantry is then determined from facing in this direction (i.e. the direction of increasing SLK). For gantries with two columns on each side, the legs closest to the start of the road (lower SLK value) are designated column 1, the columns further along the road are designated column 2.



This sign gantry has been inspected in accordance with the requirements of the Main Roads Western Australia Sign Gantry Guidelines for Level 2 inspections.

Sign Off:

Inspected By:	<u>P. Kirk</u>	Checked By:	<u>I. Hudson</u>
Date:	<u>27-10-2010</u>	Date:	<u>27-10-2010</u>



SITE CONDITIONS



Structure No.: 8012

DRIVE THROUGH	Visible Line of Sight from Abut. 1:	80 m then a bend
	Visible Line of Sight from Abut. 2:	150 m then a bend
TRAFFIC CONTROL (Describe if different to the generic TMP)	LHS:	One lane closed with hired traffic management for use of cherry picker
	RHS:	One lane closed with hired traffic management for use of cherry picker
PARKING POSITION	> 3 m <input checked="" type="checkbox"/> Position:	None available. Parking on Lockhart Street.
	1.2 to 3 m <input type="checkbox"/> Position:	
	0 to 1.2 m <input type="checkbox"/> Position:	
ACCESS TO COLUMNS (Describe access conditions at each column)	LHS1:	Stone pitched slope behind guardrail. Dense vegetation in places.
	RHS1:	Between Kwinana Freeway on and off ramps on stone pitched slope. No guardrail protection therefore exercise caution.
	LHS2:	N/A
	RHS2:	N/A
HEADROOM	Minimum (m):	5.30
	Maximum (m):	5.50
POTENTIAL HAZARDS	Railing/Posts:	None
	Bolts:	
	Services:	
	Other:	
FENCES	Timber: <input type="checkbox"/> Location:	None
	Wire/Mesh: <input type="checkbox"/> Location:	
	Electrified: <input type="checkbox"/> Location:	
	Barbed Wire: <input type="checkbox"/> Location:	
	Other (Specify): <input type="text"/> Location:	
POWERLINES	Side of gantry:	None
	Horizontal distance from edge of gantry (m):	
	Estimated vertical height above gantry (m):	


Signature

27-10-2010
Date

SIGN GANTRY DETAILED VISUAL INSPECTION REPORT (Level 2 Inspection)

* Note: Sign gantry naming conventions and terminology are detailed in "Sign Gantry Guidelines (Level 1 and Level 2 Inspections)".

Group	Component	Component Location	Component Material	Modification Status	Unit	% of Inspected Component in Each Condition State				Not Inspected (%)	Comments <i>Full description including details of: * Location of defect/condition * Description of defects including type, magnitude and extent</i>	Sketch No.	Photograph No.	Work Required?	Work Item Number	Work Description	Priority
						1	2	3	4								
Barriers	Barriers	LHS	Steel	Orig							Post and 3-rail system extending from Lockhart St to Freeway. Posts formed from 100 SHS, rails from 150 x 75 RHS. Welded splices on rails showing surface corrosion. Welded splices have shown issues in the past and should be inspected with possible provision for replacement. Bolted connections between posts and rails in good condition. Paint system in poor condition; evidence of multiple layers of varying colours, suggesting poor quality repainting. Post footings encased in concrete ground beam/wing wall. Corrosion at natural ground level where vegetation sits above concrete. Substandard end terminal on approach.		5 6 7	Y	S467	Guardrail - Install	3
																Guardrail - Maintain/Repair (weld inspection)	2
		RHS									No guardrail present; RHS gantry column within clear zone (1.5 m) of both carriageways.		2	Y	S467	Guardrail - Install	3
Gantry Beams	Beams	1	Steel	Orig	Linear m	95	5				Small areas of visible corrosion on edges of RHS section, probably due to inadequate protective coating thickness. No indication of any section loss. Paint system generally in poor condition.		8	Y	S324	Bridge - Control Corrosion	2
	Connections	LHS	Steel	Orig	Each			100			Visible corrosion to surface of butt weld. MPI conducted on weld, refer ALS Report 10BGE2. Surface slag inclusions observed. No crack initiation detected but these weld defects are potential weak points for future fatigue.		9	Y	S601	Beam - Repair (Beam-Column Connections, weld repair)	1
		RHS	Steel	Orig	Each			100			Visible corrosion to surface of butt weld.		10	Y	S601	Beam - Repair (Beam-Column Connections, weld repair)	1



SIGN GANTRY DETAILED VISUAL INSPECTION REPORT (Level 2 Inspection)

* Note: Sign gantry naming conventions and terminology are detailed in "Sign Gantry Guidelines (Level 1 and Level 2 Inspections)".

