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DA Structural Report

Malthouses 1, 2 and Maltsters House
The Maltings, Mittagong

Colliers International / 29 August 2024

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Executive Summary

At the request of Colliers International, TTW (NSW) Pty Ltd were commissioned to prepare a structural report for The Maltings complex building comprising Malthouses 1 and 2 (M1 and M2) and Maltsters Cottage (Maltsters House). This has been prepared to support the S.4.55 submission for Malthouses 1 and 2 (Development Application reference DA20/1400).

This report has been updated following previous issue (dated 6 February 2024) to account for changes in architectural direction regarding the existing Malsters House ruins (drawing set dated 12 February 2024).

In the preparation of this report, we have carried out inspection of the structure, materials testing and investigation works, and further design development in coordination with project architect Snøhetta.

Based on structural inspection of the building condition, we anticipate that the following components may be retained, with repair works to remediate defects:

- Masonry walls
- Existing piers and footings
- M1/M2 concrete silos
- M2 concrete slabs
- M2 steel columns
- M2 structural timber (repairs required, replacement of some elements)
- Stores 1A/1B timber and steel (with strengthening)

We recommend that the following components are not retained:

- Existing roof cladding to M1 and M2
- Vaulted slabs in M1
- Select deteriorated structural timbers in M2 and fire damaged roof

A wholistic review of the structures to resist lateral loads will need to completed as part of design development. As a minimum, strengthening of the existing structure is required to provide resistance to lateral loads at the following locations:

- Malthouse 1 freestanding masonry walls and gable, where there is no roof remaining and is not proposed to be reinstated, and the internal slab is proposed to be removed and not reinstated.
- Footings may be required to be locally strengthened in order to resist high overturning loads on tall cantilevering masonry walls.
- Southern Sheds timber framing (walls and roof) requires additional bracing as the current framing has little lateral load resistance and is unstable under wind loads.

Key structural elements of the proposed design are as follows:

- New roofing including adjusted roof structural framing
- New outdoor amphitheatre within the M1 machinery room, requiring masonry strengthening
- New suspended Level 2 floors within the central zone of the M1/M2 complex, the two kiln rooms and old silo
- New lift core within M2 machinery room area, adjacent to the kiln room
- New ancillary spaces at Ground Level including plant, storage and office spaces
- New Northern Shed construction, to the northeast of the M2 machinery room
- Modifications to the Southern Sheds (existing sheds 1a and 1b) including strengthening/bracing of the existing structure, new ticketing and café partitions, and standalone services/amenities blocks to the rear.

New structural elements will be designed and certified in accordance with the National Construction Code and referenced Australian Standards. Where existing building elements are not able to be upgraded achieve compliance with the NCC, e.g. seismic loading for existing unreinforced masonry, performance solutions will be sought.

1.0 Introduction

At the request of Colliers International, TTW (NSW) Pty Ltd were commissioned to prepare a structural report for the Maltings precinct at Mittagong. The purpose of this report is to provide discussion on the concept structural design for the revised architectural scheme prepared by Snøhetta for M1, M2 and the Maltsters House for the S4.55 submission (Development Application ref DA20/1400). Additional discussion is also provided on strengthening and remediation works that will be required to the existing structures as part of the adaptive re-use of the buildings.

All descriptions, references to conditions and other details are a general guidance only and are given as our opinion but any interested parties should not rely on them as statements or representations of fact and must satisfy themselves as to the correctness, quantity, costs, etc of each of them.

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This report has been updated following previous issue (dated 6 February 2024) to account for changes in architectural direction regarding the existing Malsters House ruins (refer architectural drawing set dated 12 February 2024).

2.0 Scope of Review

In order to form our opinion on the elements we could view, the following level of review was undertaken:

- Building inspection (visual and photographic) of accessible areas including steel and cast iron columns, slabs, masonry facades, and timber framing.
- Measurements of structural items has been undertaken of items able to be accessed for measurement, in order for calculations to be undertaken as part of design works.
- Material testing was carried out by BCRC as part of this assessment. Inspection of all structural timber elements was also undertaken by BCRC and is appended to this report. Outcomes of the assessments undertaken by BCRC have been used to inform this report.
- Initial analysis and capacity checks of the structure have been undertaken, for structural concept design informed by the current architectural design as prepared by Snøhetta architects and the condition and stability of the existing structure, as outlined in Section 5.0.

A discussion of items which may be retained, items which must be removed for structural reasons, and the required extent of repair works (anticipated to be as close to like-for-like as feasible) is provided in Section 5.0.

Structural strengthening for stability and/or compliance with National Construction Code/ Australian Standard requirements has been found to be required in areas as discussed in 6.0.

Structural design concepts for new and upgraded/modified building elements is discussed in Section 7.0.

3.0 Description of Building Structure

The Maltings site is located adjacent to the Old Hume Highway in Mittagong, NSW. This project involves the adaptive re-use of all structured on the site (as indicated in Figure 1). This report refers to the M1/M2 complex and Maltsters House (M3 and other buildings are the subject of a separate report).

Figure 1: M1 and M2 location plan

The collection of buildings incorporating this project were constructed at various stages commencing from 1899.

A summary of the building construction type and their ages of the M1/M2 building is provided below.

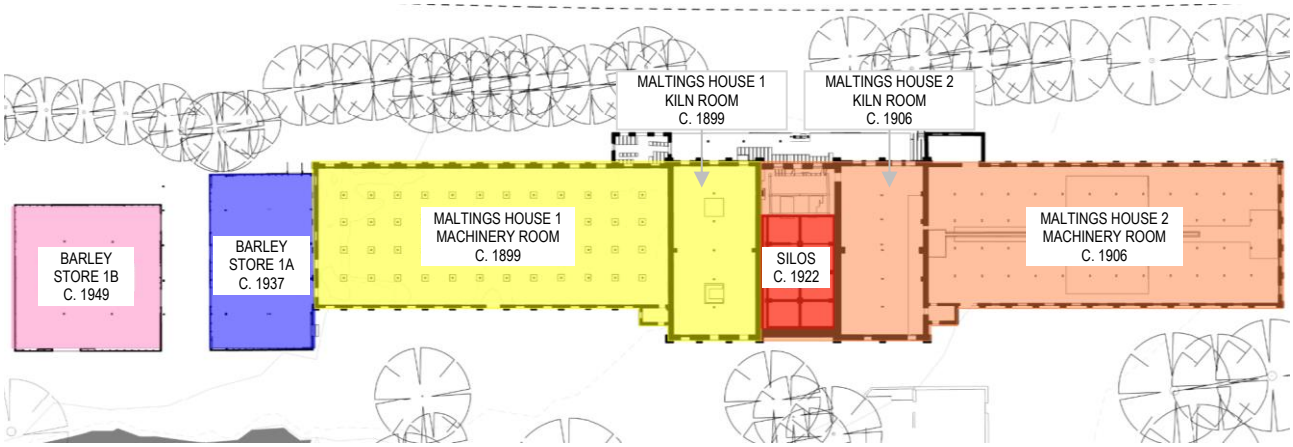

Figure 2. Building Separation and Dates – M1/M2 Building

- Barley Store 1A c. 1937 – Constructed of timber wall framing and timber roof trusses.
- Barley Store 1B c. 1949 – Constructed of timber wall framing and timber roof trusses and purlins with a concrete slab on ground.
- Maltings House 1 c. 1899 – Constructed of load bearing brick masonry façade walls, cast iron columns supporting Level 1. The first floor is constructed of vaulted plain concrete segments supported on cast iron beams (potentially mild steel) which span to the cast iron columns.

- Silos c. 1922 – Constructed of reinforced concrete beams, walls and columns, housed within a brick masonry façade.
- Maltings House 2 c. 1906 – Consists of load bearing masonry façade walls. First floor is constructed of reinforced concrete slabs spanning onto mild steel beams which are supported by a grid of mild steel columns. Level 2 consists of timber joists spanning to mild steel beams which are supported by steel columns. The roof is a timber framed truss supported by the façade walls and internal timber columns.

4.0 Site Geotechnical and Environmental Conditions

Discussion of the site geotechnical and environmental conditions and constraints as it relates to structural works proposed for the site has been provided as part of the original Development Application submission structural report (reference DA20/1400). The assessment of geotechnical constraints remains relevant to the amended design.

A geotechnical investigation report has been prepared by EI Australia for the site, dated July 2023 (report reference E25829.G03). Refer to geotechnical report for full details of the site geotechnical conditions.

5.0 Existing Structure and Condition

5.1 Summary of Condition of Structure

A review of the existing building was carried out to inspect the general condition of the building and identify items which require repair or replacement found during the inspection of the accessible structural elements, in order to inform requirements for design.

Building inspection, visual and photographic, was undertaken of accessible areas including steel and cast iron columns, slabs, masonry facades, and timber framing. Materials testing and timber inspection were carried out by BCRC as part of this investigation and have been used to inform this report.

Several elements of the structures within the Maltings site are in poor condition, given that the structure has been unmaintained for several decades. However, it is expected that many components should be able to be retained for use, if repair works are undertaken.

We anticipate that the following components may be retained, with repair works to remediate defects:

- Masonry walls in M1, M2
- Existing piers and footings
- M1/M2 concrete silos
- M2 concrete slabs
- M1 cast iron columns
- M2 steel columns
- M2 structural timber (some areas)
- Stores 1A/1B timber and steel (with strengthening)

We recommend that the following components are not retained:

- Existing roof cladding to M1 and M2
- Vaulted slabs in M1 and associated embedded beams
- Select deteriorated structural timbers in M2
- Cladding of Barley Stores 1A and 1B adjacent to M1 and M2, unless major repairs are undertaken

Localised repair or replacement of retained items found to require repairs is to be like-for-like or as minimally intrusive as possible, e.g. localised plate augmentation for locally corroded steel columns to be retained.

5.2 Malthouse 1 Machinery and Kiln Room

In its current condition, M1 is currently two stories high (however previously had a third floor) and consists of load bearing masonry façade walls with a suspended vaulted plain concrete slab at first floor supported by cast iron columns. Ground level currently does not have a floor slab, and footings below the cast iron columns are exposed (brick pier expected to be approx. 2.7m deep onto bedrock at each column location, with a sandstone block atop the pier supporting each column).

5.2.1 Concrete slab/arches

First floor slab is constructed of vaulted plain concrete segments spanning approximately1.7 Between steel beams. The beams are supported on cast iron columns arranged in a 3.4m x 3.4m grid. The slab is flat above, forming the floor of level 1 above.

A number of areas of poor condition were observed to the slab soffit (arches) in both the kiln room and machinery room, including significant water ingress, staining, efflorescence, and areas of cracking.

Within the kiln room, the undertaking of a localised breakout to a steel beam encased within the vaulted slab suggests that the kiln room concrete is in very poor condition – the vibration of a handheld drill at the breakout location caused noticeable shaking and cracking to occur at other locations within the slab several metres away. The vaulted concrete slab within the kiln room is significantly weak and presents a safety hazard. This should not be re-used.

We also do not advise that the slab to the machinery room area be re-used. While the unreinforced concrete areas of the machinery room are in marginally better condition than the kiln room, the metal beams between each arch are significantly corroded and cannot be retained.

5.2.2 Beams

Steel beams throughout Malthouse 1 (both machinery room and kiln house) span between columns, and are concrete encased other than the exposed lower flange. The exposed flanges are in very poor condition with full-depth corrosion noted in most areas. Localised break-out the concrete encasement of a beam, undertaken within the kiln room area, confirms that some thickness of the web remains, however the flange loss is significant.

Given the extremely poor condition of the beams found during the site investigations, re use of the beams and the Level 1 slab in its entirety would not be structurally feasible.

5.2.3 Cast iron columns and column footings

The columns within M1 are grey cast iron. These columns appear to exhibit a high degree of surface corrosion, however could be retained with surface treatment (removal of corrosion and recoating) as this corrosion does not penetrate deeply. Coatings appear in poor to very poor condition in many locations. It is noted that the existing coating is expected to be lead-based.

The internal columns are each supported by a masonry foundation, capped with a sandstone block of 450mm height. The piers measure 800mm x 800mm square. While the full masonry pier under each column could not be exposed, it is noted that the area below exterior ground level is currently exposed through much of the Malthouse 1 interior, therefore a significant depth of the pier is exposed for viewing; this appears to be generally in good condition, however it is noted that several sandstone capping blocks have sustained mechanical damage.

As the slab at Level 01 has been deemed unsuitable for retention, it is not considered necessary to retain these columns which had previously provided support to the slab, or the large block footings which in turn supported these columns. As the columns are redundant following slab removal, the architectural decision has been made to propose removal of these columns in order to reconfigure the space.

5.3 Malthouse 2 Machinery and Kiln Room

5.3.1 Steel columns

Steel columns in M2 (particularly on ground level) are in notably worse condition towards column bases, with significantly deep corrosion observed.

Paint coatings are typically in poor condition; where columns display adequate coating over the column length, this is typically failed at the base near the location of corrosion. Columns to the north-eastern end of the machinery room building display very poor coatings; there is currently no roof over this area, and missing floor/ceiling between Ground Floor and Level 1.

