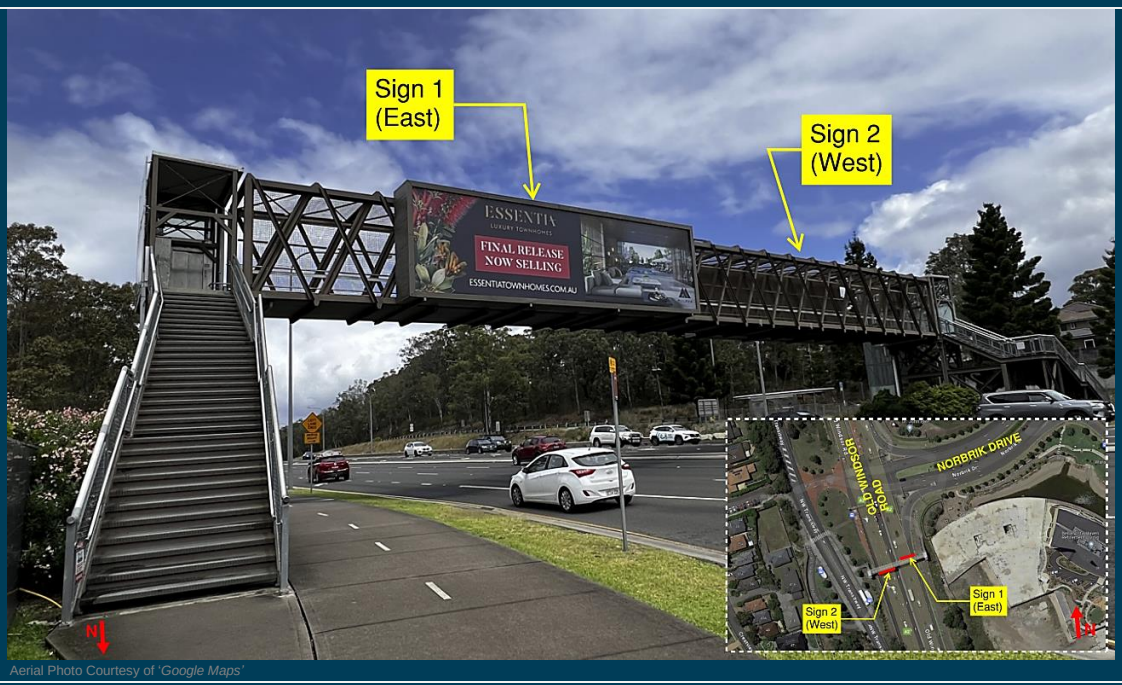
Structural Condition Assessment 01

Norbrick Dr. and Old Windsor Rd. Pedestrian Bridge - **Sign Structures**

Prepared for: Mulpha Norwest Pty Ltd

Ref No: 2311081

Date: 15-12-2023



Aerial Photo Courtesy of '*Google Maps*'

Revision Table

Revision	Date	Purpose	Prepared By	Approved By
1	15-12-2023	For Information	Parham Mohajerani	Parham Mohajerani

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1. Inspection Details

Asset	Norbrick Dr and Old Windsor Rd Pedestrian Bridge - **Sign Structures**
Building/Block No.	-
Unit(s) No.	-
Purpose of Inspection	Structural condition assessment of the sign structures internally
Date of Inspection	05-12-2023
Weather at the Time of Inspection	Sunny
Access	Mulpha Norwest Pty Ltd (the Owner) Sydney Rescue Consultants Pty Ltd (Confined Spaced access and rescue team)
Inspector(s)	Mr Parham Mohajerani
Orientation	For the purposes of this report, the sign box on the northern face of the bridge is Sign 1 and the sign box on the southern face is Sign 2.

2. Asset Information

Year of Construction	Circa 2009 (Sign Boxes)
No. of Storeys	-
Structural System	The sign box has a structural steel frame. The sign structures are bolted to the 'Support Beam' (BEAM 1) and 'Top Connector' beams (BEAM 2).
Site Topography	-
Class of Building	-

3. Exclusions and Limitation

- No intrusive investigations were undertaken during the inspection or in preparation of this report.
- This report is a Stage 1 report and is not for the purpose of being issued to contractors as a guide to tendering or carrying out remedial works. A Following stage report will follow for the purpose of Tendering.

4. Information Provided by Others

- Refer to Section 5.

5. Sign Structures – Drawings

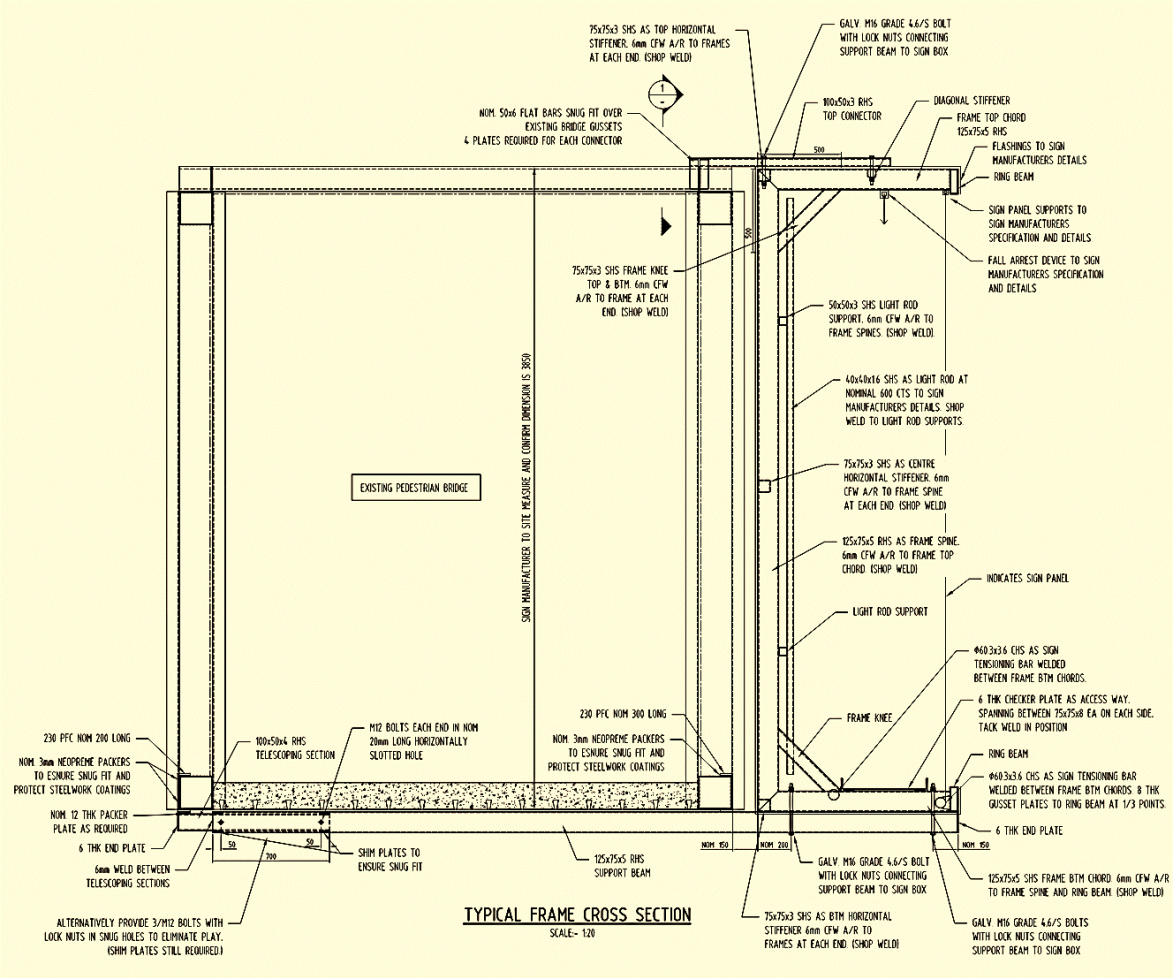


Figure 1- Typical frame cross section (Not to Scale)- by O'Hearn Consulting Pty Ltd

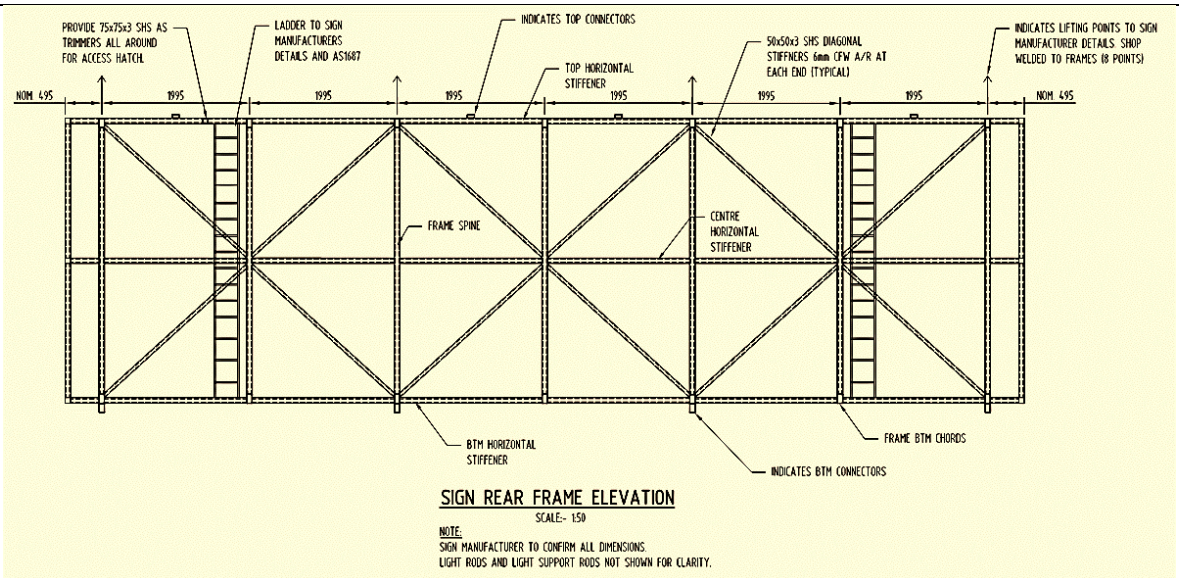


Figure 2- Sign rear frame elevation (Not to Scale)- by O'Hearn Consulting Pty Ltd