Group	Component	Component Location	Component Material	Modification Status	Unit	% of Inspected Component in Each Condition State				Not Inspected (%)	Comments <i>Full description including details of: * Location of defect/condition * Description of defects including type, magnitude and extent</i>	Sketch No.	Photograph No.	Work Required?	Work Item Number	Work Description	Priority
						1	2	3	4								
Gantry Columns	Columns	LHS1	Steel	Orig	Linear m	95	5				Isolated areas of corrosion, particularly along edges of section towards top of column. Paint thicknesses at critical location as 480 µm on S face, 249 µm on W face, 260 µm on N face and 204 µm on E face. Section thickness measured on corroded area as 9.41 mm, suggesting negligible loss of section.	2	15	Y	S324	Bridge - Control Corrosion	2
		RHS1	Steel	Orig	Linear m	95	5				Isolated areas of corrosion, particularly along edges of section. A number of large scrapes near ground level on east and north faces, probably due to abrasion from adjacent vegetation (subsequently cut back). Paint thicknesses measured at critical location as 166 µm on S face, 171 µm on W face, 235 µm on N face and 151 µm on E face. Section thickness measured on scrape on N face as 9.61 mm, suggesting no loss of section.	1	13 14	Y	S324	Bridge - Control Corrosion	2
	Base Plates/ Gussets	LHS1	Steel	Orig	Each	100				50	Base plate approximately 600 mm below GL. Top of base plate exposed. Only exposed half of base plate on LHS of gantry column. Base plate in as new condition, with original green paintwork present. Eddy Current Inspection carried out, refer ALS Report 10BGE1. Weld found to be in good condition.		16 17	N			
		RHS1	Steel	Orig	Each					100	Not inspected - below concrete stabilised rock protection.			N			
Footings	Footings	LHS1	Conc	Orig	m ²					100	Not inspected, > 650 mm below GL.			N			
		RHS1	Conc	Orig	m ²					100	Not inspected - below concrete.			N			
Anchor Bolts	Bolts, Nuts, Washers	LHS1	Steel	Orig	Each		100			75	2No. Bolts exposed. Surface corrosion to bolts, nuts and washers, but no significant section loss. Bolts cleaned with wire brush and Denso Tape applied prior to backfill.		17	N			
		RHS1	Steel	Orig	Each					100	Not inspected - below concrete.			N			



SIGN GANTRY DETAILED VISUAL INSPECTION REPORT (Level 2 Inspection)

* Note: Sign gantry naming conventions and terminology are detailed in "Sign Gantry Guidelines (Level 1 and Level 2 Inspections)".

Group	Component	Component Location	Component Material	Modification Status	Unit	% of Inspected Component in Each Condition State				Not Inspected (%)	Comments <i>Full description including details of: * Location of defect/condition * Description of defects including type, magnitude and extent</i>	Sketch No.	Photograph No.	Work Required?	Work Item Number	Work Description	Priority
						1	2	3	4								
Mortar Grout Pads	Grout Pads	LHS1	Conc	Orig	Each					100	Not inspected, > 650 mm below GL.			N			
		RHS1	Conc	Orig	Each					100	Not inspected - below concrete.			N			
Maintenance Access	Access Ladders										N/A						
	Access Hatch										N/A						
	Walkway										N/A						
	Balustrades										N/A						
Static Signs	Signs		Alum	Mod							Good condition with no evidence of impact.		1	N			
	Mounting Brackets	LHS	Steel	Mod	Each				100		Weld between sign support and gantry beam is in poor condition. MPI conducted on weld, refer ALS Report 10BGE2. Slag inclusions, cold lap and lack of fusion in weld toes observed. Galvanic corrosion at all connections between aluminium sign and steel mounting brackets; no nylon washers provided.		11 12 18	Y	S601 S324	Beam - Repair (Sign-Beam Connections, weld repair) Bridge - Control Corrosion	1 1
		RHS	Steel	Mod	Each				100		Similar condition to LHS.		11 12 18	Y	S601 S324	Beam - Repair (Sign-Beam Connections, weld repair) Bridge - Control Corrosion	1 1
Variable Message Signs	VMS										N/A						
	Mounting Brackets				Each						N/A						
	Electrical Cables										N/A						