Localised breakout of the internal ground floor slab was carried out to expose the footings under the machinery room columns. These were found to be masonry piers continuing to 2.8m depth.

The steel columns in the M2 machinery room and kiln room may be retained, however, some columns in the kiln room and machinery room require localised strengthening to be undertaken to resolve localised corrosion issues at the bases of these columns.

5.3.2 Concrete slab

Malthouse 2 contains a concrete slab-on-ground at ground level, and a reinforced concrete lab between Ground Floor and Level 1. Above this, floors are timber construction.

The concrete slab-on-ground is in generally acceptable condition with no significant defects.

The first floor slab is also in generally acceptable condition, however, narrow cracking exists between columns, and at the midpoint of slab spans, in several areas of the slab soffit; a number of small spalls exist at the ends of these cracks (terminating at dropped beams) or along the cracks. Cracking directly between columns is likely due to movement or corrosion of steel embedded in the slab in this area, noting that surface-level corrosion was found to be present on extracted reinforcement samples.

On the top side of this slab, cracking is not significant, however, a significantly large area of scour exists where the concrete is exposed to inclement weather at the north-eastern end (no floor above or roof in this area), out of which vegetation is growing. The slab is generally more weathered in this location, likely due to the additional exposure.

Recent testing as part of the structural investigation works found that the characteristic concrete compressive strength is 31 MPa on average in M2.

5.3.3 Beams

The steel beams supporting the Level 1 slab are concrete-encased except for the bottom flange. The beams span along the short axis of the building from column to column, with the concrete slab atop spanning between beams and supported by the masonry perimeter walls. The steel beams were found to have been manufactured from a low-carbon structural steel consistent with Grade 250 (per AS3678:2011).

The lower flanges of the beams appear corroded, however this has been found to be primarily surface level. Surface level corrosion was also observed on steel beam webs where the concrete encasement was broken out for assessment.

Spalling has been observed at the lower edges of the beams, including at the termination of cracks running perpendicular to the beams. This is likely to have been caused by the observed corrosion of the steel (steel corrosion causing expansion and therefore spall). Small spalls have also been observed on the soffit along cracks.

Isolated areas of slab damage were also noticed on the ground level slab-on-ground, however this may be due to mechanical/chemical damage or abrasion due to past use.

5.3.4 Timber framing

The timber structural elements (floor framing on Level 2 and above, floor boards on these levels, and roof framing) are Oregon Pine (Douglas Fir). While several elements are able to be re-used, a number of timbers (particularly in areas of significant exposure to weather) are in very poor condition and will require replacement or strengthening.

Several floor joists in the Level 2 and 3 framing are out of grade and must be replaced, however most can be retained. Floorboards in general are in poor condition and should not be re-used.

Several timber posts on the upper levels are considered out-of-grade and must be replaced – most of these out-of-grade elements show previous attempts at strengthening (metal straps) due to severe splitting. These should not be replaced. The number and distribution of severely split posts indicates that the posts may be inadequate for the load they are under (or have historically been under, when the building was in use) rather than solely material decay.

5.4 Silos

The silos themselves are in generally good condition – where viewing access was cut into the side of a silo, the concrete appeared clean, uncracked and not spalled.

The exposed wall at the front of the silo is carbonated, and reinforcement corrosion appears to have initiated (visible where samples were taken and reinforcement cut). This area may require remedial works in future should this progress and spalling occur, however, it does not appear at this time that the structure is compromised.

Other walls of the silo, which are much less exposed, are in much better condition and are not expected to require remedial works.

The masonry building housing the silos appears in acceptable condition, however, the degree of vegetation observed indicates likely mortar loss at these areas which requires local repointing.

Additionally, it is noted that the masonry walls are very tall and unreinforced; where piers are present these are not continuous to the top of the wall. As the masonry and mortar are likely to have very low flexural strength, this (along with other similarly high unreinforced masonry walls within the site) is not compliant with current standards such as AS 3700 (2018) *Masonry Structures.*

5.5 Masonry Facade

The masonry walls are in generally good condition, with no signs of cracking or movement. However, a few areas of mortar fretting were observed, mainly to the north-eastern end façade. These areas of fretting were not severe, and are likely to require localised repointing.

Masonry piers of 695mm x 695mm (M1) and 590mm x 590mm (M2) are located around the building perimeter at a spacing of 3.4m, continuing to approximately 2.8m depth below ground level. These piers appear to be in generally good condition in the areas that were partially excavated.

Masonry in M1 and M2 was found to have a mean compressive strength of 12.7 MPa for single bricks, and a mean characteristic strength of 8.6 MPa.

It is noted that additional strengthening may be required in tall areas (e.g. kiln room) if the wall is expected to span a significant height without intermittent floors.

The brick façade is in generally good condition, except for mechanical damage and loss of bricks at the top of the façade where the roof has been removed. Limited cracking is present, however, these are not wide and do not indicate greater structural issues e.g. subsidence. This cracking is therefore not likely to be a structural concern, but may require repair.

5.6 Perimeter Footings

The masonry piers around the building perimeter terminate at bedrock, 2.8m below ground level.

It is presently assumed that these may be re-used, however further structural analysis of tall masonry walls cantilevering vertically (particularly at the M1 machinery room, where most walls are unrestrained by intermediate slabs or roof) may require strengthening of footings at piers below ground level.

5.7 Barley Stores 1A and 1B

The stores are timber construction with timber roof framing, wall framing and internal columns, and Store 1A incorporates a further three steel columns. The roof and walls are clad with sheet metal.

The timbers in both stores are in overall acceptable condition, although it is noted that a small number of wall battens in Store 1B are buckled/broken towards the south corner of the building. The steel columns (in 1A only) are also in acceptable condition; although surface corrosion has been noted, this does not appear to have caused section loss.

Damaged timber elements and corroded steel is to be repaired as part of works.

While the sheet metal cladding is not considered to be a structural element, this is noted to be in poor condition in both buildings, with several holes observed; this is more severe in Store 1A. This cladding is required to be repaired or replaced.

5.8 Maltster’s House

The Head Maltster’s cottage was constructed in 1907 of brick masonry and timber, with evidence of lathe and plaster ceilings and metal sheet roofing. The cottage was subsequently damaged by fire and is currently in a ruinous state.

Some areas of brick wall are intact, though most have at least partially collapsed. The remaining timber roofing elements are badly burned and generally collapsed. There is no roof over most of the structure.

The condition of the structure is overall very poor and unstable. Should any of the existing Malsters House fabric be retained, extensive strengthening works e.g. steel support framing would be required in order to make the area safe and accessible.

6.0 Analysis of Existing Structure

6.1 BCA Provisions

BCA information has been provided by a BCA consultant engaged for this project (Group DLA; refer separate BCA report for further information). Note that this BCA assessment is preliminary only and will be concluded following further development of the design.

The building classification to be considered for structural assessment of M1/M2 is summarised in the following table:

Proposed Classification	Ground Floor: Class 8 (Substation) *TBC* Class 9b (Gallery - Assembly Building) Class 10a (Amenities) Level 1: Class 5 (Office) Class 9b (Gallery - Assembly Building) Level 2: Class 9b (Gallery - Assembly Building) Level 3: Class 9b (Assembly Building)
Proposed Rise in Storeys	4
Proposed Type of Construction (BCA Table C2D2)	A
Effective Height	TBC by BCA consultant (approx. 9m)
Importance Level (BCA Table B1D3a)	3 (buildings designed to contain a large number of people)
Annual probability of exceedance (BCA Table B1D3b)	1:1000

The building classification to be considered for the Maltster's House is summarised in the following table:

Proposed Classification	Ground Floor (ruin): N/A, no building structure retained above footing level Ground Floor (new gallery structures): Class 9b (Assembly Building) Class 4 (Artists Residence – Dwelling)
Proposed Rise in Storeys	2
Proposed Type of Construction (BCA Table C2D2)	B
Effective Height	TBC by BCA consultant (approx. 5m)
Importance Level (BCA Table B1D3a)	2
Annual probability of exceedance (BCA Table B1D3b)	1:500

6.2 Masonry seismic performance

A lateral load review of the masonry structure is required to be carried out. This will make reference to the following Australian Standards and International Technical publications:

Number	Edition	Title
AS/NZS 1170.0	2002	Structural design actions Part 0: General Principles
AS 1170.4	2007	Structural design actions Part 4: Earthquake loads
AS 3700	2011	Masonry Structures
AS 3826	1998	Strengthening Existing Buildings for Earthquake

ASCE/SEI 41-17	2017	Seismic Evaluation and Retrofit of Existing Buildings – American Society of Civil Engineers
FEMA 440	2005	Improvement of nonlinear static seismic analysis procedures – Applied Technology Council
FEMA 356	2000	Pre-standard and Commentary for the Seismic Rehabilitation of Buildings – Federal Emergency Management Agency
FEMA 273	1997	NEHRP Guidelines for the Seismic Rehabilitation of Buildings – Federal Emergency Management Agency
NZSEE	2017	Part A: Assessment objectives and Principles
NZSEE – C8	2017	Section C8 – Seismic Assessment of Unreinforced Masonry Buildings – New Zealand Society for Earthquake Engineering

Unreinforced masonry, by nature, has low tensile capacity and therefore low bending capacity; this results in limited resistance to lateral loads including seismic loads. Where existing building components cannot feasibly be strengthened to enable certification to AS1170.4 and the NCC for seismic resistance, a performance solution will be sought (refer Section 7.2.2) to meet a reduced threshold for seismic resistance.

New structures and elements will be designed to meet 100% NBS for seismic loading, and certified to AS1170.4 and the NCC.

6.3 Wind Stability

Wind stability of the existing structure is to be assessed against the following standard:

Number	Edition	Title
AS/NZS 1170.2	2002	Structural design actions Part 2: Wind Actions

Tall masonry walls, particularly when cantilevering from the base as in this case, offer negligible lateral load resistance. Tall masonry walls and parapets which cantilever a large distance are particularly vulnerable and require strengthening in order to resist wind loads per AS1170.2.

Wind loading will be based on the following parameters, in accordance with AS1170.2:

Parameter	Value
Region:	A3
Importance Level (BCA Table B1.2a):	3
Annual probability of exceedance (BCA Table B1.2b):	1:1000 (ultimate) 1:25 (serviceability)
Regional Wind Speed:	V1000 = 46 m/s (ultimate) V25 = 37 m/s (serviceability)
Terrain Category (all directions):	2

6.4 Proposed strengthening

It is envisaged that strengthening of the existing structure will be required to provide resistance to lateral loads at the following locations:

- M1 freestanding masonry walls and gable, where there is no roof remaining and is not proposed to be reinstated, and the internal slab is proposed to be removed and not reinstated. This is required particularly at the tall gable end of the M1 machinery room adjacent to the southern sheds, and tall remnants of wall at the southern end of the M1 machinery room along the long sides, but may be

required along the two-storey-height long sides generally as these are no longer supported at mid-height. This will take the form of steel framing (refer Section 7.4).

- M2 gable wall is likely to also require strengthening in a similar manner, potentially via steel framing.
- Footings may be required to be locally strengthened in order to resist high overturning loads on tall cantilevering masonry walls.
- Southern Sheds timber framing (walls and roof) requires additional bracing as the current framing has little lateral load resistance and is unstable under wind loads.

Other locations may also require strengthening following future structural reviews.

7.0 New Structure and Design Principles

7.1 Proposed Development

Key structural elements of the proposed design are as follows:

- New roofing including adjusted roof structural framing
- New outdoor amphitheatre within the M1 machinery room, requiring masonry strengthening
- New suspended Level 2 floors within the central zone of the M1/M2 complex, the two kiln rooms and old silo
- New lift core within M2 machinery room area, adjacent to the kiln room
- New ancillary spaces at Ground Level including plant, storage and office spaces
- New Northern Shed construction, to the northeast of the M2 machinery room
- Modifications to the Southern Sheds (existing Sheds 1a and 1b) including strengthening/bracing of the existing structure, new ticketing and café partitions, and standalone services/amenities blocks to the rear.
- New roof canopy, gallery and artist-in-residence structures at the current Malsters House site, and in-ground interpretation of the existing Malsters House ruin footprint.

7.2 Design Criteria

7.2.1 Australian Standards

The new building elements will be designed to comply with the following Australian Standards, as referenced by the National Construction Code (NCC) 2022:

Number	Edition	Title
AS/NZS 1170.0	2002	Structural design actions Part 0: General Principles
AS/NZS 1170.1	2002	Structural design actions Part 1: Permanent, imposed and other actions
AS/NZS 1170.2	2002	Structural design actions Part 2: Wind Actions
AS 1720.1	2010	Timber Structures – Design Methods
AS 2312	2002	Guide to the Protection of Structural Steel Against Atmospheric Corrosion
AS 3600	2018	Concrete Structures
AS 3700	2018	Masonry Structures
AS 4100	2020	Steel Structures

7.2.2 Performance Solutions

Seismic resistance of existing building elements

Existing building components are to be assessed per AS3826 (refer Section 6.2) to ensure seismic stability of vulnerable elements such as parapets and unreinforced tall walls. While this is not a current standard referenced within the NCC, it will be used as a reference document for assessment of seismic capacity and upgrades. The existing structure is to be bought to a minimum of 33% NBS seismic resistance.[1]

Note that new building elements and structures are to be designed to meet 100% NBS and certified to current standards and NCC.