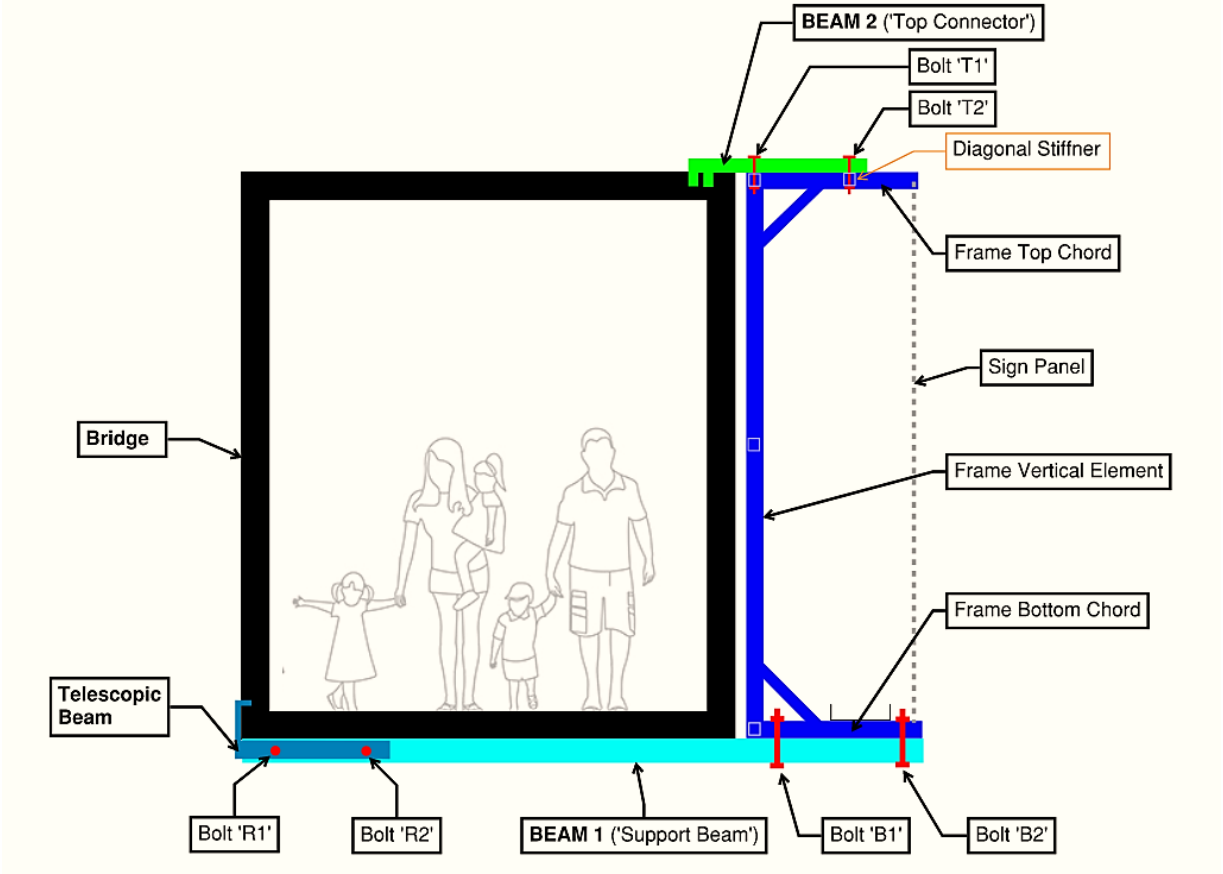


Figure 3- Typical frame cross section (Not to Scale)

Figure 4 – General view of the sign from ground

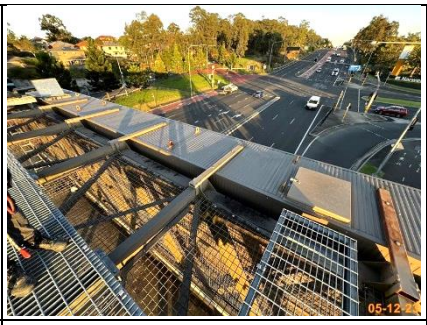


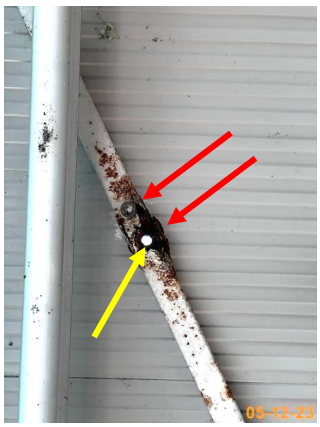
Figure 5- General view of the sign from above

Figure 6- Inside the sign box

6. Defects

6.1. Corrosion

Typical photo(s) of the defect and/or symptom (if applicable)
For detailed Photos refer to Appendix C



Location(s): Sign 1 and Sign 2

Inspection Date: 05 December 2023	**Testing:** DFT test

Observations:

General

- It seems that the structural frame of the sign is coated with two layers of protection. The initial layer is blue, serving as the original protective coating, while the upper layer is white. It is highly probable that this white layer was applied retrospectively. (Refer to **Photographs 19-31**)

Frame Top Chord

- Moderate to severe corrosion of frame top chord was observed around bolts T1 and T2. (Refer to **Photographs 9-10-12-13-26-32-33-42-46**)

- It appears the original T2 bolt holes were mistakenly placed, and new bolts were installed adjacent to their location. The original holes remain open. Moderate to severe corrosion was observed around both the new and original T2 bolts. (Refer to **Photographs 42-46-47-49-50**)

- Moderate-Severe localised paint flaking (the top coat) and brown rust stains were observed on the top chords and diagonal stiffeners. (Refer to **Photographs 26-36-57-58**)

- Moderate to severe localized corrosion was observed where the corrugated metal sheet lining of the sign comes into contact with the top members of the sign frame. (Refer to **Photographs 36-58**)

Frame Bottom Chords

- Minor to moderate corrosion was observed on the bottom members of the sign frame. (Refer to **Photographs 2-4-5-7-19-54-56**)

- Moderate localised paint flaking was noted on the bottom members of the sign frame in the areas where the corrugated metal sheet lining of the sign comes into contact with the bottom members of the frame. (Refer to **Photographs 19-54-56**)

- Waterponding was noted at the east end of Sign 1 and the west end of Sign 2. Moderate-severe corrosion was observed on the bottom member of the frame where water was ponds. (Refer to **Photographs 20-25-55-56**)

Access Ladder

- The steel ladders were severely corroded where they connect to the bottom chord of the frame (both signs). (Refer to **Photograph 51**)

Other Members

- Surface corrosion was observed on the bottom members of the sign frame under the walkway checker plate. (Refer to **Photograph 30**)

- Localised surface corrosion and rust stains were noted on the various members of the sign structure.

Paint Thickness

- The total thickness of the coating (blue coat and the top white coat) over the structural members was measured using PosiTector FNDS thickness gauge. The protective coating has a thickness ranging from 16 microns to 88 microns, with an average of 45.5 microns based on 125 readings (Figure 7).

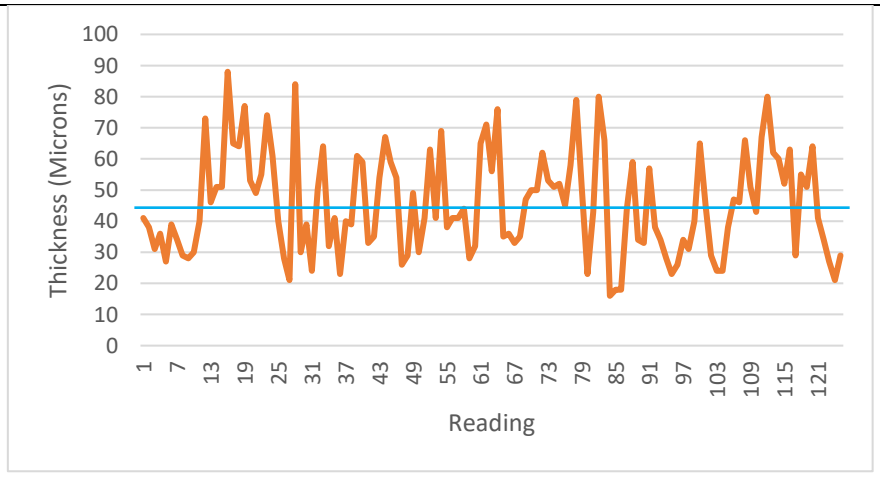


Figure 7- Paint thickness readings (Sign 1 and Sign 2)

Comments and Recommendations:

Localised slight to severe corrosion was observed on the top and bottom members of the sign structural frames. The average coating thickness was measured as 45.5 micorns. As per AS/NZS 2312.1 (i.e. guide to the protection of structural steel against atmospheric corrosion by the use of protective coating- Part 1: paint coatings), the sign structures fall under atmospheric corrosivity category C2 to C3 (Low to medium). Based on Table 6.3 of AS2312.1, various protective coating systems can be applied to achieve a 15-25 year' service life (e.g. high build epoxy system, polyurethane system).Most of the protective coating systems mentioned in the Table 6.3 of AS2312.1 have total nominal dry film thickness larger than 150 microns. There is no information regarding the specification of the existing coating system in the documents provided to CCSR. Therefore, the thickness of the existing paint with average of 45 micron is considered inadequate unless the members have duplex protective coating system, galvanised and paint.