Structure No.: 8012

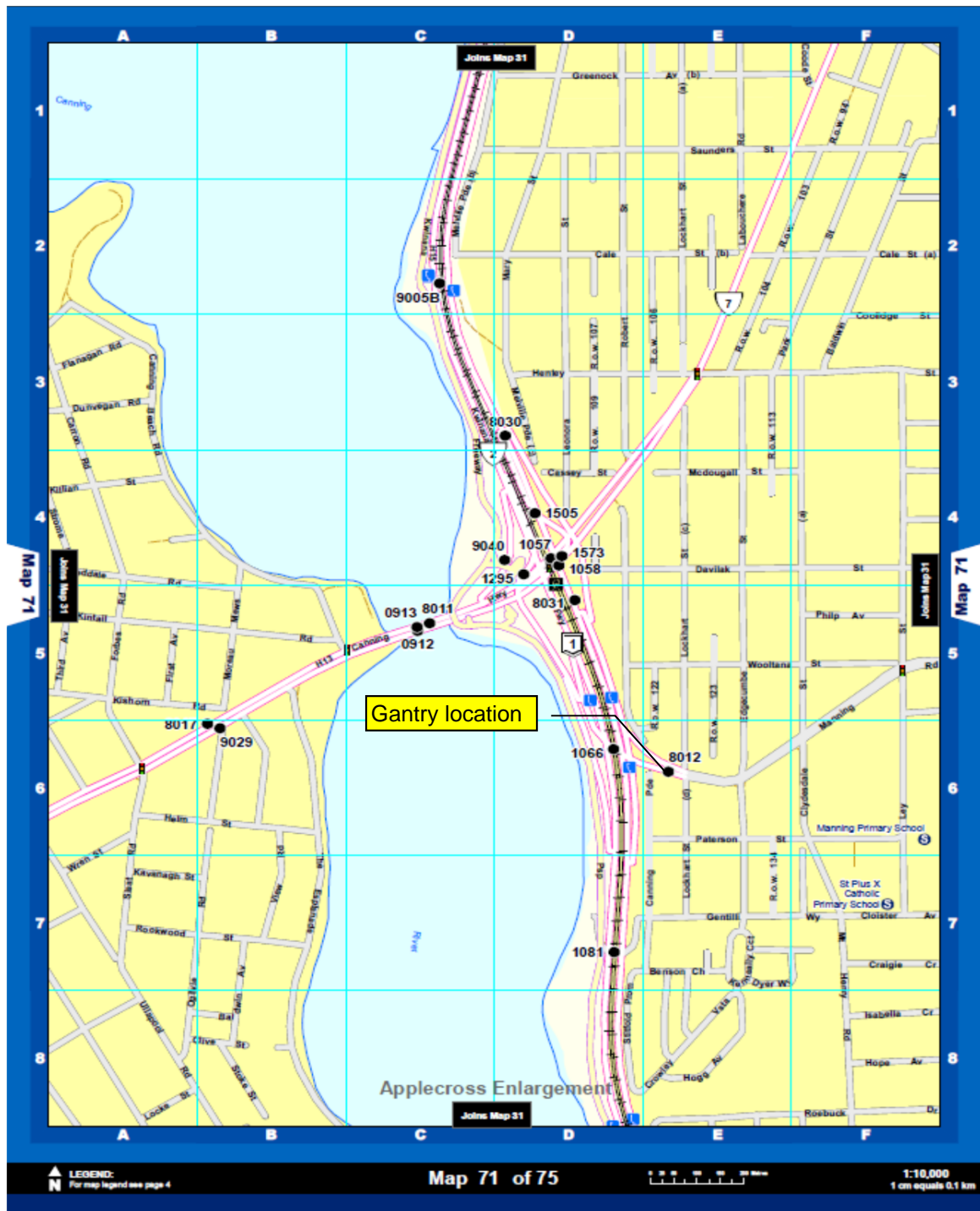
Road Name: Manning Rd On - H015 Nth Bnd

LGA: South Perth (C)

Responsibility Area: Metropolitan

Inspector: P. Kirk

SLK: 0.04



Gantry Location Sheet

GANTRY INSPECTION REPORT PHOTO SHEET

Structure No.:	8012	LGA:	South Perth (C)	Date:	27-10-2010
Road Name:	Manning Rd On – H015 (Northbound)	SLK:	0.04		
Responsibility Area:	Metropolitan	Inspector:	P. Kirk		



Photo No. 1: Overall view facing west (increasing SLK)



Photo No. 2: Overall view facing east (decreasing SLK)

Structure No.:	8012	LGA:	South Perth (C)	Date:	27-10-2010
Road Name:	Manning Rd On – H015 (Northbound)	SLK:	0.04		
Responsibility Area:	Metropolitan	Inspector:	P. Kirk		



Photo No. 3: Overall view left-hand side



Photo No. 4: Overall view right-hand side

GANTRY INSPECTION REPORT PHOTO SHEET

Structure No.:	8012	LGA:	South Perth (C)	Date:	27-10-2010
Road Name:	Manning Rd On – H015 (Northbound)	SLK:	0.04		
Responsibility Area:	Metropolitan	Inspector:	P. Kirk		



Photo No. 5: Corrosion to welded splices on guardrail, weathered paint system



Photo No. 6: Corrosion at foot of guardrail posts

GANTRY INSPECTION REPORT PHOTO SHEET

Structure No.:	8012	LGA:	South Perth (C)	Date:	27-10-2010
Road Name:	Manning Rd On – H015 (Northbound)	SLK:	0.04		
Responsibility Area:	Metropolitan	Inspector:	P. Kirk		



Photo No. 7: Substandard end terminal



Photo No. 8: Gantry beam (typical)

Structure No.:	8012	LGA:	South Perth (C)	Date:	27-10-2010
Road Name:	Manning Rd On – H015 (Northbound)	SLK:	0.04		
Responsibility Area:	Metropolitan	Inspector:	P. Kirk		