CLT, LVL and Glulam

To construct the proposed pavilion at the existing Maltsters House, the use of engineered timbers is proposed, in the form of laminated veneer lumber (LVL), glued laminated timber (Glulam) and/or cross-laminated timber (CLT).

- LVL system is constructed using thin, parallel laminated timber. Strips of around 3mm are laminated together to form a strong stable section. Standard sections come in thicknesses up to 75mm with larger thickness possible through block glueing. The use of massive glulam elements has been utilised in both Europe & New Zealand instead of CLT and Glulam.
- Glulam timber utilises parallel laminated layers of timber built-up to create members. Standard members come in thicknesses of up to 280mm, with larger elements being able to be created through the process of block glueing. Glulam is a flexible material being able to be constructed into curves and other freeform shapes.
- Cross-laminated timber is an engineered wood product used predominantly in wall, floor and ceiling applications. Panels are created layering timber ‘lamellas’ between 3 and 7 layers thick.

The design of engineered timber structures falls outside the DTS provisions of the NCC structural design. A performance solution is to be undertaken to identify to the certifier that the design meets the performance requirements that are set out within the NCC.

Manufacturers in Australia can produce the engineered timber beams and panels required for a project of this scale. As an alternative to Australian sourced mass timber elements, glulam beams and CLT panels can be sourced from Europe. If materials are being sourced from European suppliers, then the Eurocodes are to be designed to and used as part of the certification process.

The structure will be designed to follow international best practice in both European and American Standards. The accompanying commentaries of the NCC reference both standards as relevant approaches to follow. Certification can be undertaken to the NCC by a performance solution process using relevant European and American standards.

7.2.3 Loading

On the basis of the above standards, building elements will be designed for the following design **live loads**:

Load type	Area	Live Load
Floor load	Gallery areas	2.0 kPa
	Function spaces	4.0 kPa
	Restaurant/bar areas	4.0 kPa

[1] As required for Earthquake Prone Buildings (EPBs) under Building Act 2004, New Zealand; all buildings of less than 33% NBS seismic resistance are considered Very High Risk.

	Kitchens	5.0 kPa
	Office areas	3.0 kPa
	Terraces	4.0 kPa
	Egress/hallways/landings	4.0 kPa
	Storage	5.0 kPa (minimum)
	Plant areas	5.0 kPa (minimum)
Roof load	Lightweight roofs	0.25 kPa NOTE: Superimposed dead load to allow for solar panel array
	Concrete roof (not trafficable)	1.0 kPa

Building elements will be designed for **superimposed dead loads** on the basis of architectural finishes selected for each area, and are to be not less than the following:

Area	**SDL**
Office areas	1.0 kPa (Including carpet, ceilings, services under. No raised access floors considered)
Gallery areas	1.0 kPa (Including floor finishes, ceilings, services under. No raised access floors considered)
Communal Area potential area subject to overcrowding	3.0 kPa (Including floor finishes, ceilings and services under. No raised access floors considered)
Store & Plant Areas	2.5 kPa (Plant plinths, falls. No raised access floors considered)
Concrete roof areas	3.5 kPa (Includes 50mm ave falls +60mm pebbles+ services under)
Concrete roof areas with soil planting	12 kPa (600mm of soil & slab falls)

7.3 Roofing

Repair works are to be undertaken to the existing timber roof structural framing where the timbers are in acceptable condition to be kept, and members replaced with new timbers (or strengthened) where poor condition requires replacement (in particular, in areas where cladding loss has been significant and members left exposed to the elements for a long period).

New glazed skylights will be added to the M2 kiln room as part of the cladding replacement works, and roof framing modified to accommodate the skylights.

A new flat roof is to be constructed over the M1 kiln room. This is to be a concrete slab roof, or alternatively a sheet metal may be used with minimal slope required for drainage.

Photovoltaic (PV) cells are proposed to be installed to the M2 machinery room roof, where existing roof framing is to be repaired and retained with new cladding. Additionally, central rows of columns are proposed to be removed through the length of the upper level of the M2 machinery room in order to provide a more open space. Preliminary structural analysis of the roof framing structure indicates that the existing roof framing including trusses will require modification and strengthening to facilitate removal of the central columns and the addition of PV cells; the extent of strengthening works will be dependent on design ceiling weight.

At present, no roof exists over the M1 machinery room structure. This is proposed to be retained as an unroofed, open air space – no re-roofing works are proposed to be undertaken in this area.

For discussion of the Northern and Southern Sheds including roofing, refer Sections 7.8 and 7.9 respectively).

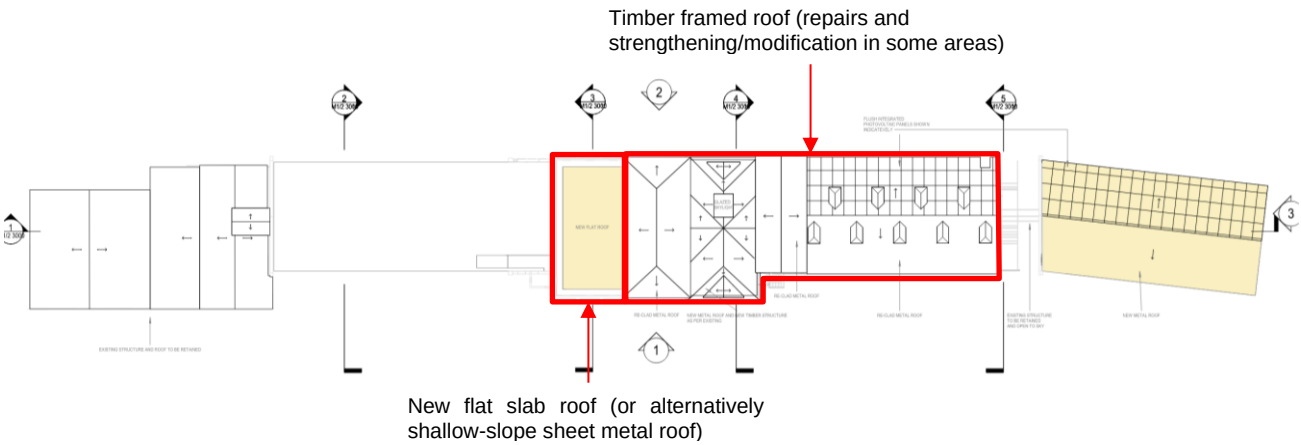

Figure 3: Roof works (excluding Northern and Southern Sheds

7.4 Outdoor Amphitheatre

An outdoor amphitheatre is proposed to be developed at Ground Level within the M1 machinery room space. The slab at Level 1, which is in very poor condition, is proposed to be removed and will not be reinstated. The space is currently unroofed, and it is not proposed to construct a new roof structure.

The masonry walls surrounding the M1 machinery room are over 5 metres height at their lowest point (along long sides). These long walls stretch for approximately 40 metres in length with no crosswalls, with vertical support provided at ends only. At the southern end, a triangular gable is approximately 12 metres in height, with the upper 7m unsupported. At the northern end, stretches of wall approximately 3.5 to 4 metres wide and approximately 10 metres tall are present perpendicular to the adjacent kiln room wall the upper 4 metres of wall is supported at one side edge and base only.

The freestanding walls/gable at the northern and southern ends of the machinery room area will require strengthening in order to achieve reasonable seismic resistance (33% NBS, refer Section 1.1) and resist wind loads, given the height of these walls and as no roof is present to provide restraint. The required strengthening is increased by the removal of the intermediate floor slab at Level 1. This will be undertaken internally to the machinery room space, and will take the form of lightweight steel framing fixed back the masonry. These will be required to sit out from the wall in order to brace the wall back.

It is anticipated that the majority of strengthening will be required at the gable (southern) end of the machinery room; strengthening in this area may be partially concealed at the base by the proposed planting zone planned for this portion of the existing machinery room. Strengthening at the northern end will be carried out around and behind the proposed screens to be installed along this wall as much as is possible.

Further structural assessment is required to determine the mode of strengthening required to the 5 metre walls along the length of the machinery room, however this is expected to be required to provide adequate lateral load resistance for at least 33% NBS seismic loads and wind loads in accordance with AS1170.2. This may take the form of steel framing fixed to the inside face of the masonry wall within the machinery room space, and/or strengthening of the existing piers by the addition of internal reinforcement by coring through the top of the pier in carefully selected locations.

Localised footing strengthening works may be required to support the proposed design scheme within this space, as the machinery room perimeter walls will be effectively cantilevering from the wall base under the proposed scheme, unrestrained by a roof or intermediate floors. Should strengthening be required, this is likely to consist of increasing the size and/or depth of the existing footings. Any strengthening works to be conducted will be carried out below ground and will not be visible once works are complete.

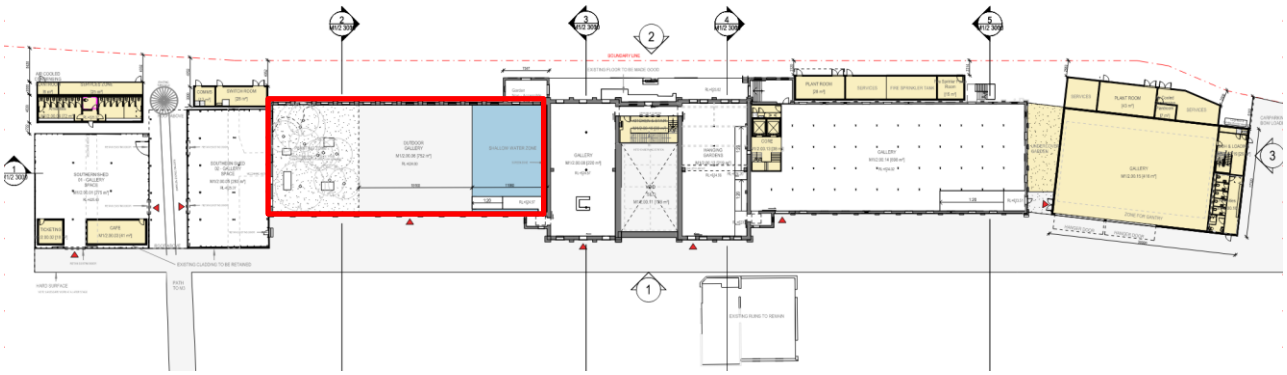

Figure 4: M1 outdoor amphitheatre

7.5 New Floors in Kiln Rooms & Silo

New floors are to be introduced at Level 2 within the central zone of M1/M2 – the two kiln rooms and silo between. The new floors will be reinforced concrete slab floors. These floors will form new gallery spaces within the two kiln rooms, and a bar at Level 2 height within the existing void in front of the concrete silos.

The new floor within the M1 kiln room will span the full space, and be supported by both the existing masonry walls and a series of columns below. The new floor within the M2 kiln room covers half the floor area of the kiln room, and will be supported by the existing masonry walls. The remainder of the kiln room space is to be a void from roof level to ground floor.

A new ramp will be located within the silo at second-floor level connecting the two exhibition spaces. The ramp is to be constructed of conventionally reinforced concrete or steel framing and a permanent formwork system with in-situ concrete.

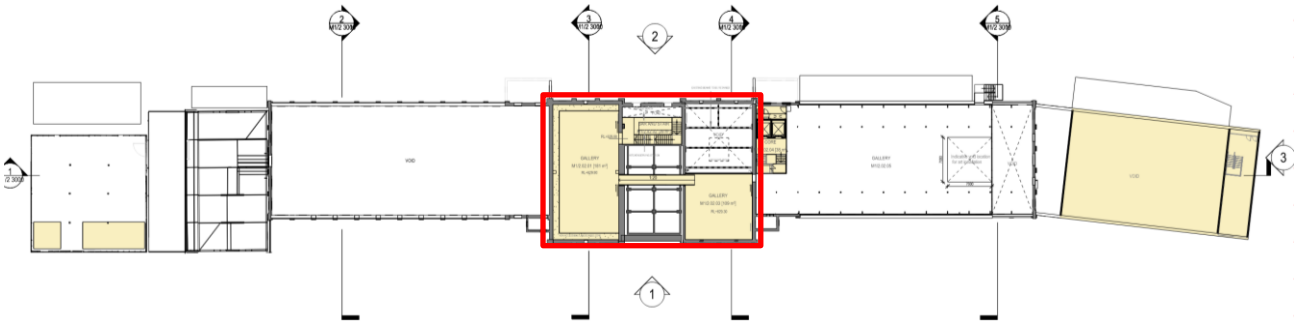

Figure 5: Kiln rooms and silo, new Level 02 slab floors and new ramp

7.6 Lift Core

A new access core consisting of two lifts and a stairwell is to be constructed within the M2 machinery room space adjacent to the kiln room. The lift core is to be constructed of reinforced concrete, and will contribute to the overall lateral stability of the building.