The corrosion has mainly occurred on:

1) Bottom face of the bottom members of the frame

2) Top surface of the top members of the frame

3) On all faces of the top members around Bolts T1 and T2

The severity of corrosion on the top face of the top members and bottom face of the bottom members can not be determined as they were covered with corrugated metal sheet cladding of the signs. Therefore, we recommend the top and bottom metal sheet cladding be removed from the sign and the extent of corrosion be assessed by the Engineer.

The condition of the metal sheets, especially around the fasteners, will determine if they need replacing. To prevent water from leaking through fastener holes into the sign boxes, all fasteners (including structural bolts and screws) should be properly sealed and waterproofed. Durable thermal break foam tapes should be applied on the top and bottom edges of the structure to prevent direct contact between the metal frame and the corrugated metal cladding. This will significantly reduce the chance of moisture build-up and the risk of galvanic and crevice corrosion in the future.

Regarding the corrosion and paint flaking of the top members near bolts T1 and T2, we recommend the following remedial works be undertaken:

- Remove the corrosion product to achieve Sa 2½ cleanliness.
- Engineer to assess the section loss of the affected structural members
- Member with more than 10% section loss shall be replaced or structurally strengthened as per the Engineer's specification. The new member(s) or strengthened areas shall be coated with a proprietary corrosion protective coating system in accordance to AS2312.1.
- For areas with less than 10% section loss, the surfaces shall be prepared and fully cleaned, and the affected area be painted as per AS2312.1 standard and the Manufacturer's current technical data sheets.

We recommend that all gaps and unsealed joints between the corrugated roof sheets and angle flashing be fully sealed with a durable, UV-resistant silicone sealant. All holes in the sign's roof sheets shall also be sealed. Additionally, we recommend sealing the joint around the access hatch. A gap was noted under the cladding screws and there was no rubber sealing washer installed. We recommend screw be replaced with new screws compatible with the sheet cladding. Rubber sealing washer shall be installed with each screw. These measures will help to minimize rainwater infiltration into the sign boxes.

It is worth noting that because of how the PVC/vinyl banner is installed, gaps exist at its perimeter, this allows wind-driven rain to penetrate the sign boxes and contribute to corrosion, mould growth, and other issues. Therefore, we recommend installing drainage holes in the bottom sheets where water has been

observed to pool. Additionally, the bottom members should be coated with a more durable coating system that complies with AS2312.1 standards.

Access Ladders: corrosion needs to be removed from the corroded sections of the access ladders. For corrosion more than 10% (section loss more than 10%), we recommend the whole ladder be replaced with a new ladder, suitably coated as per with AS2312.1 standards. The welding zones (where ladder is welded to the sign frame) shall be coated with corrosion protective coating as per the Standard.

CCSR was engaged to assess the condition of the sign structures internally. As part of our duty of care, we wish to inform the owner that during our inspection, we observed moderate to severe corrosion on the inside faces of the 'BEAM 2' hollow sections outside the sign boxes for both Sign 1 and Sign 2 (refer to **Photographs 62-71**).

To address this issue, we recommend the following:

1. Inspection: All BEAM 2s need to be inspected to determine the extent of the corrosion. This may involve additional visual inspection, as well as non-destructive testing techniques.

2. Replacement: Any beams with moderate to severe corrosion on the inside face should be replaced with new beams suitably coated for corrosion protection. This coating could include hot-dip galvanization (HDG) and/or a high-quality corrosion-protective paint system.

3. Cap Plates: Cap plates with ventilation holes shall be installed at the ends of the new beams and the existing beams to minimise rainwater entering the hollow sections. This will help to prevent further corrosion from occurring inside the beams.

Alternative B (Recommended)

The above-mentioned remedial works require special equipment and teams. Conducting cutting, grinding, painting, and welding inside the confined space of the sign structure is complicated and considered very high-risk work. Considering the age of the structure, paint condition, locations of corrosion, and inadequate coating thickness, the owner of the signs may consider disassembling the sign structures (detaching the sign box from ‘BEAM 1’ and ‘BEAM 2’), carefully lowering it, and transporting it to a controlled factory environment. Then, in the factory, all cladding panels can be removed, providing access for a thorough assessment of the hidden surfaces of the top and bottom structural members. In the factory environment, the entire sign structure can be prepared and painted using suitable quality assurance measures. In addition, severely corroded members with more than 10% section loss can be safely replaced or strengthened in the factory in accordance to the engineer's specifications.

Requirements for Further Investigation:

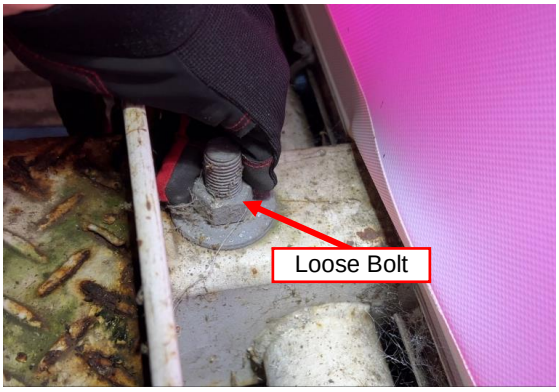
The following further investigation is required:

- Rust to be removed and the condition of the members and level of section loss to be assessed by the engineer.

Condition Index (Table 1 – Appendix A)	**4**
Priority Ranking (Table 2 – Appendix A)	**4**

6.2. Defective Bolting

Typical photo(s) of the defect and/or symptom (if applicable)
For detailed Photos refer to Appendix C



Location(s): Sign 1 and Sign 2

Inspection Date: 05 December 2023

Testing: No testing

Observations:

- The top and bottom chords of the frame were connected to BEAMS 1 and 2 using bolts, nuts, and washers. (Refer to **Figures 1 and 3 - Photographs 72**)

- All readily accessible bolts from the walkway within the sign boxes were hand-tested for looseness. One loose nut was identified (in Sign 2) and hand-tightened by our engineer as a safety precaution. (Refer to **Photograph 76**)

- There was no lock nut installed on Bolts B1, B2, T1 and T2. (Refer to **Photographs 72-73-74-75**)

- Split lock washers were installed on some of the Bolts. (Refer to **Photograph 73**)

- Some bolts lacked both lock nuts and split lock washers. (Refer to **Photograph 74-75-76-77**)

- Surface corrosion (rust stains) was observed on a number of Bolts T1 and T2 (on the bolt head, washer and nuts). (Refer to **Photograph 66-70-77**)

Comments and Recommendations:

According to the original structural drawings for the sign structure, locking nuts should have been installed on all Bolts B1, B2, T1, and T2. However, during inspection, no locking nuts were found, but split lock washers were present on some bolts. Split washers and locking nuts are both types of fasteners used to prevent bolts and nuts from loosening due to vibration or movement. However, they have distinct differences in design and application. Splitting washers are more suitable for non-critical connections with minimal vibration, while lock nuts are generally used for critical connections experiencing high stress and extreme vibration.

Based on the level of vibration the sign structure experiences on the bridge and since these bolts are the main structural bolts that connect the sign boxes to the supporting beams, we recommend that locking nuts be installed on all bolts as per the original structural drawings.

Corroded bolts, nuts and washer to be replaced like-for-like.

All bolts shall be hand-tested and loose nuts to be tightened using a standard wrench to a 'snug-tight' condition as per the approved structural drawings.