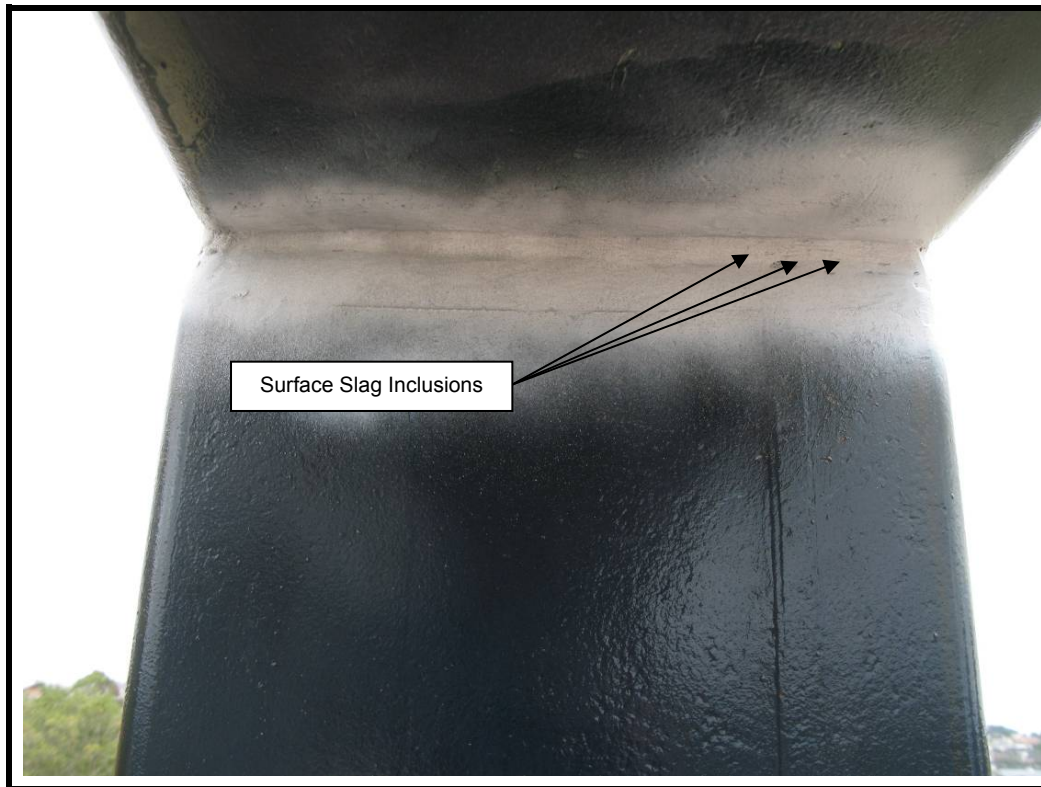


Photo No. 9: LHS beam column connection following MPI inspection



Photo No. 10: RHS beam to column connection

Structure No.:	8012	LGA:	South Perth (C)	Date:	27-10-2010
Road Name:	Manning Rd On – H015 (Northbound)	SLK:	0.04		
Responsibility Area:	Metropolitan	Inspector:	P. Kirk		

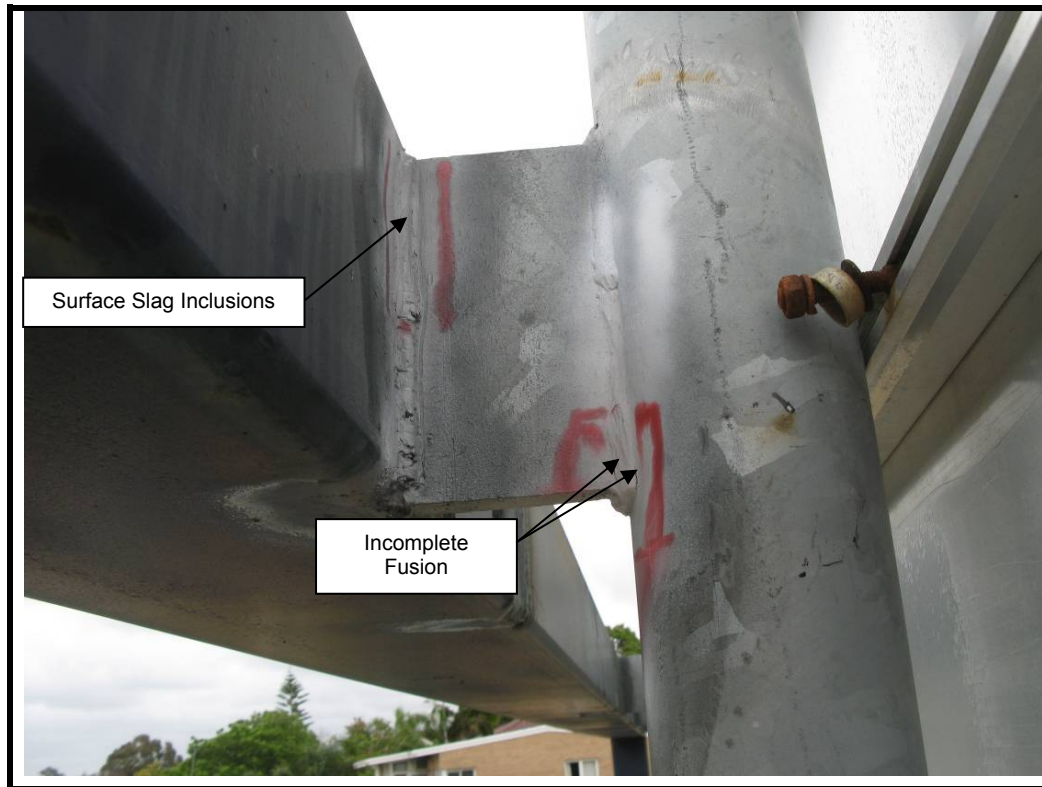


Photo No. 11: Sign connection 1, following MPI inspection



Photo No. 12: Sign connection 1 – close up of slag inclusions

GANTRY INSPECTION REPORT PHOTO SHEET

Structure No.:	8012	LGA:	South Perth (C)	Date:	27-10-2010
Road Name:	Manning Rd On – H015 (Northbound)	SLK:	0.04		
Responsibility Area:	Metropolitan	Inspector:	P. Kirk		



Photo No. 13: Sign connection 1 – close up of lack of fusion



Photo No. 14: Sign connection 4 (typical)

GANTRY INSPECTION REPORT PHOTO SHEET

Structure No.:	8012	LGA:	South Perth (C)	Date:	27-10-2010
Road Name:	Manning Rd On – H015 (Northbound)	SLK:	0.04		
Responsibility Area:	Metropolitan	Inspector:	P. Kirk		



Photo No. 15: RHS column, north face



Photo No. 16: RHS column, east face

GANTRY INSPECTION REPORT PHOTO SHEET

Structure No.:	8012	LGA:	South Perth (C)	Date:	27-10-2010
Road Name:	Manning Rd On – H015 (Northbound)	SLK:	0.04		
Responsibility Area:	Metropolitan	Inspector:	P. Kirk		



Photo No. 17: LHS column, east and north faces (typical)