The lift pit base is to be constructed on a new concrete raft foundation. As existing footings (masonry piers) are founded onto rock approximately 2.8m below ground, the new lift is not proposed to undermine existing footings or require works to modify existing footings.

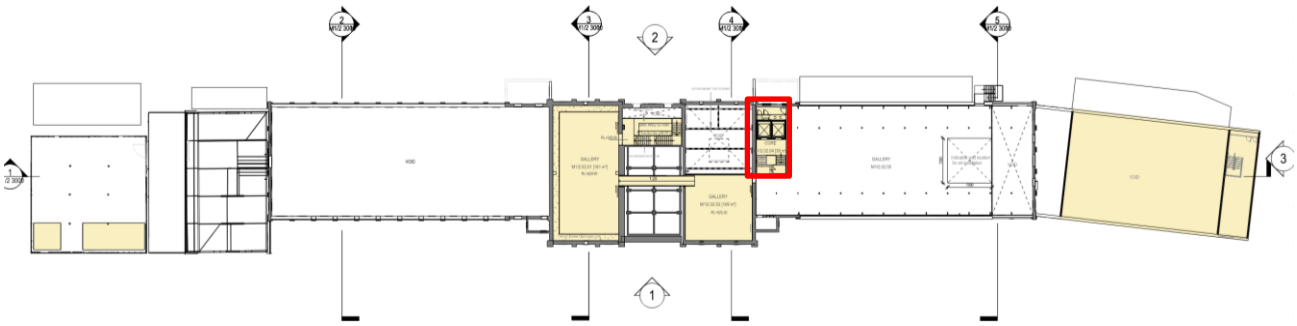

Figure 6: New access core (stairwell and lift core)

7.7 Ground Level Ancillary Spaces

New standalone structures for plant, storage and office spaces are proposed to be constructed to the rear of the M1 kiln room at ground level, and to the rear of the existing Southern Sheds (including amenities block). These structures are single storey only.

It is anticipated that these structures will be constructed of concrete slab-on-ground, and either lightweight framed walls and roofs or blockwork walls (with façade cladding) depending on FRL requirements.

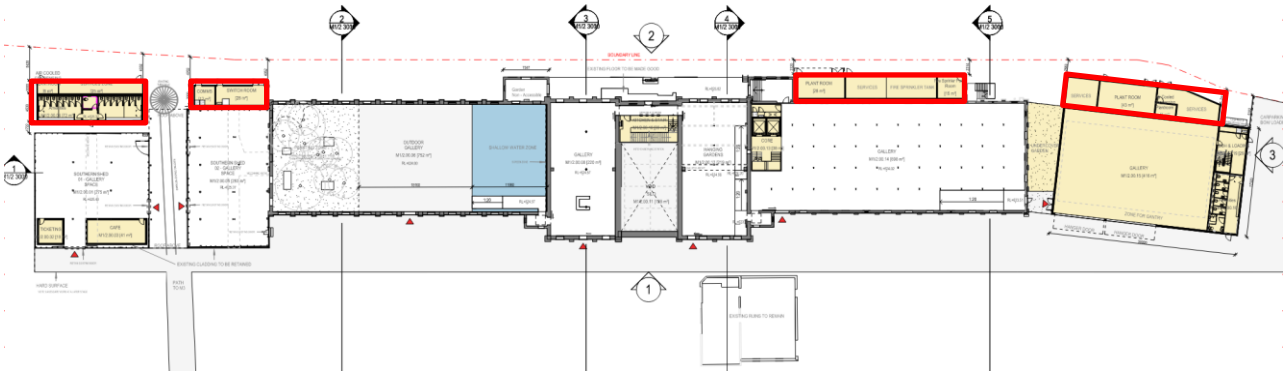

Figure 7: Ground floor ancillary spaces

7.8 Northern Shed

The Northern Shed is a wholly new structure located to the north-eastern side of the M2 machinery room, connected by a garden area with a canopy over. The building will primarily house a gallery space, with ancillary rooms for plant, services, loading and amenities located to the building's northern and eastern sides.

The Northern shed is proposed to be a structural steel framed building. Wall and roof bracing are to be located within appropriate bays. A structural gantry frame on a steel upper rail is to be located within the Shed along the south eastern wall for lifting of heavy items (load capacity to be advised by designer/end user).

The steel framed roof will extend over the connecting garden area between the Northern Shed and the side of M2, acting as a canopy over the space. The roof framing will be designed to support PV cells over the northern roof slope.

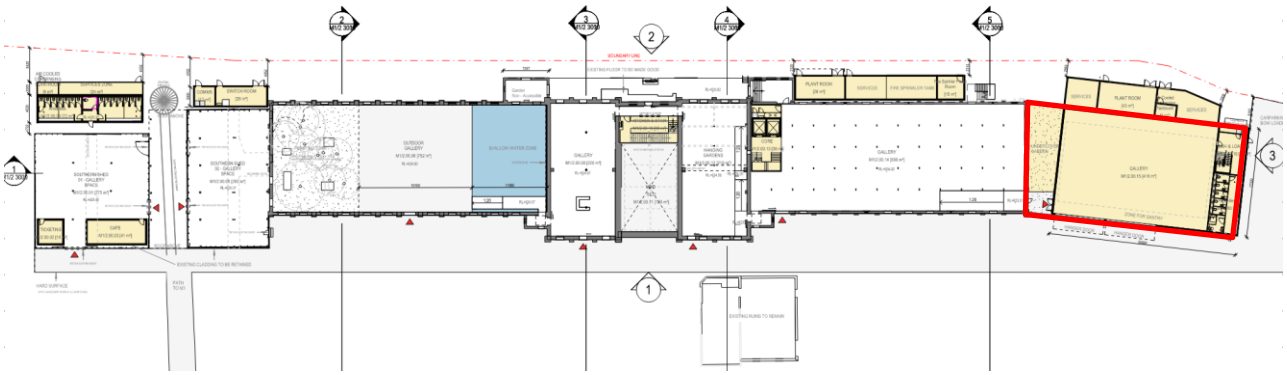

Figure 8: Northern Shed

7.9 Southern Sheds

The Southern Sheds (existing Barley Stores 1a and 1b) are existing structures composed largely of timber wall and roof framing, with some structural steel column elements internally. The majority of this structure is proposed to be retained, aside from localised repair/replacement members.

At present, neither shed structure involves a lateral load resisting system appropriate for design wind loads, and is hence unstable under such lateral loads. New bracing will be incorporated into the existing wall and roof structure in order to provide adequate lateral load resistance.

The existing sheet metal cladding is to be repaired or replaced per architect's requirements.

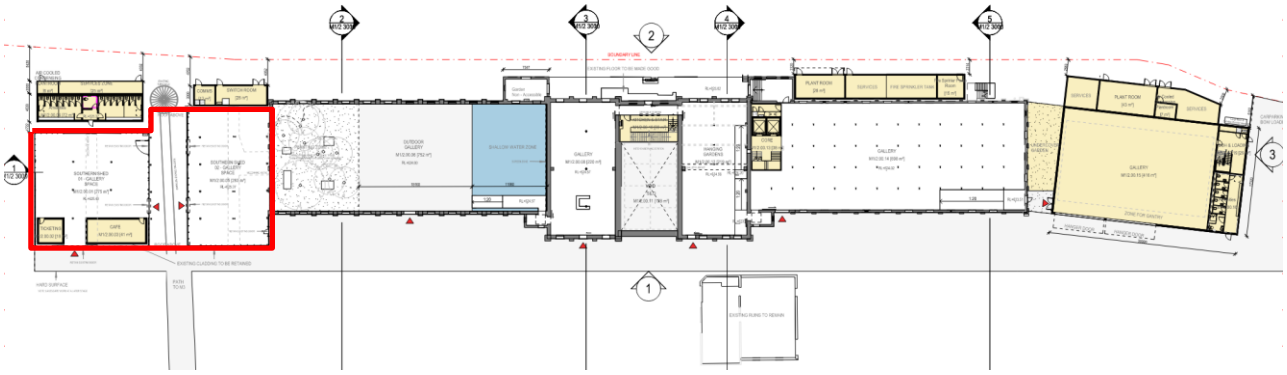

Figure 9: Southern Sheds

7.10 Maltsters House

The existing Maltsters cottage, given its current very poor condition and low level of intactness, is proposed to be demolished down to footing level. The outline of the house walls will be indicated by in ground treatment per architect's requirements. As no load-bearing portion of the existing Malsters cottage is proposed to be retained, no strengthening of the existing structure is required.

Two new structures are proposed to be constructed adjacent to the cottage ruins, acting as a gallery space (122 m^2) and a gallery/artist-in-residence space (63 m^2). Each of these two structures extends to a courtyard (19 m^2 each courtyard). The two new structures will be steel framed, with masonry cladding.

A pavilion style roof will extend over the new gallery and workshop buildings, and over parts of the ruins. The courtyard spaces attached to each new structure are proposed to be unroofed, and a roof void is located over much of the footprint of the existing Malsters house. The roof is proposed to be constructed in mass timber with Glulam beams supporting CLT panels and supported on timber columns with concrete pedestals.

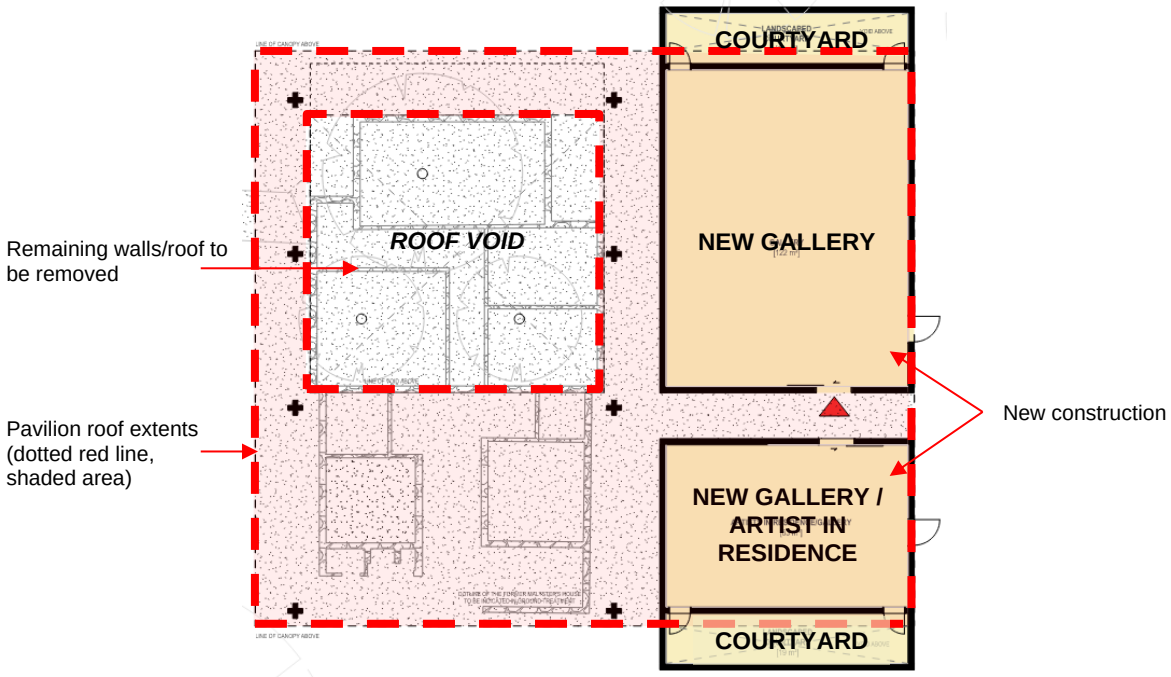

Figure 10: Maltsters cottage

8.0 Changes to Retained or Removed Elements From Prior Development Application Submission

8.1 Additional elements to be retained

Following submission of the original Development Application, efforts have been made to rework architectural solutions and develop structural strengthening design that will allow retention of the following components previously indicated for removal:

Element to be retained	Change from previous design solution
M2 machinery room Level 01 slab to be retained	Previous design anticipated that this slab was likely to be in poor condition, however, structural and materials investigations have determined that the Level 01 slab within the machinery room is in acceptable condition to be re-used (note some localised concrete repairs are required).
M2 machinery room Level 01 steel columns to be retained (proposed to be removed in previous DA submission architectural drawings)	Previous design proposed to remove these existing columns as removal of the Level 1 slab was expected to be required. Structural and materials investigations have determined that these are in suitable condition to be retained with minor localised repairs.
M2 machinery room roof structural timbers	Previous design assumed a high likelihood that the roof timbers would be in too dilapidated a state to be suitable for re-use, and indicated demolition of all roof structure. Structural and materials investigations have since found that some areas of roof structure is suitable to be retained and re-used (primarily areas which still have remaining roof cladding over; areas without roofing over are

	expected to need to be replaced on an as-necessary basis). Note that the roof structure will need to be modified/augmented to support a changed column arrangement and PV cell loading (refer Section 7.3).