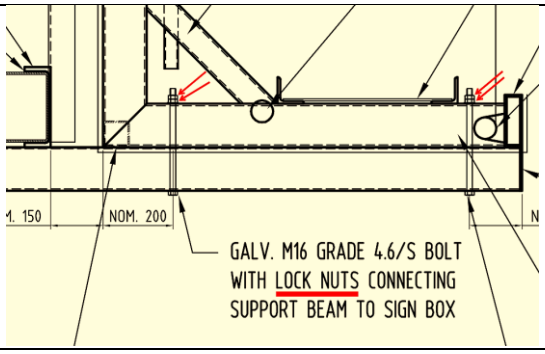


Figure 8- Lock nuts on Bolts B1 and B2 (Bottom chords and BEAM 1)
(Extracted from the original drawings prepared by O'Hearn Consulting Pty Ltd)

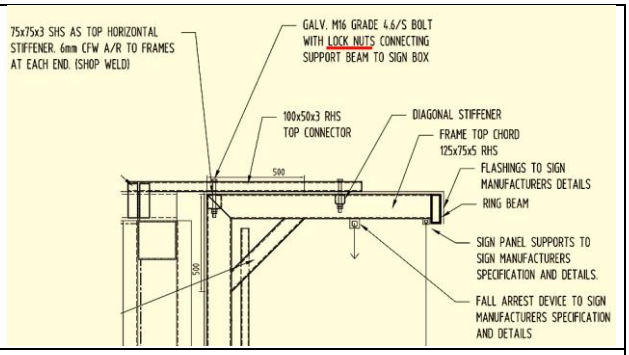


Figure 9- Lock nuts on Bolts T1 and T2 (Top chords and BEAM 2)
(Extracted from the original drawings prepared by O'Hearn Consulting Pty Ltd)

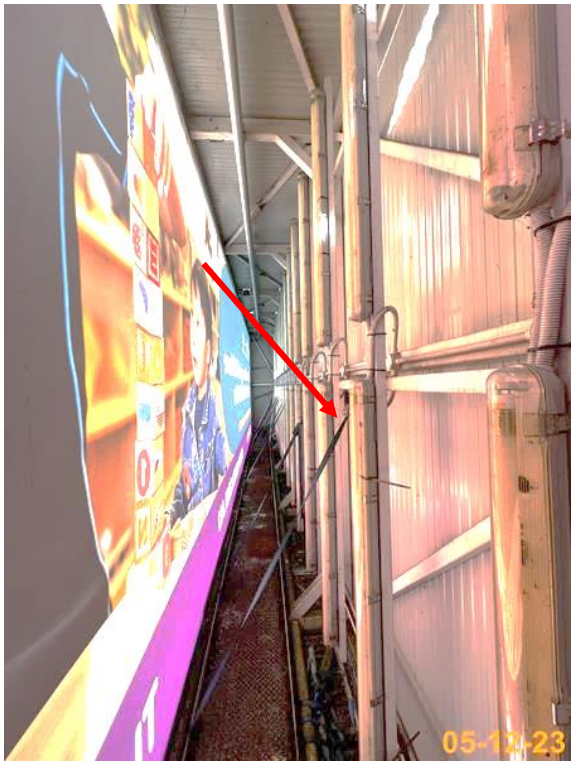
Requirements for Further Investigation:

-

Condition Index (Table 1 – Appendix A)	**3**
Priority Ranking (Table 2 – Appendix A)	**4**

6.3. Sign Tensioning Mechanism

Typical photo(s) of the defect and/or symptom (if applicable)
For detailed Photos refer to Appendix C



Location(s): Sign 1 and Sign 2

Inspection Date: 05 December 2023

Testing: No testing

Observations:

- Both sign boxes have two tensioning bars (CHS 60x3.6) welded between the bottom chords (indicated by the yellow arrows above). (Refer to **Figure 1** and **Photograph 78**)

- The sign banner was tensioned with ratchet straps attached to its edge at one end and tied around the non-structural horizontal Light Rod supports at the other end. (Refer to **Photographs 78-79-80-81-83-84**)

- Due to the way the straps were installed, the straps rub against the edge of the walkway checker plate. (Refer to **Photographs 81-85**)

- Surface corrosion was observed on several rachets. Broken and faulty rachets and torn straps were found on the floor of the sign boxes. (Refer to **Photograph 79**)

Comments and Recommendations:

- We strongly recommend that only the existing tensioning bars be used for securing and tensioning the banners. If this is not possible, it is crucial to have a structural engineer assess the structural adequacy of the light rod supports and any other element that straps will be in contact with (walkway plate, etc.)

- The current strap installation method is incorrect and poses a high risk of tearing due to friction against the sharp edge of the walkway checker plate. It is also a trip hazard for the maintenance team. We recommend that only the existing tensioning bars be used for securing the banners. - Any ratchets showing even slight surface corrosion shall be replaced with new stainless steel or galvanized ratchets. - Broken and faulty rachets and straps shall be removed from the interior space of the sign boxes.	
Requirements for Further Investigation: -	
Condition Index (Table 1 – Appendix A)	**4**
Priority Ranking (Table 2 – Appendix A)	**4**

6.4. Mould Growth

Typical photo(s) of the defect and/or symptom (if applicable)
For detailed Photos refer to Appendix C

Location(s): Sign 2 (facing South)

Inspection Date: 05 December 2023

Testing: No testing

Observations:

- Mould growth was observed on the frame structure of Sign 2. (Refer to **Photographs 86-88**)

Comments and Recommendations:

It is correct that mould in a sign structure might not be important as the interior space of the sign boxes is not habitable. However, mould can have other detrimental impacts on the coating system of the steel frame, such as:

a) Mould can trap moisture against the painted surface, creating a perfect environment for corrosion. Over time, this can compromise the integrity of the steel and lead to structural weaknesses.

b) Mould can penetrate and feed on organic components within the paint. This can cause the paint to degrade, leading to discolouration, peeling, and flaking.

The sign boxes were not equipped with mechanical ventilation. Penetration of moisture and water vapours from the gaps and unsealed joints around the banner and other parts of the signs, coupled with inadequate ventilation are the two main factors contributing to the identified mould growth. We recommend that all gaps and joints be suitably sealed to minimise the infiltration of moisture and water to the interior of the sign boxes. In addition, we recommend that a mechanical ventilation system (with intake and exhaust fans) be designed and installed to reduce the humidity and prevent moisture buildup in the sign boxes.

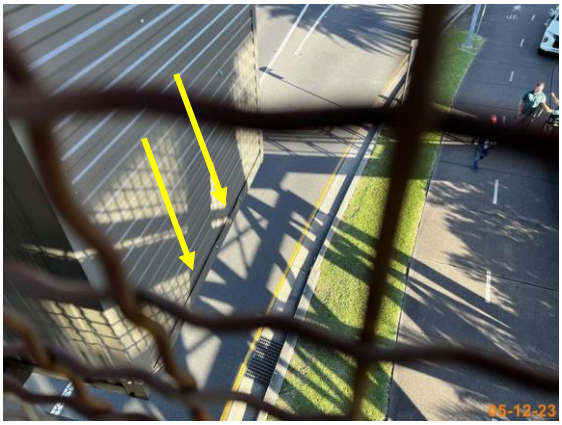
A mould cleaner specialist shall be engaged and the areas with mould shall be cleaned and treated as per their instruction. Ensure that the chemicals used in the cleaning process do not degrade the performance and durability of the existing coating system.

Requirements for Further Investigation: -	
Condition Index (Table 1 – Appendix A)	**3**
Priority Ranking (Table 2 – Appendix A)	**3**

6.5. Water Ponding

Typical photo(s) of the defect and/or symptom (if applicable)
For detailed Photos refer to Appendix C

Sign 1 – East End



Sign 1 – East End

Sign 2 – West End

Sign 2 – West End

Location(s): Sign 1 and Sign 2

Inspection Date: 05 December 2023

Testing: No testing

Observations:

- The sign box floor sheet was wet at the East end of Sign 1 and west end of Sign 2. (Refer to **Photographs 89-91)**

- A gap was noted between the edge flashings and the sheet linings (indicated by the yellow arrows above). (Refer to **Photograph 24)**

- Sunlight beams were passing through the gap along the perimeter of the banner. (Refer to **Photograph 91)**

Comments and Recommendations:

We are of the opinion that the waterponding observed at the East end of Sign 1 and west end of Sign 2 has primarily occurred due to the following factors (or a combination of them):

a) Gap between the banner and its surrounding structure: This allows water to directly penetrate the space below the banner.

b) Inadequate flashing: Lack of or insufficiently sealed flashing at the edges of the sign boxes and cladding panels provides pathways for water infiltration.

b) Unsealed gaps and bolt holes in the roof: Openings in the roof, especially unsealed bolt holes, create points of entry for water.

c) Missing rubber sealing washers on cladding screws: The absence of these washers allows water to bypass the screws and seep into the structure.

We recommend that the following remedial actions be undertaken to minimise the water ingress issue:

- All gaps and unsealed joints between the corrugated roof sheets and flashings be fully sealed with a durable, UV-resistant silicone sealant.

- All holes in the sign's roof sheets should also be sealed with UV-resistant sealant. All sheet lining screws shall be replaced with new fasteners with rubber sealing washers.

- The perimeter of all the roof penetrations and openings (e.g. access hatch, sign box anchor points) shall be fully sealed.

- Modify the banner installation and tensioning methods to minimise or, ideally, eliminate the gap between the banner and the sign frame.

Requirements for Further Investigation:

-

Condition Index (Table 1 – Appendix A)	**3**
Priority Ranking (Table 2 – Appendix A)	**4**

7. Closing

The recommendations provided above are an outline for remedial, further inspection and/or monitoring works. Any repair methodologies that have been included in this report should not be taken as a comprehensive specification or scope of works. CCSR can be engaged to provide subsequent professional services and advice as required.

Should any works be carried out, we advise that all works should be carried out by an experienced licensed contractor to NCC, Australian Standards, and WHS requirements.

This report shall not be construed as relieving any other party of their liabilities, responsibilities, or contractual obligations.

We trust the above meet your requirements at present. Please contact the undersigned if you require any further clarification.