Photo No. 18: LHS column base plate exposed

GANTRY INSPECTION REPORT PHOTO SHEET

Structure No.:	8012	LGA:	South Perth (C)	Date:	27-10-2010
Road Name:	Manning Rd On – H015 (Northbound)	SLK:	0.04		
Responsibility Area:	Metropolitan	Inspector:	P. Kirk		



Photo No. 19: HD bolt following treatment with Denso Tape

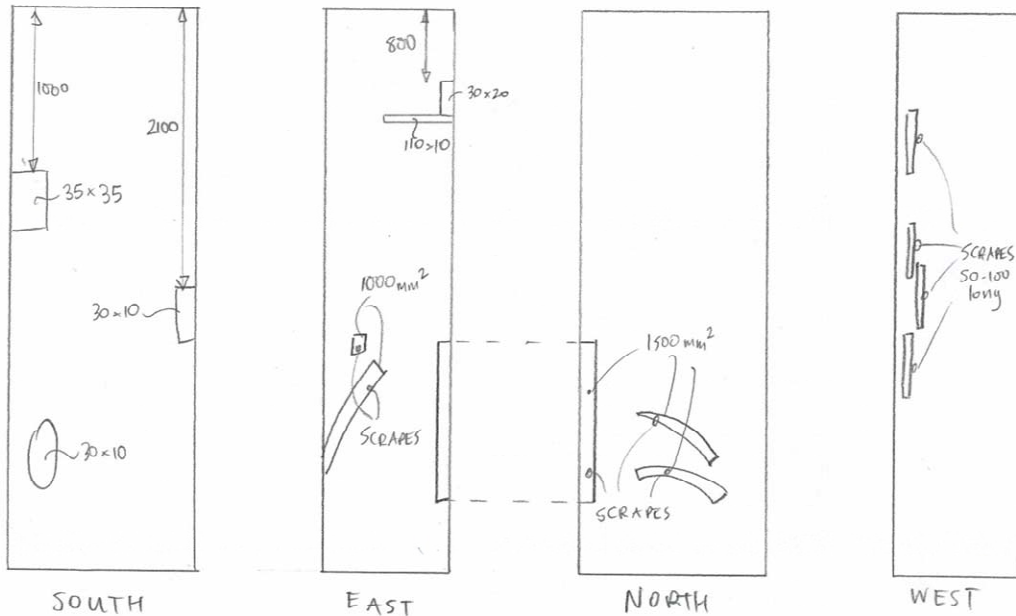


Photo No. 20: Galvanic corrosion to sign mounting bolts (typical)

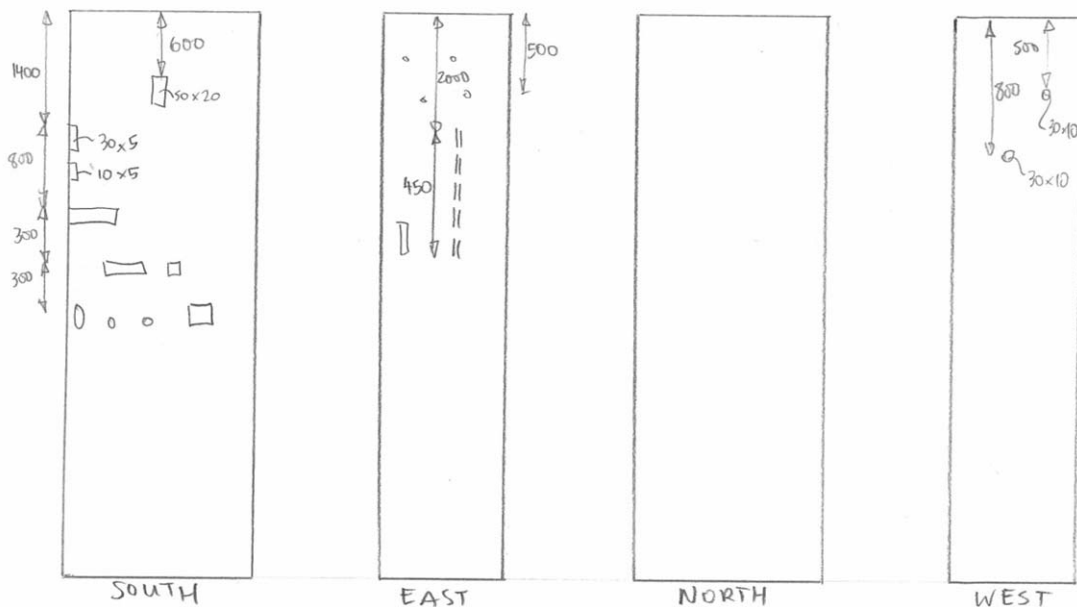
SIGN GANTRY DETAILED VISUAL INSPECTION REPORT (Level 2 Inspection)

Structure Number: 8012

Inspection Date: 27-10-2010



SKETCH No. 1: RHS column defects



SKETCH No. 2: LHS column defects

INSPECTION REPORT



CLIENT: BG & E PTY LTD
ADDRESS: PO BOX 2776, CLOISTER SQUARE
PERTH WA 6580
ATTENTION: PETER KIRK/ IAN HUDSON
SUBJECT: EDDY CURRENT INSPECTION OF WELDED JOINTS ON SIGN GANTRY
STRUCTURE