8.2 Additional elements proposed to be removed

Following submission of the original Development Application, further investigation has indicated that the following components of the original structure are unable to be retained:

Element to be removed	Reason for removal
M1 machinery room and kiln house Level 01 vaulted concrete slabs to be removed (proposed for partial removal in previous DA submission architectural drawings)	Further material testing and structural investigation has concluded that these vaulted slabs, present at Level 01 of the M1 machinery room and kiln room, is unstable and presents a significant hazard to retain. Severe destabilisation was evident with reasonably small tests being conducted (hand drill only), hence it is considered unfeasible to conduct any construction works to or using these slabs as it presents a risk to both workers and final users. Note that the machinery room vaulted slab will not be replaced with a new slab. Instead an open air outdoor gallery will be provided at Ground Floor level, reminiscent of the existing experience on the current (inadequate) Level 01 slab where no roof is present overhead.
M1 Level 01 cast iron columns to be removed (proposed for partial removal in previous DA submission architectural drawings)	These columns will be removed as they are supporting a slab which is unsuitable to retain (see above).
Malsters House remaining walls and roof	Due to structural instability and the significant strengthening works which would be required to make the existing structure safe, the decision has been made to propose removal of the existing Malsters house and identify the existing wall locations indicatively via ground treatment as a method of interpretation.

9.0 Conclusions

The structural design for repair, strengthening and upgrade (where required) and of the existing structure and construction of new elements, per the architectural design prepared by Snøhetta, are to be designed in accordance with the National Construction Code and referenced Australian Standards. Where existing building elements are not able to be strengthened to enable certification to current Australian Standards or the NCC e.g. seismic loading for existing unreinforced masonry, performance solutions will be sought.

Appendix A

BCRC Timber Inspection Report

BCRC Durability Consultants

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REPORT TITLE:	**Grading report of timber members at Abandoned Maltings Brewery**		
CLIENT:			
REPORT AUTHOR:	M. Rutkai	**REVIEWED BY:**	Edgar (Ted) Stubbersfield
REPORT DATE:	06 April 2023	**FILE REF:**	N10479

EXECUTIVE SUMMARY

On 6-7 March 2023, Edgar (Ted) Stubbersfield and Mihaly Rutkai inspected the existing timber members of M1 and M2 of the Abandoned Maltings Brewery Mittagong. We observed a variety of construction techniques which involved the use of Douglas Fir (Oregon pine), Redwood (California Red Fir) and mixed NSW Hardwood. The timber members varied in their conditions throughout the structure. A mixture of defects was observed including termite damage, splits, rot, and fire damage. Where the timbers were not exposed to the elements, they were generally in a good condition, with the Oregon members graded as F11 and the mixed NSW Hardwood as F22 which represents a framing grade with 60% of its strength remaining as opposed to select quality.

The individual spots will detail the observations and defects related to the timber members which can be found in Appendix A.

KEY WORDS: Oregon pine, Douglas fir, F11, NSW Hardwood, F22

REVISION SHEET

Revision Number	Description of Revision	Prepared By	Checked/ Reviewed By	Approved	Issued to Client
1		M Rutkai			

Disclaimer:

This report and the results shown, and the recommendations made herein are based upon the information, drawings, samples and tests referred to. BCRC, its consultants and agents accepts no liability for any damages, charges, costs or expenses in respect of or in relation to injury to or death of any person or damage to any property or of other loss whatsoever arising either directly or indirectly from the use of this report, the carrying out of any recommendations contained herein or the use of any goods or materials referred to.

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1. SCOPE OF THIS REPORT

Figure 1. Maltings Brewery Malthouse 1 and 2 at Mittagong

The Mittagong Maltings was a large three-malthouse complex first established in 1899 by the Malting Company of New South Wales, Australia, to supply malt to breweries throughout the state.[2][3] The Maltings site is listed as a local council heritage item.

The building is being redeveloped and, as construction was long before the concept of F grades was developed, BCRC was engaged to advise what the species and grades of the various timber members.

2. THE METHODOLOGY BEHIND DETERMINING THE STRESS GRADE

Mr. Stubbersfield, BCRC's Lead Timber Consultant, is basing his comments on a site visit carried out by himself and Mihaly Rutkai, 6-7 March 2023. Mr Stubbersfield is uniquely qualified to comment on the stress grade of the timber joists as he has over forty years experience with grading. He has also completed an all species grading course conducted by Toowoomba TAFE (Cert. No. SAJ00435). Further, he has also researched and written a book on grading hardwood to AS 2082. Similar principals apply when grading softwood to AS 2858.

Construction at The Maltings was done in stages and the construction methods and timber sizes vary on the different floors and buildings, however, in Mr. Stubbersfield's opinion, one predominant species of timber was used, Douglas fir. This timber is also known as Oregon pine or simply and more commonly known in the building trade as Oregon. The grain of Oregon is distinctive and easily distinguishable from other softwoods. .

There are a limited number of Australian Standards, such as *AS 1684 Residential Timber Framed Construction*, and *AS 1720 Timber Structures Design methods*, which are mentioned as primary references in Section A1.3 of Volume 1 of the National Construction Code as part of the Building Code of Australia. Standards like *2082-2007 Timber - Hardwood - Visually stress-graded for structural purposes* and *2858-2008 Timber - Softwood - Visually stress-graded for structural purposes* are secondary references that get applied through being referenced in the primary Standard. This gives a legal basis for accepting grading to Australian Standards.

Because of the age of the building, the timber is seasoned. Each kiln dried or seasoned timber species marketed in Australia falls into one of eight strength groups. The visual grading standards recognise four Structural Grades for hardwood and five for pine. These Structural Grades describe the amount of natural feature permitted in a piece for a given Structural Grade, i.e., what the timber looks like, not its structural properties. Each Structural Grade represents a percentage of the strength of wood free of any defect. The lesser the amount of natural feature the higher the percentage. Refer Table 1.

Structural Grade:	% of clear wood strength
No. 1	75%
No. 2	60%
No. 3	48%
No. 4	38%

Table 1. Structural grades as a percentage of solid hardwood.

TABLE A1

SEASONED SOFTWOOD

Standard trade name	Source	Average density at 12% MC	Minimum density at 12% MC	Method of assigning F grade	Strength group	Stress grade (F grade) Structural grade number 1	2	3	4	5
cedar, western red	Can	380	300	A	SD8	F8	F7	F5	F4	—
	USA	360	300	A	SD8	F8	F7	F5	F4	—
cypress	Aust	—	—	C	SD6	See Section 3				
fir, alpine	Can	390	300	A	SD7	F8	F8	F7	F5	F4
fir, amabilis	Can	440	330	A	SD6	F11	F11	F8	F7	F5
	USA	460	345	A	SD6	F11	F11	F8	F7	F5
fir, balsam	Can	410	310	A	SD7	F8	F8	F7	F5	F4
	USA	380	300	A	SD7	F11	F8	F7	F5	F4
fir, Calif. red	USA	430	325	A	SD6	F11	F11	F8	F7	F5
fir, Douglas	N Amer	540	405	B	SD5	F11	F11	F8	F7	F5
	Elsewhere	400	300	B	SD6	F11	F11	F8	F7	F5

Figure 2. Correlation between Structural Grade and F Grade with Douglas Fir

After a Structural Grade has been determined, and when the species or Strength Group is known, tables in the Standards equate this to an F rating. Figure 2 from AS 2858-2008 shows that the highest grade that can be given to Douglas fir is F11 which applies to both Structural Grade 1 and 2. Grading was done to the rules for Structural Grade 2. In a production setting this is predominately governed by assessing the knot size and position. Briefly, If knots are contained in the inner half of the face, singly or combined, they can cover 40% of the face but if in the outer 50% of the face the knots can only cover 25%. Knots are measured as the average of the measurement on each face (AS 2858-2008 2.2.2 (a)). Structural Grade 2 describes a reasonable framing grade, not select timber however, old timber usually has very few knots.

When assessing installed timber, care is taken to determine if there has been subsequent end decay, notching for services and, decay associated with water leaks from say a bathroom. Deterioration is invariably associated with a change of colour, such as a water stain or a change in texture.

When timber is protected from the weather, subsequent water ingress and, termites it has an indefinite lifespan as the historic buildings of the UK and Europe demonstrate. However, longevity in weather exposed applications is completely dependent on the natural durability of the timber which varies considerably between species. Under *AS5604-2005 Timber—Natural Durability Ratings*, Douglas fir is rated as Durability Class 4 for both in ground and above ground used. This is the lowest durability on a scale of 1 to 4. This standard is also a secondary reference under the NCC.

TABLE A1 (*continued*)

1	2	3	4		5
Standard common name and scientific/botanical name	Lyctid susceptibility of sapwood	Termite resistance of heartwood (inside above ground—applicable to H2 in AS 1604 series)	Natural durability class of heartwood		Marine-borer resistance of heartwood
			In-ground contact, D_{ig}	Outside above ground, D_{ag}	
dabarima *Planchonia* spp.	NS	—	—	—	—
fir, amabilis *Abies amabilis*	NS	—	4	—	4
fir, Douglas (oregon) *Pseudotsuga menziesii*	NS	NR	4	4	4

AS5604 is unusual among durability standards. International standards frequently simply rate one species durability against another. The Australian Standard provides a table of expected life when weather exposed.

TABLE 1

NATURAL DURABILITY—PROBABLE LIFE EXPECTANCY*

Class	Probable in-ground life expectancy (years)	Probable above-ground life expectancy (years)
1	Greater than 25	Greater than 40
2	15 to 25	15 to 40
3	5 to 15	7 to 15
4	0 to 5	0 to 7

* The ratings in this Table are based on expert opinions and the performance of the following test specimens:

(a) In-ground: 50 × 50 mm test specimens at four sites around Australia.

(b) Above-ground: 35 × 35 mm test specimens at eleven sites around Australia.

While many factors impact actual longevity, BCRC's experience has been Table 1 of the Standard is a useful guide. This means that any Douglas fir that has an extended period of weather exposure must be considered compromised.

3. ASSESSMENT AT SPECIFIC LOCATIONS

As well as a general observation of the timber members (including joists, trusses, posts, beams and battens), specific locations were inspected, and their defects detailed below. The numbers in this report are the same as those used in the report compiled by Mihaly Rutkai. Their location is shown on the INSPECT report which can be found in the Appendix.

3.1 M2 SECOND FLOOR SOFFIT

The joists viewed from the first floor were F11 Douglas fir, 300x50 mm at 480 mm centres. The spans were 3380 mm and in general these joists have short bearers (50mm^2 or less load bearing area). The following section breaks down the defects via spots. Where there are no spots, it can be assumed that the timbers are Oregon with no significant natural defects, Structural Grade 2 and a Proof Grade of F11. The floor was broken down into a grid for easier referencing from A1 to E13. Within these bays the joists were named as member 1-8 starting from the north end of each bay, member 1 being the first and member 8 being the last in the bay. The layout of the grid can be seen in Figure 3 below. The defect list is to be used in conjunction with the INSPECT report in Appendix A.