Yours faithfully,

CCSR Consulting Engineers Pty Ltd

Digitally signed by Parham Mohajerani
Date: 2023.12.15 15:20:48+11'00'

Parham Mohajerani

Managing Director – Principal Engineer
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Appendix A

Table 1 – Condition Index

Rating	Status	Definition of rating/condition of the element
0	**Non-existent**	Asset abandoned or no longer exists.
1	**Very Good**	Element in sound condition and designed to meet current standards. Element likely to perform adequately within routine maintenance for 10 years or more. No work is required.
2	**Good**	Acceptable condition but not designed to current standards, or showing minor surface defects. Deterioration has minimal impact on the performance of the Component. Minimal short-term failure risk but the potential for deterioration or reduced performance in the medium-term (5 – 10 years). Only minor work is required (if any).
3	**Fair**	Moderate deterioration has occurred, but defects do not affect the short-term durability and/or serviceability and/or integrity of the building and/or the Component. Failure is unlikely within 2 years but further deterioration is likely and major replacement may be required within the next 5 years. Work is required but the element is still serviceable.
4	**Poor**	Defects affecting the durability and/or serviceability and/or integrity of the building and/or the Component. Failure is likely in short-term. Likely need to replace most or all of the element within 2 years. No immediate risk to health or safety but works required within 2 years to ensure asset/element remains safe. Substantial work is required in short-term, the asset/element is barely serviceable.
5	**Very Poor**	Failed or failure imminent. Need to be repaired, replaced or investigated urgently. Health and safety hazards exist which present a possible risk to asset's users and/or public safety.

Table 2 – Priority Ranking

Priority Ranking	Definition
1	Action is required **5-7 years**.
2	Action is required **3-5 years**.
3	Action is required **1-2 years**.
4	Action is required **1 year**.
5	Action is required **Immediately**.

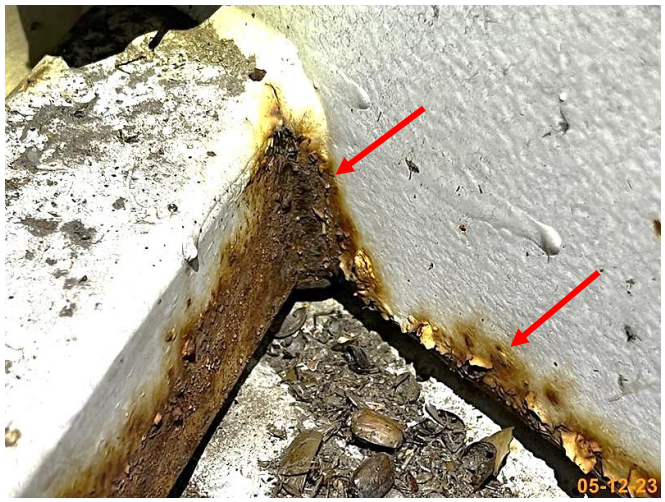
Appendix B Defect Summary

Table 3 – Defect Summary

Defect No.	Defect Description	Condition Index	Priority Ranking	Is Further Investigation Required?
1	Location: Sign 1 and Sign 2 Defect: Corrosion	4	4	Yes
2	Location: Sign 1 and Sign 2 Defect: Defective bolting	3	4	-
3	Location: Sign 1 and Sign 2 Defect: Sign tensioning mechanism	4	4	-
4	Location: Sign 2 Defect: Mould growth	3	3	-
5	Location: Sign 1 and Sign 2 Defect: Water Ponding	3	4	-

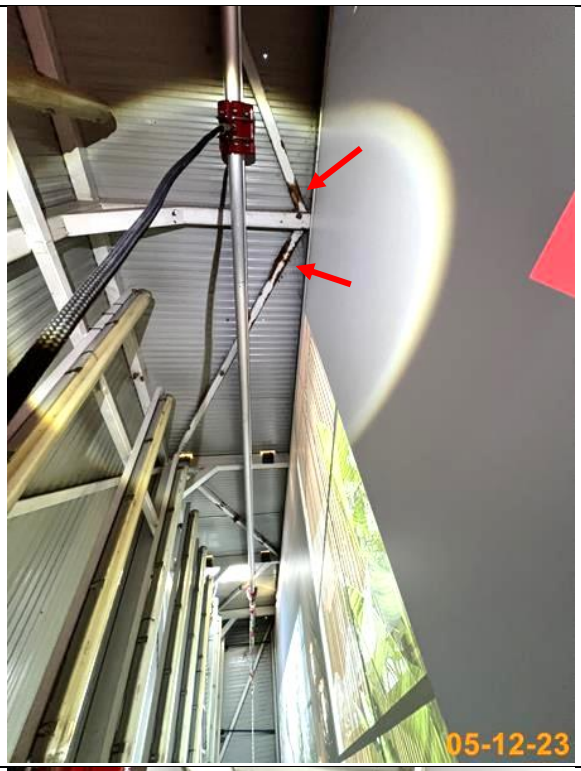
Appendix C Photographs

	**Photograph 1** Sign 1 – Defect 6.1 - Corrosion of structural members
	**Photograph 2** Sign 1 – Defect 6.1 - Paint degradation and corrosion of structural members - Closed up view of **Photograph 1**.

	**Photograph 3** Sign 1 – Defect 6.1 - Paint degradation and surface corrosion of structural members - Closed up view of **Photograph 1**.
	**Photograph 4** Sign 1 – Defect 6.1 - Paint degradation and surface corrosion of structural members
	**Photograph 5** Sign 1 – Defect 6.1 - Corrosion of structural members

	**Photograph 6** Sign 1 – Defect 6.1 - Paint degradation and surface corrosion of structural members
	**Photograph 7** Sign 1 – Defect 6.1 - Closed up view of **Photograph 6**.

	**Photograph 8** Sign 1 – Defect 6.1 - Paint degradation and surface corrosion of structural members - Closed up view of **Photograph 7**.
	**Photograph 9** Sign 1 – Defect 6.1 - Paint degradation and localised corrosion of structural members

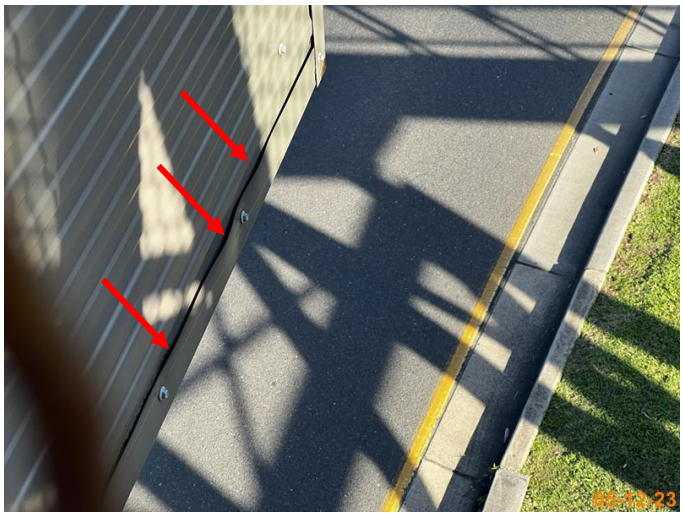
	**Photograph 10** Sign 1 – Defect 6.1 As above.
	**Photograph 11** Sign 1 – Defect 6.1 - Closed up view of **Photograph 10**.

	**Photograph 12** Sign 1 – Defect 6.1 - Localised corrosion of structural members
	**Photograph 13** Sign 1 – Defect 6.1 - Localised corrosion of structural members - Closed up view of **Photograph 12**.

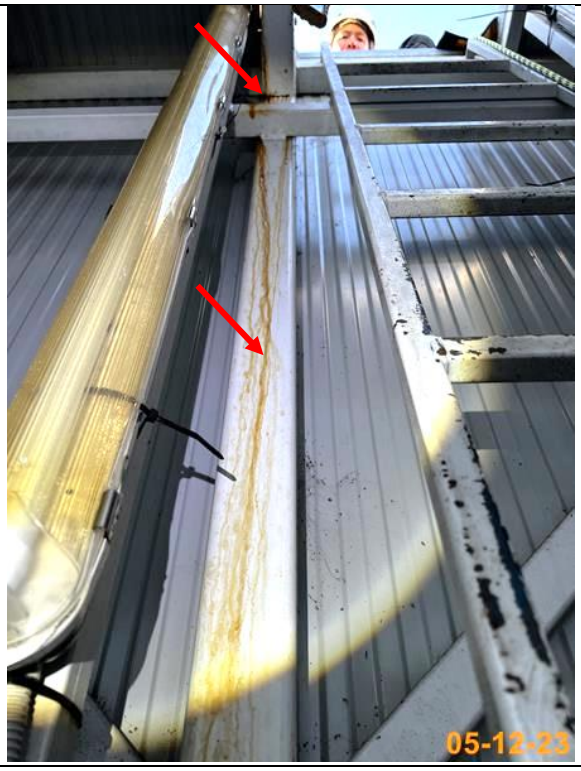
	**Photograph 14** Sign 1 – Defect 6.1 - Localised corrosion of structural members
	**Photograph 15** Sign 1 – Defect 6.1 - Localised surface corrosion of structural members - Closed up view of **Photograph 14**.
	**Photograph 16** Sign 1 – Defect 6.1 - Rust staining

	**Photograph 17** Sign 1 – Defect 6.1 - Localised corrosion of structural members
	**Photograph 18** Sign 1 – Defect 6.1 - Paint discolouration and surface corrosion of structural members
	**Photograph 19** Sign 1 – Defect 6.1 Close up view of **Photograph 18**.

	**Photograph 20** Sign 1 – Defect 6.1 - Waterponding - Moderate-severe corrosion of structural members
	**Photograph 21** Sign 1 – Defect 6.1 Close-up view of **Photograph 20**.
	**Photograph 22** Sign 1 – Defect 6.1 As above.