PAGE 1 OF 1
REPORT NO: 108GE1
REPORT DATE: 28/10/2010
REVISION: 0

ORDER NO: P06105-224
CLIENTS JOB #: N/S
TEST DATE: 27/10/2010
TEST LOCATION: MANNING ROAD
MATERIAL TYPE: CARBON STEEL
SURFACE CONDITION: N/A
TEST SPECIFICATION: AS4544 - 2005

VOUCHER NO: 35969
TECHNICIAN: A. MAXWELL
TEST PROCEDURE: ETG-001
TEST RESTRICTIONS / COMMENTS:
NIL

ACCEPTANCE SPEC: REPORT CRACKING

EQUIPMENT DETAILS
HOCKING PHASEC 2D

PLANT #
X700

CALIBRATION METHOD
EDDY CURRENT

CALIBRATION SETTINGS
100KHz 54dB 61°

INSPECTION RESULTS

INTRODUCTION:

Nominated weld areas on overhead road sign located on Manning Road as shown on Figure 1.0 - Locality Plan in Attachment 1.

TEST RESULTS:

The weld area on south side base plate to upright inspected was free from detectable surface crack indications.

SIGNATORY: A. MAXWELL (CA)

SIGNED:



INSPECTION REPORT CONTINUATION PAGE

REPORT NO: 10BGE 1

TEST DATE: 27-10-2010

ATTACHMENT NO: 1

PAGE 2 of 2

SUBJECT: EDDY CURRENT INSPECTION OF MANNING ROAD OVERHEAD SIGN GANTRY

The only nominated weld area suitable for eddy current was located on the South side base plate to gantry upright box section as shown in Figure 3.

The remaining weld areas nominated for test were unsuitable for eddy current inspection due to rust and flaking paint on gantry welds and galvanized coating on tubular uprights. These areas were cleaned by BG and E representatives on site and tested using magnetic particle inspection. Refer to report number 10BGE 2.



Figure 3

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MAGNETIC PARTICLE INSPECTION REPORT



CLIENT: BG & E PTY LTD
ADDRESS: PO BOX 2776, CLOISTER SQUARE
PERTH WA 6580
ATTENTION: PETER KIRK/ IAN HUDSON
SUBJECT: MAGNETIC PARTICLE INSPECTION OF WELDED JOINTS ON SIGN
GANTRY STRUCTURE

PAGE 1 OF 1
REPORT NO: 10BGE2
REPORT DATE: 28/10/2010
REVISION: 0

ORDER NO:	P06105-224	VOUCHER NO:	36129
CLIENTS JOB #:	N/S	TECHNICIAN:	A. MAXWELL
TEST DATE:	27/10/2010	TEST PROCEDURE:	MTG-001
TEST LOCATION:	MANNING ROAD	EQUIPMENT:	AC YOKE MAGNET
MATERIAL TYPE:	CARBON STEEL	MAGNETISING METHOD:	MAGNETIC FLOW
SURFACE CONDITION:	GROUND	DEMAGNETISED:	NO
TEST SPECIFICATION:	AS 1171 - 1998	MEDIA/VIEWING CONDITIONS:	BLACK MAGNETIC INK ON A WHITE BACKGROUND
ACCEPTANCE SPEC:	AS 1554 PT. 1. SP - 2004		

TEST RESTRICTIONS / COMMENTS: Weld areas restricted to locations with coating removed.

INSPECTION RESULTS

POSITION EXAMINED:

Nominated weld areas on Manning Road overhead sign gantry.

Refer Attachment 1 for details.

TEST RESULTS:

The two weld areas inspected had multiple indications of slag inclusions, cold lap and lack of fusion 2mm to 16mm long.

Weld areas do not comply.



Accreditation No: 218
Site No: 508

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SIGNATORY: A. WILLIAMS (CA)

SIGNED:



REPORT NO: 10BGE 2
TEST DATE: 27-10-2010

INSPECTION REPORT CONTINUATION PAGE

ATTACHMENT NO: 1
PAGE 1 of 5

SUBJECT: MAGNETIC PARTICLE INSPECTION OF MANNING ROAD OVERHEAD SIGN GANTRY

TEST DETAILS

A magnetic particle inspection was carried out on nominated weld areas unsuitable for eddy current inspection on Manning road overhead sign gantry at the location shown in Figure 1 and 2.

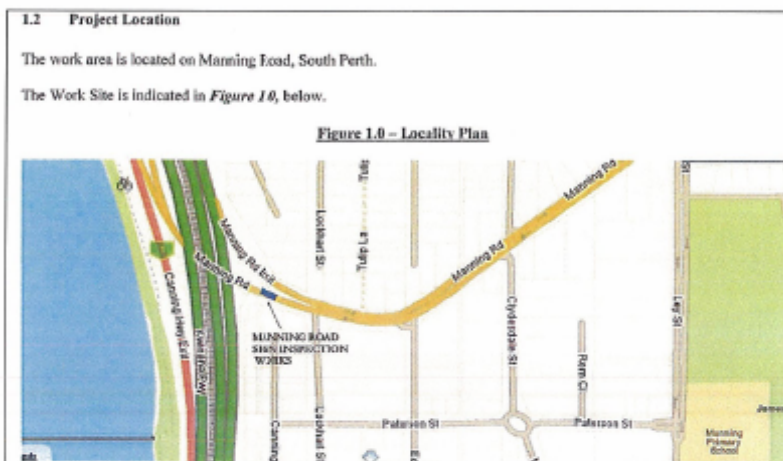


Figure 1



Figure 2

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REPORT NO: 10BGE 2
TEST DATE: 27-10-2010