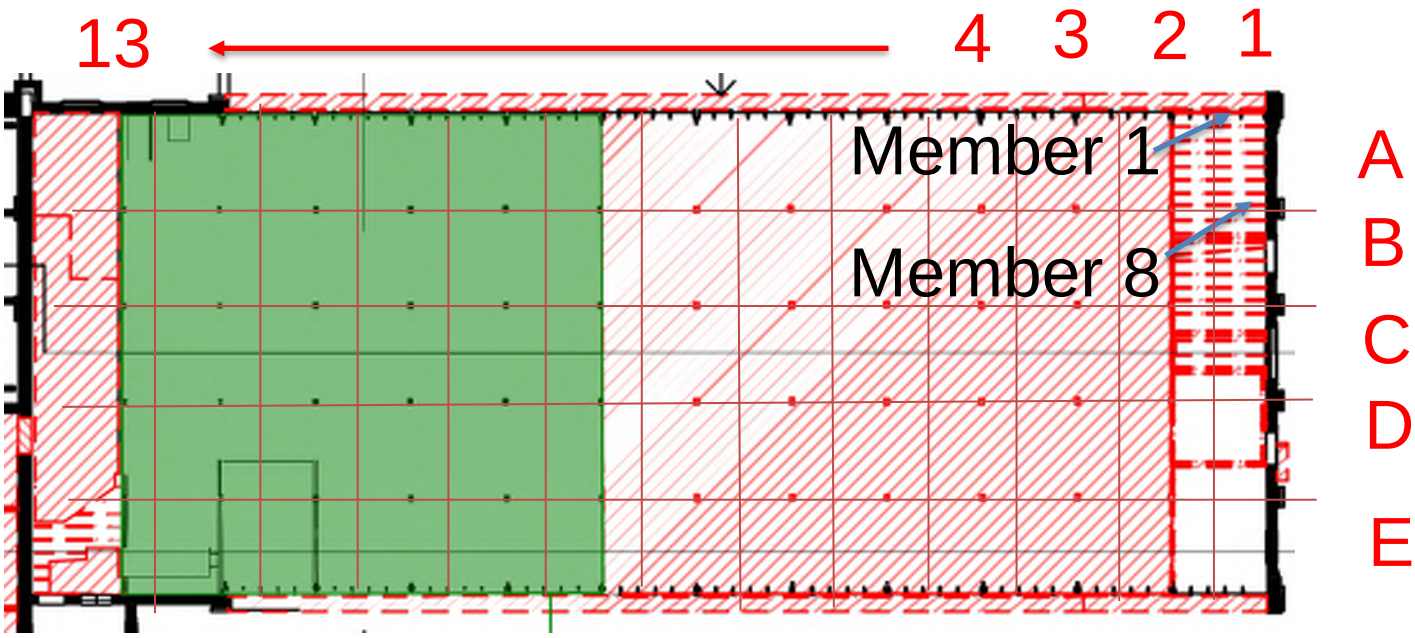


Figure 3. Grid layout of the second floor soffit

3.1.1 M2 Second Floor Soffit Defect List

Spot Number	Component	Defect	Severity	Remarks	Member Location	Member Number	Grade
3	Floor Joist	Rot	Major	Decayed top 75mm for all members, plating besides rotten area possible	1B	6	Out of grade
4	Floor Joist	Rot	Major	Unsound 50mm deep from top for all plate beside	1C	1, 2, 3, 4	Out of grade

7	Floor Joist	none	Major	1 and 3 rot Short bearers notches are not affecting structural grade Connections are sitting on bolt	2D	1, 3	Out of grade
8	Floor Joist	End Split	Minor	End split 300mm plate over	4A	1	Out of grade
9	Floor Joist	fire dam-age	Major	-	4C	4, 5, 6	Out of grade
10	Floor Joist	Fracture	Major	Unserviceable	5B	7	Out of grade
11	Floor Joist	fracture	Major	-	-	5	Out of grade
12	Floor Joist	Fracture	Major	-	6D	2	Out of grade
13	Floor Joist	Split	Minor	30mm deep, repair	7B	2	Out of grade
14	Floor Joist	Split face to face	Major	-	8A	4	Out of grade
15	Floor Joist	Fracture	Major	-	8D	7	Out of grade
16	Floor Joist	Fracture	Major	Repair	8/9D	5	Out of grade
17	Floor Joist	Shake	Major	Repair	8E	1	Out of grade
18	Floor Joist	Fracture	Major	-	9D	7	Out of grade
19	Floor Joist	Check	Major	Repair	9D	5	Out of grade
20	Floor Joist	Check	Major	-	9B	6	Out of grade
21	Floor Joist	Check	Minor	-	9B	3	Out of grade
22	Floor Joist	Check	Minor	Not face to face	10B	2	Out of grade
23	Floor Joist	Check	Major	-	10D	1	Out of grade
24	Floor Joist	Frac-ture/spli t	Major	-	11D	2	Out of grade
25	Floor Joist	End Split	Major	-	11C	7	Out of grade
26	Floor Joist	Frac-ture/sha ke	Major	-	11B	2	Out of grade

27	Floor Joist	End Split	Major	End to end	11B	1	Out of grade
28	Floor Joist	End Split	Major	600mm	12C	1	Out of grade
29	Floor Joist	End Split	Major	-	12C	4	Out of grade
30	Floor Joist	Fire Damage	Major	-	12D	6	Out of grade
31	Floor Joist	fire	Major	1-4 missing, 5 fire damage, 6 and 7 ok, 8 fire damage	13E	1-5, 8	Out of grade
32	Floor Joist	Fire damage	Major	-	13D	6, 7	Out of grade
33	Floor Joist	none	None	Recommend ledger plate to be installed under and connected back into solid timber	-	Along wall	Out of grade
34	Floor Joist	Rot	Major	Decayed	13B	3, 4, 5, 6, 7	Out of grade
35	Floor Joist	Rot	Major	Members connected to wall are rotten at connection all suspect	13A	1, 2, 3, 4, 5, 6, 7, 8	Out of grade

Figure 4. Table of Defects M2 2nd Floor Soffit

Figure 4 details the timber members that are out of grade on M2 2nd floor soffit. The severity entails the extent of damage, though these have no bearing on the grade due to the nature of the defects. The remarks were made while on site inspecting the timber members.

The defects range from rot, splits, checks, fractures and fire damage. In most cases where the members were exposed to the elements they are deemed to be out of grade. A number of joists were found to contain splits and end splits due to extensive loading in the past. Fire damage was also present in some locations where the fire burned through the floor significantly damaging or even destroying sections of the joists.

3.2 M2 Second Floor, Third Floor and Roof Members

The timber members viewed from the second floor are Structural Grade 2, F11, Douglas fir, with joists being 170x60 mm at 480 mm centres. The spans are 3430 mm. The posts are 200x150 mm Douglas Fir with spans of 3430 mm. Many of these posts had splits in the middle with metal bracing already fixed to them. These posts are all out of grade. The number of such posts suggesting either excessive load for the size or poor-quality timber. The bottom chords are 350x150 mm. The Struts are 150x100mm. Beams are 250x150 mm. Top chord size is 150x100 mm. Underbattening 60x50mm and purlins are 120x60 mm at 1120 mm centres. The

following section breaks down the defects via spots. Both underbattening and purlins have a strong red colour, likely Californian red fir, with both in good condition throughout the structure, graded as Structural Grade 2, F11. Elsewhere, where there are no spots, it can be assumed that the timbers are Oregon with limited natural defects, Structural Grade 2 and a Stress Grade of F11. The floor was broken down into bays as grid for easier referencing from A1 to E13 the same way following the posts as in level 1 plan. The layout of the grid can be seen in Figure 5 below. The joists were split 1-8 within the bays the same as level 2 soffit. The defect list is to be used in conjunction with the INSPECT report in Appendix A.

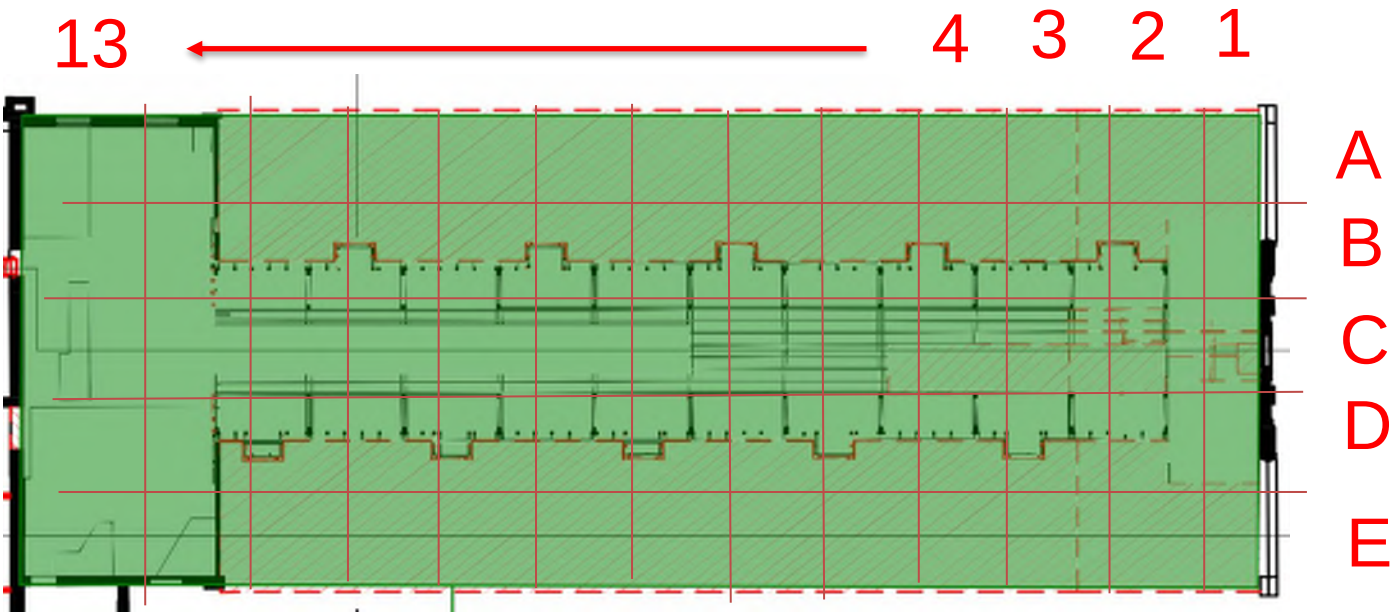


Figure 6. Grid layout of second floor and third floor and roof

3.2.1 M2 Second Floor, Third Floor and Roof Defect List

Spot Number	Component	Defect	Severity	Remarks	Member Location	Member Number	Grade
36	Floor Joist	combined	Major	Sizes: 170x60 All unsound	1C	All	Out of grade
37	Floor Joist	Knots	Major	Excessive knot with checking around it	8C	4	Out of grade
38	Floor Joist	Check	Major	-	9C	4	Out of grade
39	Floor Joist	Split	Major	-	10/11C	3	Out of grade
40	Floor Joist	Split	Major	-	12C	6	Out of grade
41	Floor Joist	Rot	Major	As with the decay in the lower floor end beams are all suspect to rot and decay	13 All bays		Out of grade

43	Post	split	Major	Out of grade	A	2	Out of grade
44	Post	Split	Major	Every post that has metal bracing/repairs is considered Out of grade Span 3430 Size 200x150mm Repairs and splits on so many may indicate size too small for the load or poor quality timber	All with metal bracing		Out of grade
46	Bottom Chord	split	Major	Centre section of bottom chord 5 splits face to face Repair	5	5	Out of grade
50	purlin	split	Major	-	E3/4		Out of grade
52	Beam	split	Major	Out of grade	D6/7		Out of grade
53	Beam	combined	Major	Suspect out of grade	1A	1	Out of grade
54	truss	not safe to close up inspect	Minor	Could not inspect close up. Weather exposed end truss likely out of grade due to extensive weather exposure	All trusses with no roof		Out of grade

Figure 7. Table of Defects M2 Second Floor, Third Floor and Roof

Figure 7 details the timber members that are out of grade on M2 second floor, third floor and the roof. The severity entails the extent of damage, though these have no bearing on the grade due to the nature of the defects. The remarks were made while on site inspecting the timber members.

The defects range from rot, splits, checks, fractures and knots. In most cases where the members were exposed to the elements they are deemed to be out of grade. A number of posts were found to contain fractures and splits that have been strengthened via the use of metal braces. These posts are all out of grade as the fractures tend to run down the whole face. The quantity of this defect suggests a load too large for the post or poor-quality material.

3.3 M2 SHED 1 AND 2

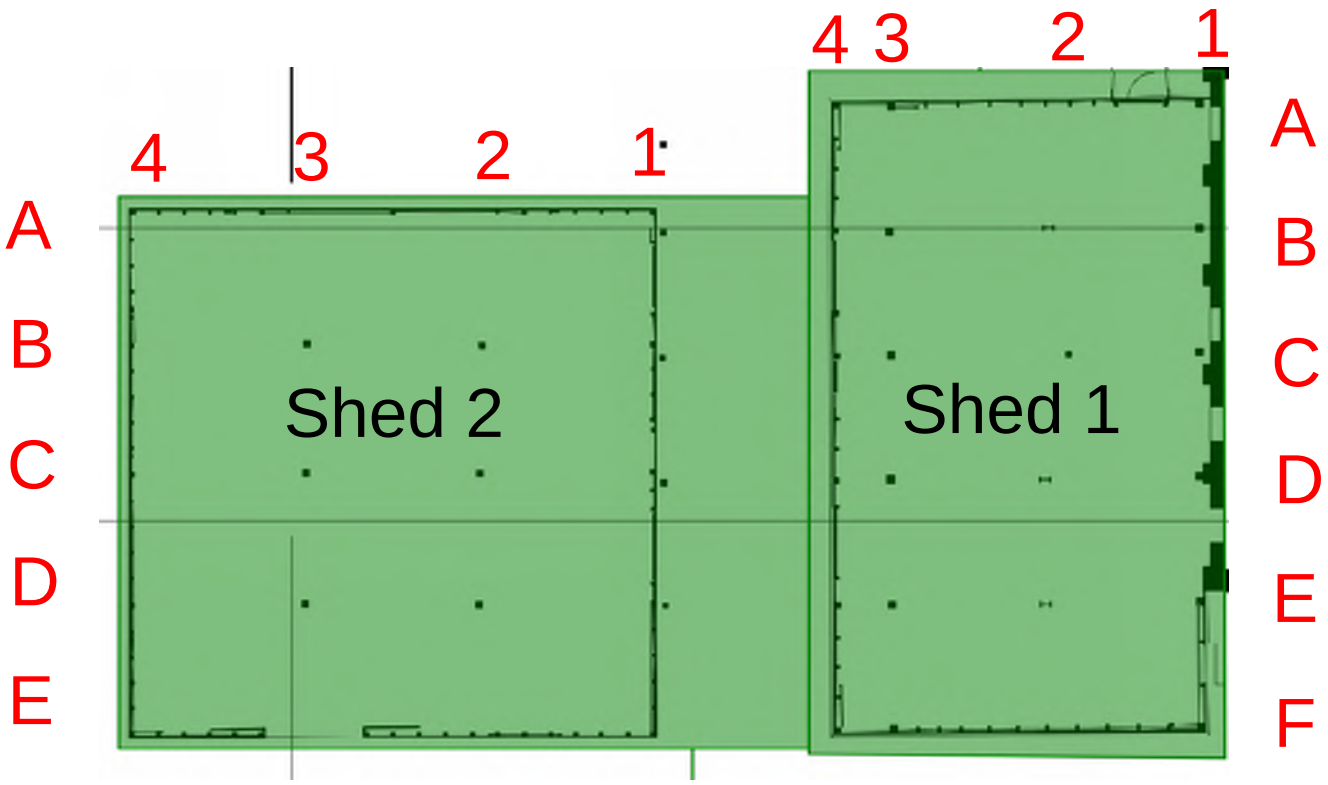


Figure 8. M2 Shed 1 (right) and Shed 2 (left)

In the M2 sheds the naming convention was changed to better reflect the structure. For shed 1 its A1 to F4 and shed 2 A1 to E4, each grid location lining up to the existing posts. All timber elements located between the sheds are out of grade due to excessive exposure to the elements.