	**Photograph 23** Sign 1 – Defect 6.1 Close-up view of **Photograph 22**.
	**Photograph 24** Sign 1 – Defect 6.1 - Gap between the flashing and the cladding (east end of Sign 1)
	**Photograph 25** Sign 1 – Defect 6.1 - Gap between the banner and the cladding.

	**Photograph 26** Sign 1 – Defect 6.1 - Localised corrosion of structural members
	**Photograph 27** Sign 1 – Defect 6.1 - Localised corrosion of structural members

	**Photograph 28** Sign 1 – Defect 6.1 - Minor localised corrosion of structural members
	**Photograph 29** Sign 1 – Defect 6.1 - Rust staining near the western access hatch.

	**Photograph 30** Sign 1 – Defect 6.1 - Surface corrosion of structural members under the walkway plate.
	**Photograph 31** Sign 1 – Defect 6.1 - Two paint layers on the structural members (blue and white)

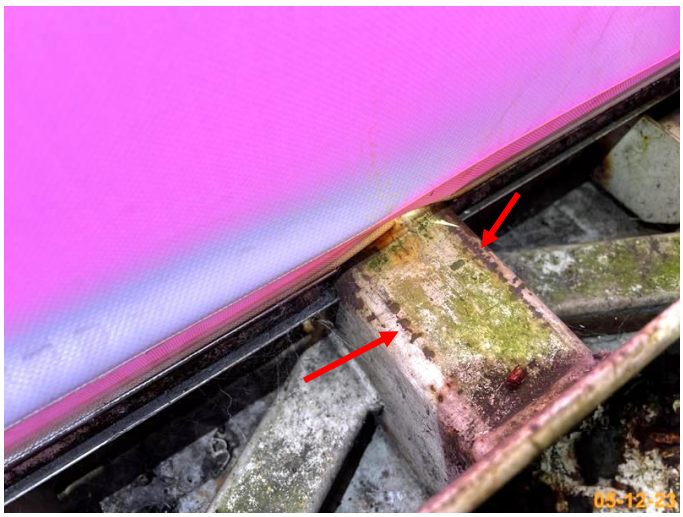
	**Photograph 32** Sign 2 – Defect 6.1 - Localised corrosion of structural members
	**Photograph 33** Sign 2 – Defect 6.1 - Localised corrosion of structural members - Closed up view of **Photograph 32**.

	**Photograph 34** Sign 2 – Defect 6.1 - Localised surface corrosion of structural members
	**Photograph 35** Sign 2 – Defect 6.1 - Localised corrosion of structural members
	**Photograph 36** Sign 2 – Defect 6.1 - Localised corrosion of structural members and cladding panels - Closed up view of **Photograph 35**.

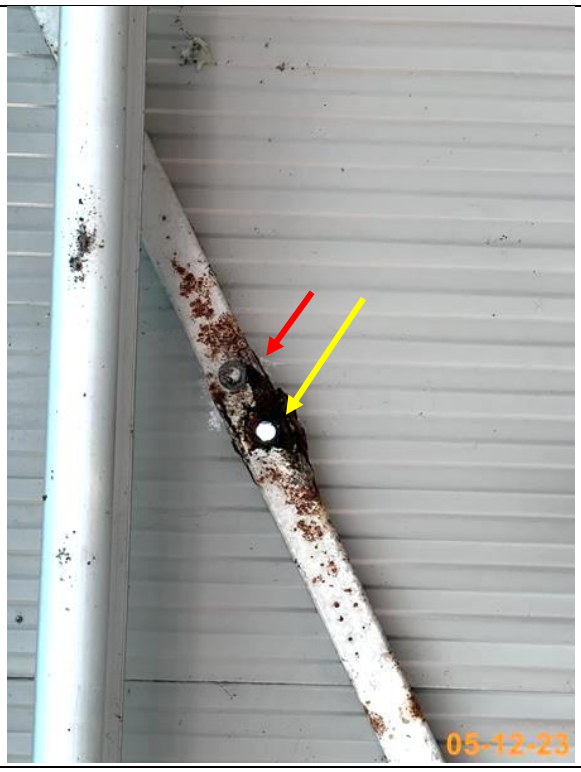
	**Photograph 37** Sign 2 – Defect 6.1 - Localised corrosion of structural members
	**Photograph 38** Sign 2 – Defect 6.1 - Localised corrosion of structural members

	**Photograph 39** Sign 2 – Defect 6.1 - Corrosion of steel ladder (weld zone)
	**Photograph 40** Sign 2 – Defect 6.1 - Paint discolouration and minor surface corrosion
	**Photograph 41** Sign 2 – Defect 6.1 - Localised corrosion of structural members - An open bolt hole in the diagonal stiffener

	**Photograph 42** Sign 2 – Defect 6.1 - Closed up view of **Photograph 41**. - Open bolt hole.
	**Photograph 43** Sign 2 – Defect 6.1 - Rust staining
	**Photograph 44** Sign 2 – Defect 6.1 - Corrosion of sign box anchor points.

	**Photograph 45** Sign 2 – Defect 6.1 - Abrasion of coating layer due to the movement of the banner and friction between the banner clamp and the bottom chord of the structure.
	**Photograph 46** Sign 2 – Defect 6.1 - Localised corrosion of structural members of the sign structure

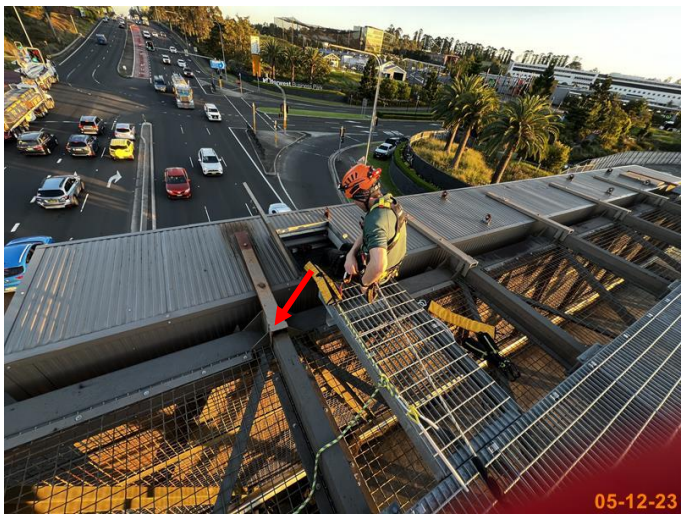
	**Photograph 47** Sign 2 – Defect 6.1 - Closed up view of **Photograph 46**.
	**Photograph 48** Sign 2 – Defect 6.1 - Closed up view of **Photograph 46**.

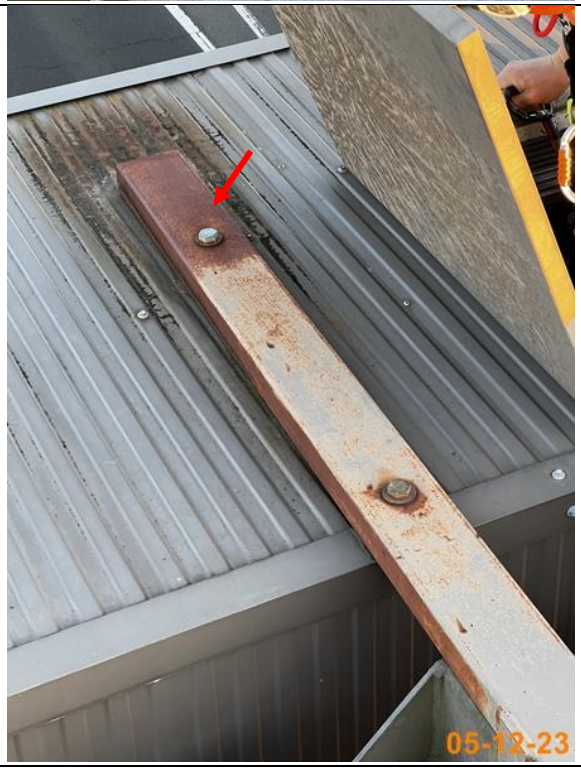
	**Photograph 49** Sign 2 – Defect 6.1 - Localised corrosion of structural members - An open bolt hole in the diagonal stiffener - Closed up view of **Photograph 48**.
	**Photograph 50** Sign 2 – Defect 6.1 - Closed up view of **Photograph 48**.