INSPECTION REPORT CONTINUATION PAGE

ATTACHMENT NO: 1
PAGE 2 of 5

SUBJECT: MAGNETIC PARTICLE INSPECTION OF MANNING ROAD OVERHEAD SIGN GANTRY



Figure 3 WELD AREAS INSPECTED



Figure 4 WELD AREA 1

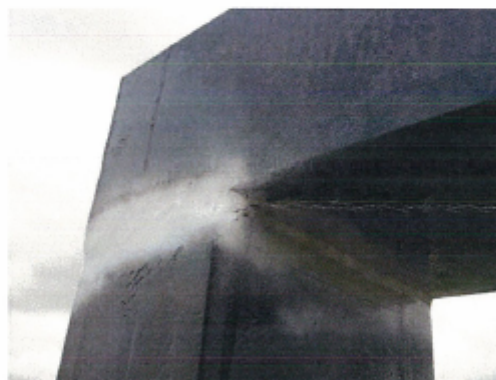


Figure 5 WELD AREA 1

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REPORT NO: 10BGE 2
TEST DATE: 27-10-2010

INSPECTION REPORT CONTINUATION PAGE

ATTACHMENT NO: 1
PAGE 3 of 5

SUBJECT: MAGNETIC PARTICLE INSPECTION OF MANNING ROAD OVERHEAD SIGN GANTRY

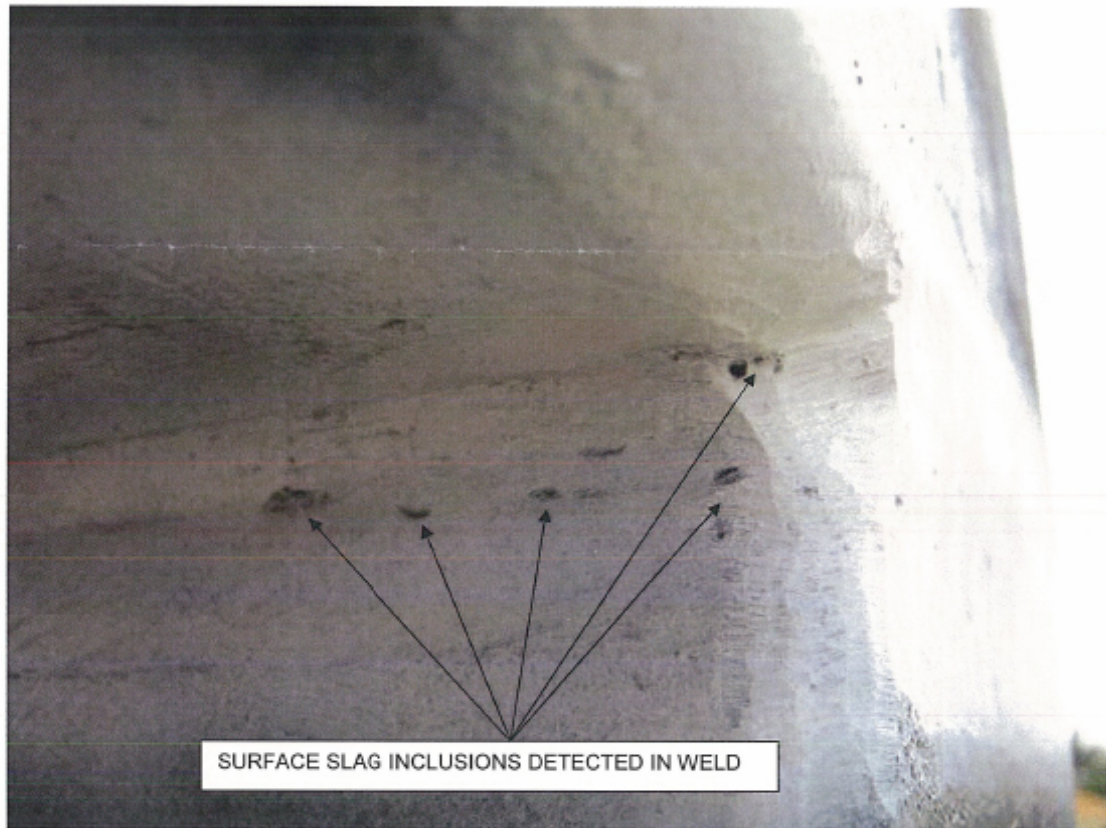


Figure 6 WELD AREA 1

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REPORT NO: 10BGE 2
TEST DATE: 27-10-2010