3.3.1 M2 Shed 1

In Shed 1 the posts from grid 1-3 are 240x240mm of Mixed NSW Hardwood F22 except for the post at 2C is 170x170 and has rot at the top connecting to the walkway and the joist. The spans were 2320 mm. The posts at grid 4B and 4D are Oregon F11 170x170. The beams are 250x150 mm from 1A-F to 3-A-F and 240x110 mm at the short span between 3A-F and 4A-F. The walkway and associated beams showed some signs of decay suspect out of grade. The wall framing is mostly Oregon with the exception of the centre member being NSW Hardwood. Centre member 210x150 mm with 75x50 mm notches. Vertical member 120x75mm at 1060mm centres, horizontal member is 75x50 mm at 1080 mm centres, diagonal brace 100x75 mm. At many posts there was severe rot at the groundline. BCRC was informed on site that the whole area was inundated for days when heavy rainfall flooded the nearby creek. There were termite tracks on the outside of some posts, but they all probed sound. The roof timber

members are in general good condition Oregon F11. The roof sheeting has holes in some areas but only walkway affected due to exposed weather trusses are ok. Struts are 100x100mm, purlin are 120x75mm bottom chord are 290x100mm, top chord are 190x100mm, beam are 240x110mm. Additional smaller diagonal struts at queen post are 75x75mm. Where the spots are not mentioned the Mixed NSW Hardwood is Treated as Structural Grade 2 F22 and the Oregon members as Structural Grade 2, being F11.

3.3.2 M2 Shed 1 Defect List

Spot Number	Component	Defect	Severity	Remarks	Member Location	Member Number	Grade
57	Post	Termites	Minor	Termite tracks on outside post sound	3C	-	F22
58	Post	Rot	Major	Heart is no issue but severe rot at the bottom	1B	-	Out of grade
59	Post	missing section	Major	Repair needed	1C	-	Out of grade
60	Post	Rot	Major	Complete decay at ground line	1D	-	Out of grade
61	Post	rot and termites	Major	Complete decay at ground line Extent of termite damage hard to determine OOG	1E	-	Out of grade
62	door jamb east	Rot	Major	Complete decay at ground line		-	Out of grade
63	end wall framing	Rot	Major	End wall framing decayed at ground line	all	-	Out of grade
64	Post	Rot	Major	Decay at the bottom at ground level about 30mm deep	3D	-	Out of grade
65	end wall framing	Rot	Major	Rot at the bottom of some end wall framing set in concrete, repair	all	-	Out of grade
66	Post	Rot	Major	Rot at ground level	4B	-	Out of grade
67	Post	notch	Minor	Void at ground line Hardwood	4C	-	Out of grade
68	Post	Rot	Major	Decay at ground line 30mm Oregon	4D	-	Out of grade
69	Post	Rot	Minor	Hardwood post 20mm decay	4E	-	Out of grade
70	end wall frame	Rot	Major	Rot at ground level	4F	-	Out of grade

89	All Between sheds	Exposure to elements	Major	All elements between the sheds out of grade	All	-	Out of Grade
91	Post	Rot	Major	Rot at top of post under walkway and connected bottom chord and joist	2C	-	Out of Grade

Figure 9. Table of Defects M2 Shed 1

3.3.3 M2 Shed 2

The members of shed 2 are mixed NSW hardwood Structural Grade 2, F22. The roof is in general good condition Oregon. The queen post is Oregon 200x155mm. The top chord is Oregon 200x75mm. The purlin is Oregon 140x75mm. The vertical and angle struts are Oregon 95x95mm. The straining beam is Oregon 140x100mm. The posts around the shed are 150x150 mm at 4480 mm centres. The six posts in the Middle of the building are 190x190 mm. Post to outer wall is 5980 mm centres and post to post is 6080 mm centres. Battening around post is 75x38 mm, belt rail is 75x38 mm at 1000 mm centres, stud framing is 95x75 mm at 900 mm centres all of which are Oregon F11. At location 72 severe termite activity was observed with active termites. The post bottom plate and battening were termite infested. The post seemed largely unaffected but was unclear whether the termites had attacked the hardwood post as it probed sound. Treat as suspect and potentially out of grade. As observed with Shed 1, many posts probed unsound at ground level. Sections of this shed were unable to be inspected due to debris limiting access these have been noted in the INSPECT report in the appendix.

3.3.4 M2 Shed 2 Defect List

Spot Number	Component	Defect	Severity	Remarks	Member Location	Member Number	Grade
72	post bottom plate frame	Termites	Major	Post bottom plate and door framing termite damage. Active termites. Hardwood post seems largely unaffected due to Oregon presence (termites move through soft timber wherever they can) Potential that hardwood post bottom compromised	A1	-	Out of grade
73	Post	Rot	Major	Post decayed at ground line	1C	-	Out of grade
74	Post	none	Major	Area had debris could not inspect closely, decay in bottom plate/sill plate	1B	-	Out of grade
75	bottom plate	Rot	Major	Decay in bottom plate	1D	-	Out of grade

76	Post	Ter-mites	Major	Termite damage minimal and in battening	1E	-	Out of grade
77	Post	Rot	Major	Decayed at ground level	East Door-frame	-	Out of grade
78	Post	Rot	Major	Rot at ground level	West Door-frame	-	Out of grade
79	loose timber	termite loose timber	None	Loose timber shows signs of termite damage and pres-ence, ideally removed Cannot inspect behind	4E	-	
80	Post	Rot	Minor	Minor decay in corner	4D	-	Out of grade
81	bottom plate	Rot	Minor	Attachment of post to plate is minimal	4C	-	Out of grade
82	inaccessible	debris	None	Could not inspect due to ac-cess	NW area	-	
83	Post	Rot	Major	Decay 25mm	3D	-	Out of grade
84	Post	rot and want and wane	Major	Out of grade but repairable	3C	-	Out of grade
85	Post	Rot	Major	Severe decay at ground level	3B	-	Out of grade
86	Post	Rot	Major	Severe decay at ground	2B	-	Out of grade
87	Post	Rot	Major	Severe decay at ground 50mm	2C	-	Out of grade
88	Post	Rot	Major	Severe decay 50mm	2D	-	Out of grade

Figure 10. Table of Defects M2 Shed 2

3.4 ROOF TRUSS M1 ADJACENT TO SILO

BCRC Inspected the roof members in M1 Demolition Area. These roof members are Mixed NSW Hardwood. Due to extended exposure to the elements these members are all OUT OF GRADE.

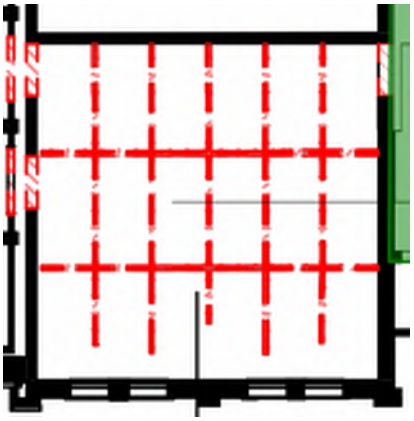


Figure 11. M1 Roof Truss Adjacent to Silo

APPENDIX A

gulraiz Ijaz's Personal Company

Maltings M1 and M2 INSPECT Report

PREPARED BY
BCRC NSW

CREATED DATE
01 May 2023

ASSET NAME
Maltings Timber Inspection

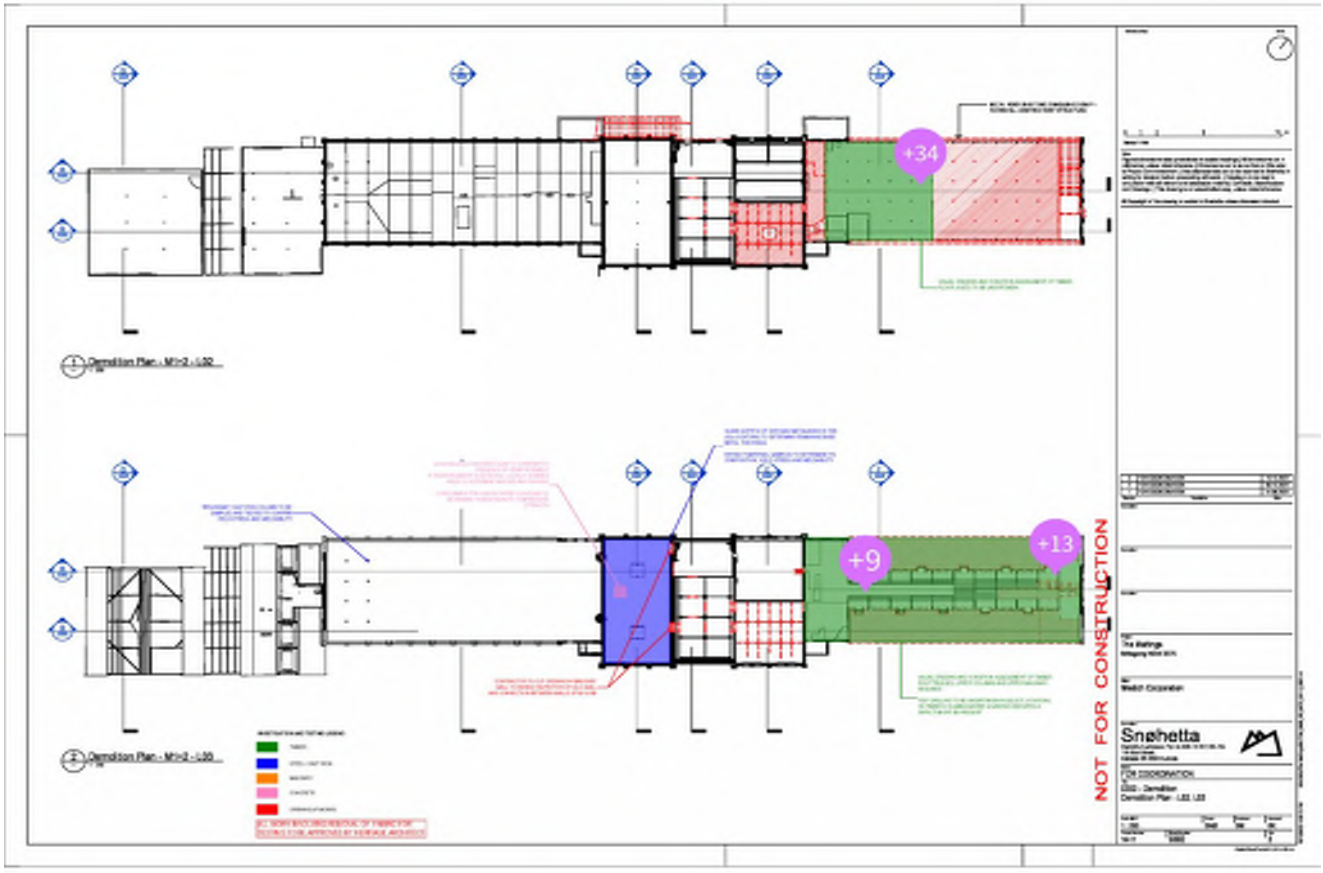
ASSET LOCATION
The Abandoned Maltings Brewery of Tooth and Co. - Mittagong, Mittagong NSW 2575, Australia