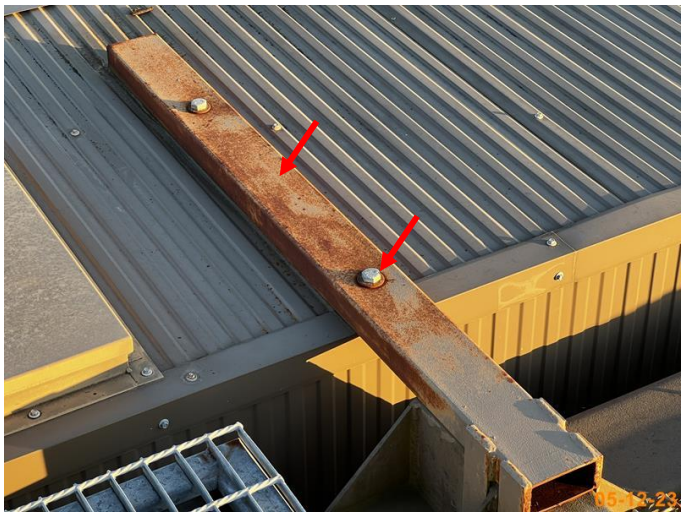
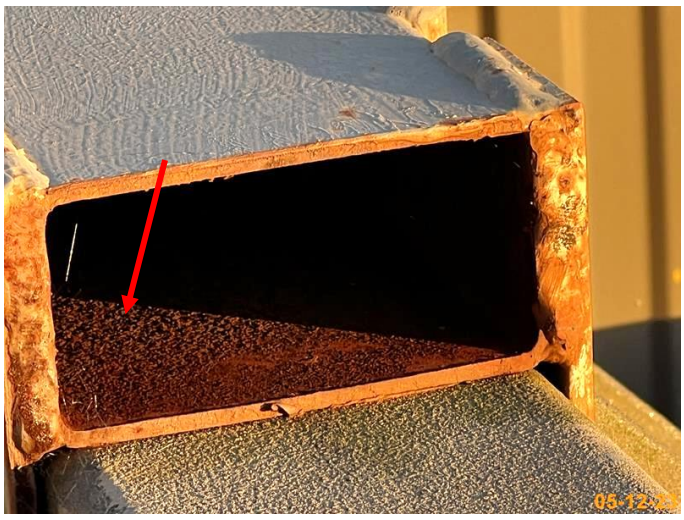
	**Photograph 51** Sign 2 – Defect 6.1 - Corrosion of ladder (weld zone)
	**Photograph 52** Sign 2 – Defect 6.1 - Localised corrosion of structural members
	**Photograph 53** Sign 2 – Defect 6.1 - Closed up view of **Photograph 52**.

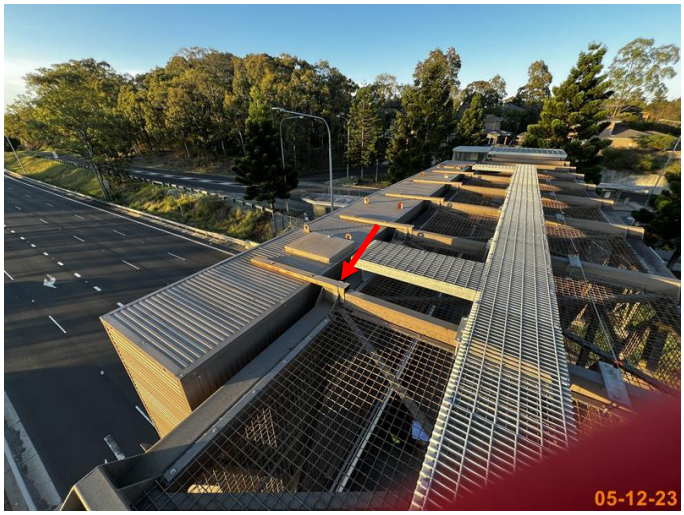
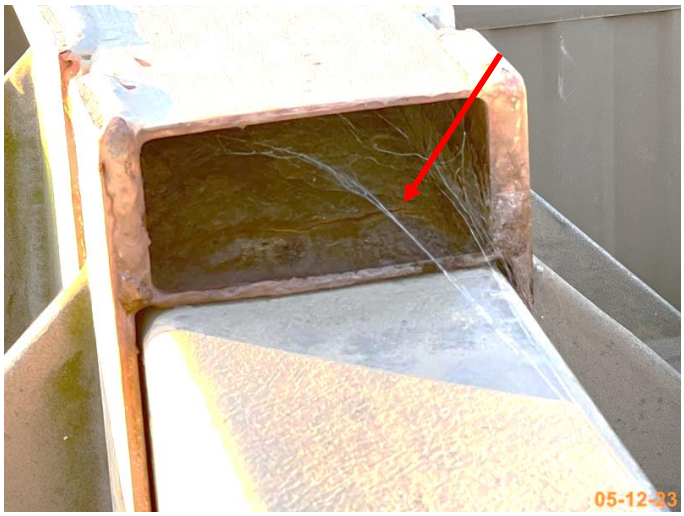
	**Photograph 54** Sign 2 – Defect 6.1 - Surface corrosion of bottom chords and members of the sign structure
	**Photograph 55** Sign 2 – Defect 6.1 - Waterponding (west end of Sign 2) - Localised corrosion and mild section loss in the bottom chord of the frame.
	**Photograph 56** Sign 2 – Defect 6.1 - Closed up view of **Photograph 55**.

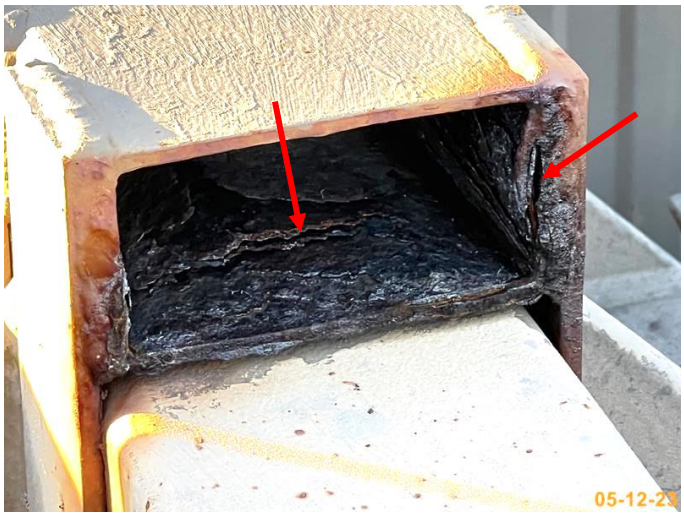
	**Photograph 57** Sign 2 – Defect 6.1 - Localised corrosion of structural members and cladding sheet linings
	**Photograph 58** Sign 2 – Defect 6.1 - Closed up view of **Photograph 57**.
	**Photograph 59** Sign 2 – Defect 6.1 - Closed up view of **Photograph 58**.

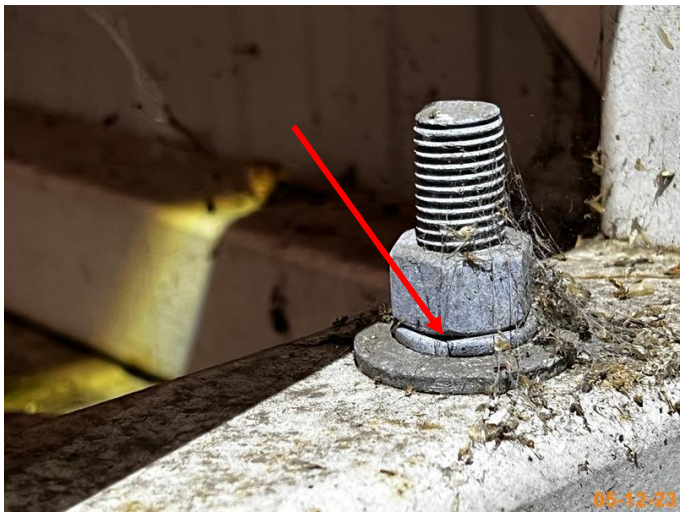
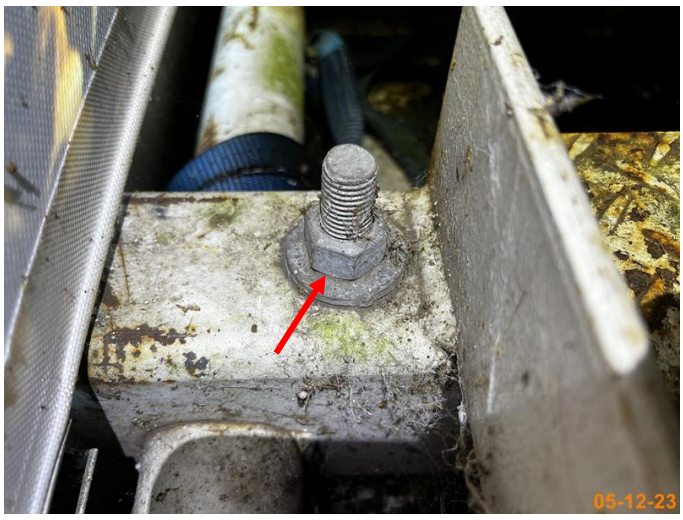
	**Photograph 60** Sign 2 – Defect 6.1 - Localised corrosion of structural members (Refer to Photograph 61 for the view of the connection from above)
	**Photograph 61** Sign 2 – Defect 6.1 - General view of the connection from above.
	**Photograph 62** Sign 1 – Defect 6.1 - Severe corrosion of BEAM 2 (inner faces) - Surface corrosion of BEAM 2 (outer faces)

	**Photograph 63** Sign 1 – Defect 6.1 - Closed up view of **Photograph 62**.
	**Photograph 64** Sign 1 – Defect 6.1 - Closed up view of **Photograph 63**.