INSPECTION REPORT CONTINUATION PAGE

ATTACHMENT NO: 1
PAGE 4 of 5

SUBJECT: MAGNETIC PARTICLE INSPECTION OF MANNING ROAD OVERHEAD SIGN GANTRY

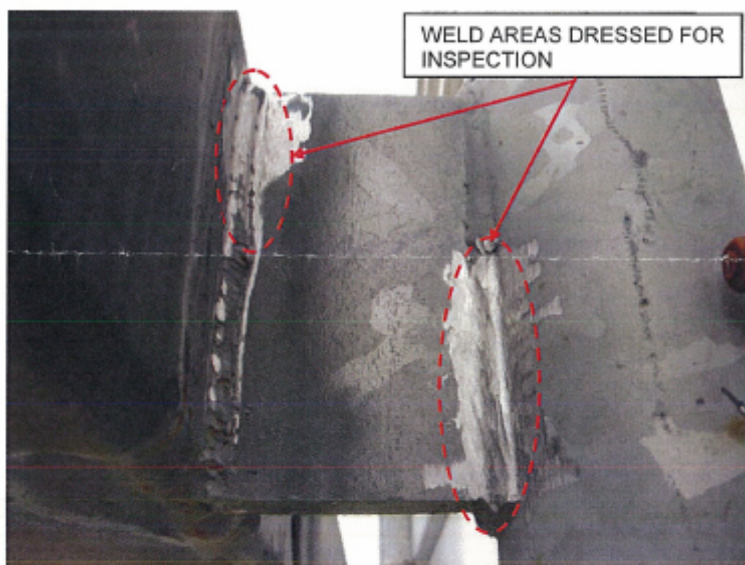


Figure 7 WELD AREA 2 AFTER GRINDING

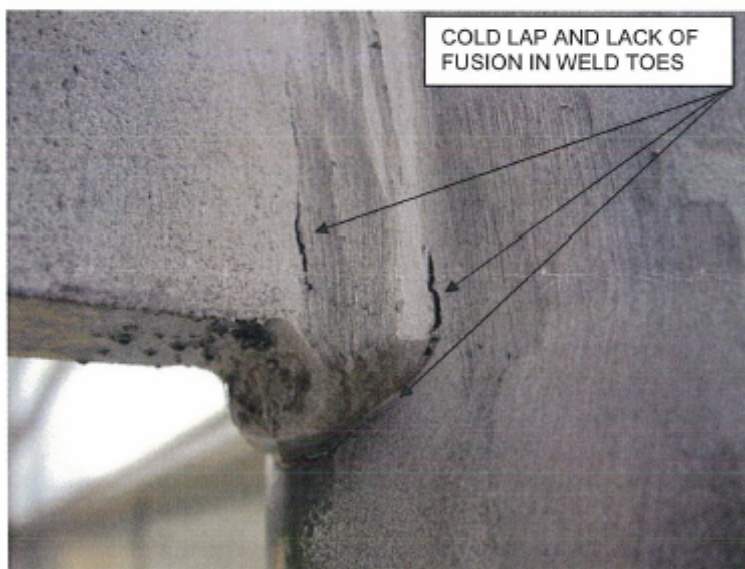


Figure 8 WELD AREA 2 TUBULAR UPRIGHT

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REPORT NO: 10BGE 2
TEST DATE: 27-10-2010

INSPECTION REPORT CONTINUATION PAGE

ATTACHMENT NO: 1
PAGE 5 of 5

SUBJECT: MAGNETIC PARTICLE INSPECTION OF MANNING ROAD OVERHEAD SIGN GANTRY

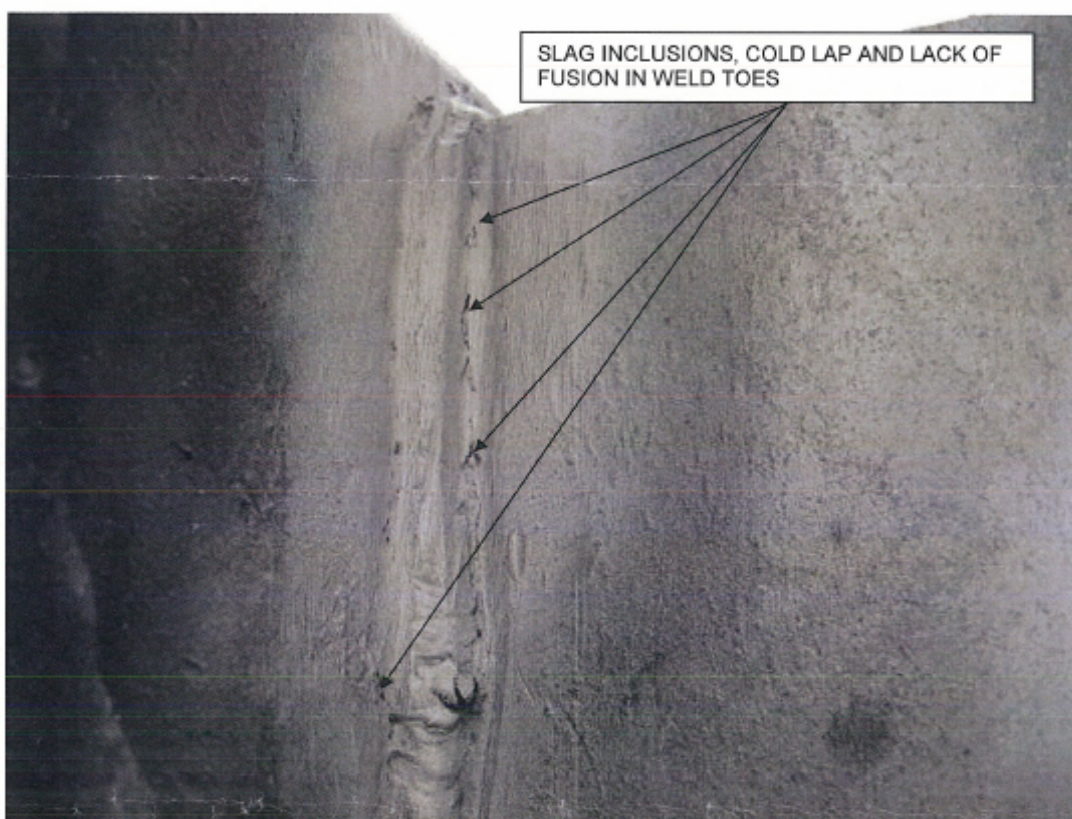


Figure 9 WELD AREA 2 BOX SECTION TO BRACKET WELD

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