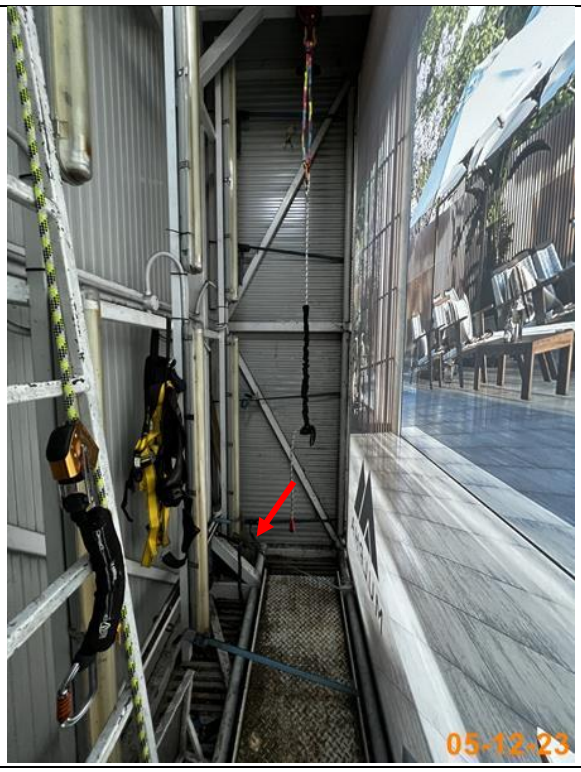
	**Photograph 65** Sign 1 – Defect 6.1 - Moderate-severe corrosion of BEAM 2 (inner faces) - Surface corrosion of BEAM 2 (outer faces)
	**Photograph 66** Sign 1 – Defect 6.1 - Corrosion of nuts - Closed up view of **Photograph 65**.
	**Photograph 67** Sign 1 – Defect 6.1 - Closed up view of **Photograph 65**.

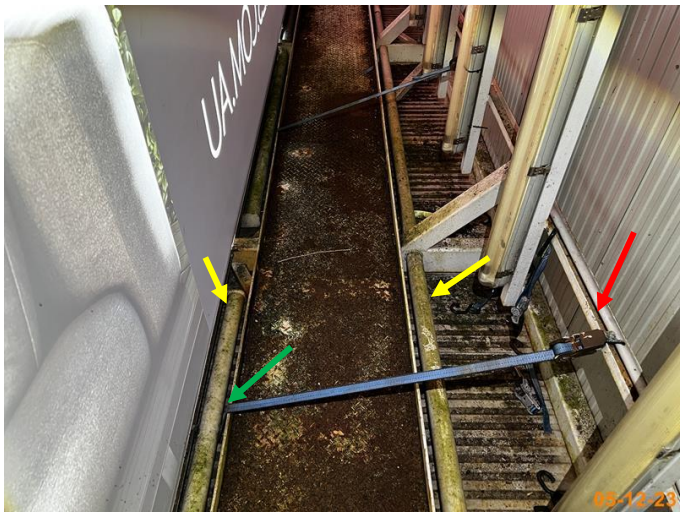
	**Photograph 68** Sign 2 – Defect 6.1 - Severe corrosion of BEAM 2 (inner faces) - Surface corrosion of BEAM 2 (outer faces)
	**Photograph 69** Sign 2 – Defect 6.1 - Closed up view of **Photograph 68**.

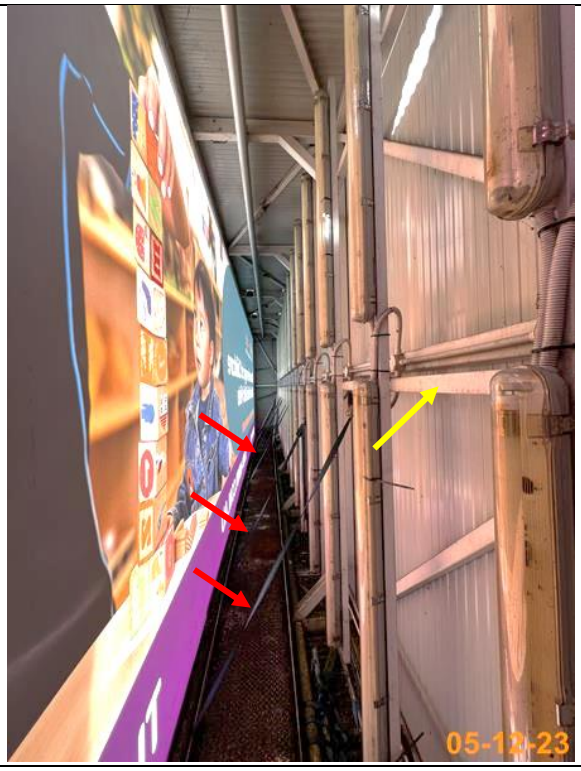
	**Photograph 70** Sign 2 – Defect 6.1 - Severe corrosion of BEAM 2 (inner faces) - Surface corrosion of BEAM 2 (outer faces)
	**Photograph 71** Sign 2 – Defect 6.1 - Closed up view of **Photograph 70**.

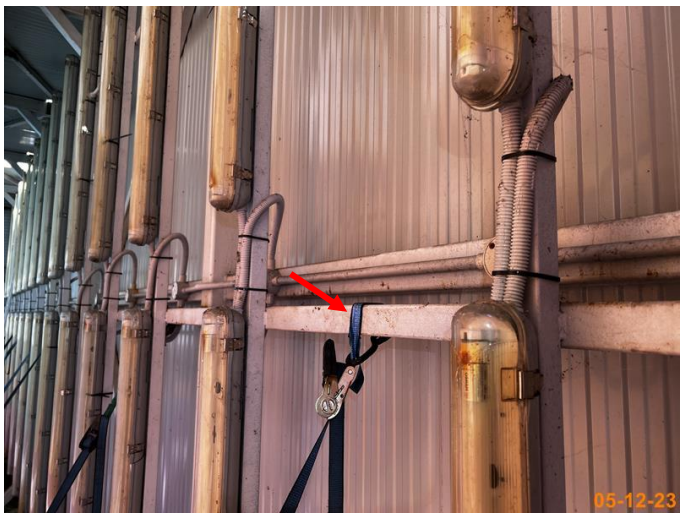
	**Photograph 72** Sign 1 – Defect 6.2 - Lack of locking nut
	**Photograph 73** Sign 1 – Defect 6.2 - Lack of locking nut - Split locking washer (indicated by the red arrow)
	**Photograph 74** Sign 1 – Defect 6.2 - No locking nut - No split washer

	**Photograph 75** Sign 1 – Defect 6.2 - No locking nut - No split washer
	**Photograph 76** Sign 2 – Defect 6.2 - Loose nut - No locking nut - No split washer
	**Photograph 77** Sign 2 – Defect 6.2 - No locking nut - No split washer

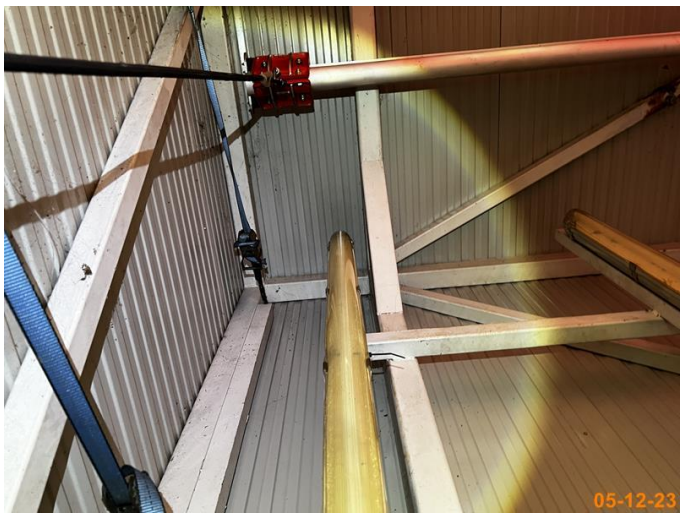
	**Photograph 78** Sign 1 – Defect 6.3 - Rusted ratchet - Strap in contact to the edge of walkway checker plate
	**Photograph 79** Sign 1 – Defect 6.3 - Closed up view of **Photograph 78**.

	**Photograph 80** Sign 1 – Defect 6.3 - Ratchet strap for tensioning the banner
	**Photograph 81** Sign 1 – Defect 6.3 - The sign banner was tensioned with ratchet straps attached to its edge at one end and tied around the non-structural horizontal Light Rod supports at the other end. - Due to the way the straps were installed, the straps rub against the edge of the walkway checker plate - Tensioning bars (yellow arrows)

	**Photograph 82** Sign 1 – Defect 6.3 - Broken ratchets on the floor
	**Photograph 83** Sign 2 – Defect 6.3 - The sign banner was tensioned with ratchet straps attached to its edge at one end and tied around the non-structural horizontal Light Rod supports at the other end (yellow arrow). - Due to the way the straps were installed, the straps rub against the edge of the walkway checker plate

	**Photograph 84** Sign 2 – Defect 6.3 - Closed up view of **Photograph 83**.
	**Photograph 85** Sign 2 – Defect 6.3 - Closed up view of **Photograph 83**.
	**Photograph 86** Sign 2 – Defect 6.4 - Mould growth on structural members

	**Photograph 87** Sign 2 – Defect 6.4 As above.
	**Photograph 88** Sign 2 – Defect 6.4 As above.
	**Photograph 89** Sign 1 – Defect 6.5 - Waterponding (east end of Sign 1)

	**Photograph 90** Sign 1 – Defect 6.5 General condition of ceiling above (east end of Sign 1)
	**Photograph 91** Sign 2 – Defect 6.5 - Waterponding (west end of Sign 2) - Sunlight inside the box (yellow arrow)
	**Photograph 92** Sign 2 – Defect 6.5 General condition of ceiling above (west end of Sign 2)

	**Photograph 93** Sign 1 – Defect 6.5 - Lack of rubber sealing washer - Gap between the screw head and the flashing.