INSPECTION DATE
06 Mar 2023 - 28 Apr 2023

2D View

FILE NAME
2 - TTW DWG - M1 and M2

TOTAL SPOTS IN VIEW
56 Spots



Spot 92

SEVERITY
None

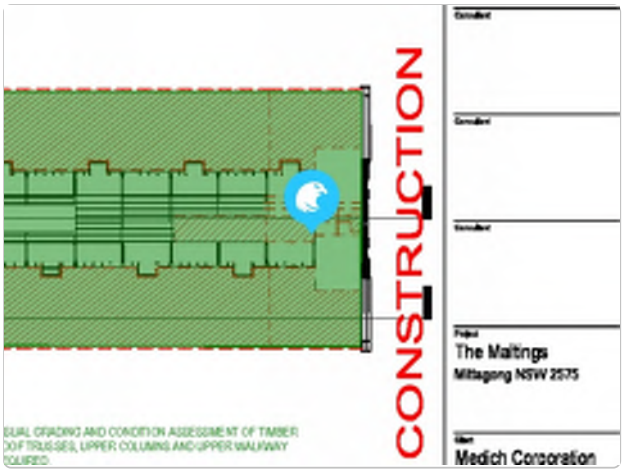
REPORTER
BCRC NSW

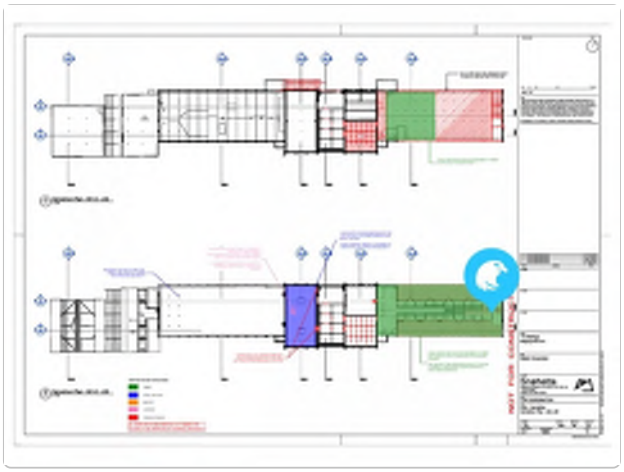
COMPONENT
Strut and queen post

DEFECT
none

REMARKS
Size 150x100mm

Location





Photos and Sketches

28 Apr 2023, 3:09 PM / BCRC NSW

Spot 55

SEVERITY
None

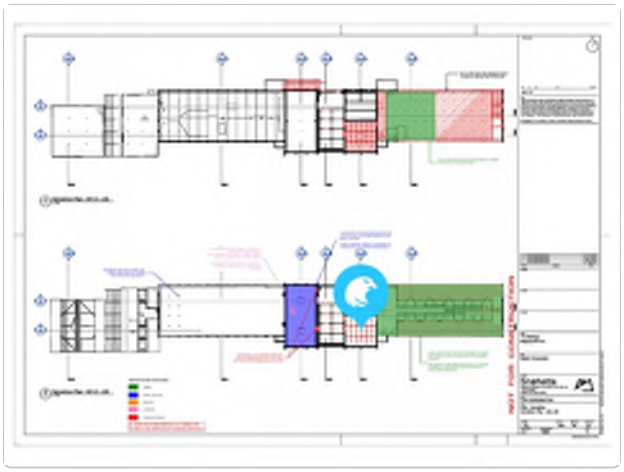
REPORTER
BCRC NSW

COMPONENT
whole roof

DEFECT
none

REMARKS
Unsafe to inspect close up
Species hard to identify but is mixed nsw hardwood originally SG2 F22
End of rafters

Location



Spot 54

SEVERITY
Minor

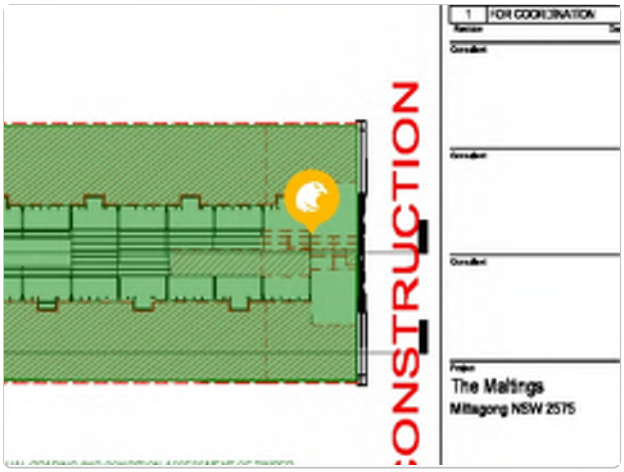
REPORTER
BCRC NSW

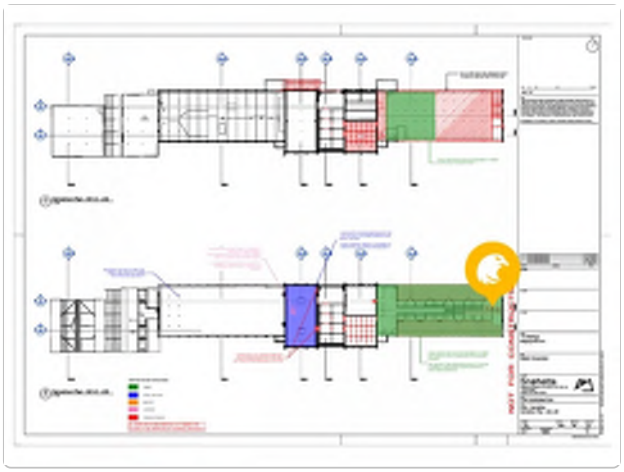
COMPONENT
truss

DEFECT
not safe to close up insp

REMARKS
Could not inspect weather exposed end truss but likely out of grade due to extensive weather exposure

Location





Spot 53

SEVERITY
Major

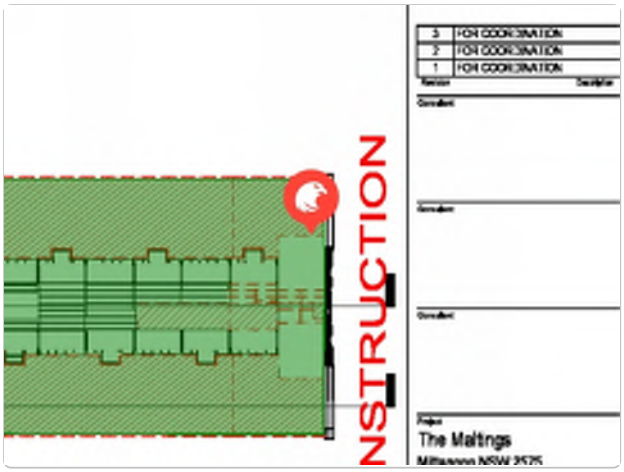
REPORTER
BCRC NSW

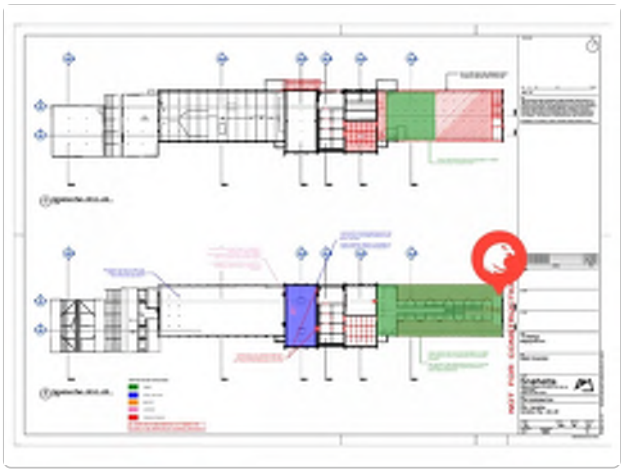
COMPONENT
Beam

DEFECT
combined

REMARKS
Suspect out of grade

Location





Photos and Sketches

06 Mar 2023, 4:50 PM / BCRC NSW

Spot 52

SEVERITY
Major

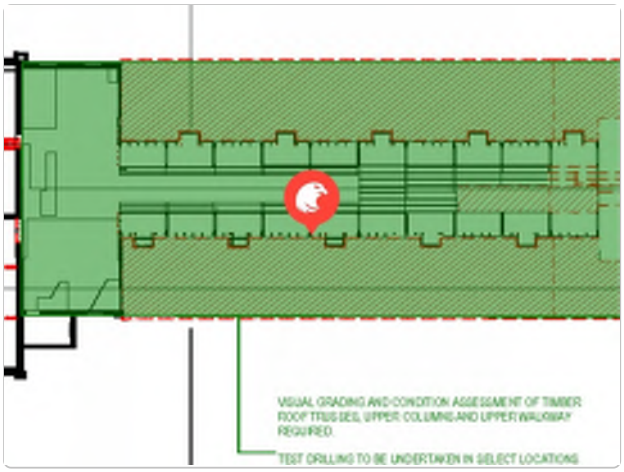
REPORTER
BCRC NSW

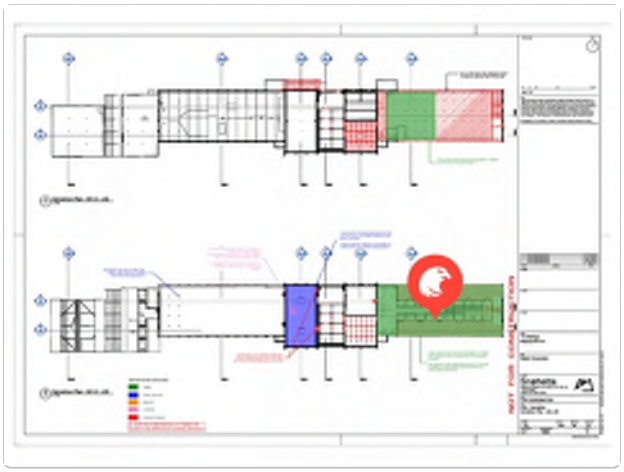
COMPONENT
Beam

DEFECT
split

REMARKS
Out of grade

Location





Photos and Sketches

06 Mar 2023, 4:47 PM / BCRC NSW

Spot 51

SEVERITY
None

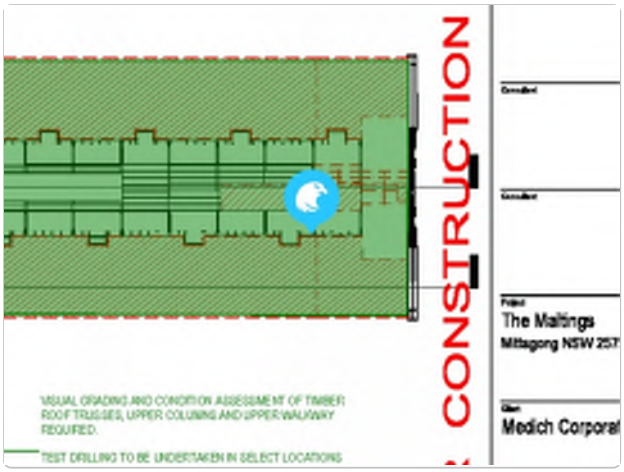
REPORTER
BCRC NSW

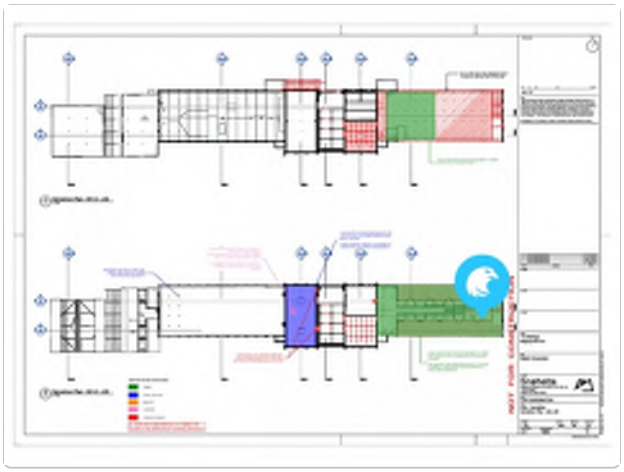
COMPONENT
Beam

DEFECT
none

REMARKS
Size: 250x150

Location





Photos and Sketches

06 Mar 2023, 4:45 PM / BCRC NSW

Spot 50

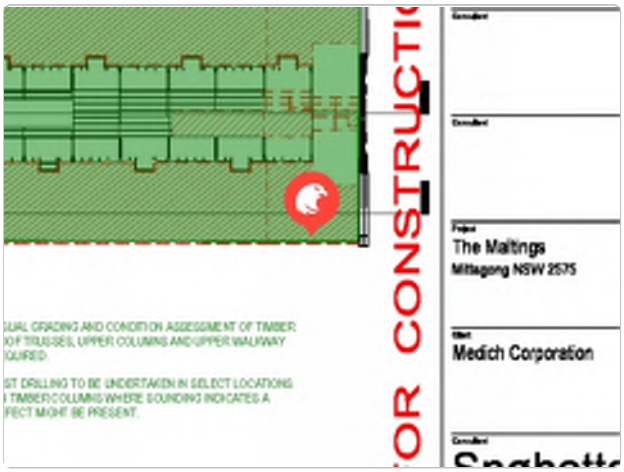
SEVERITY
Major

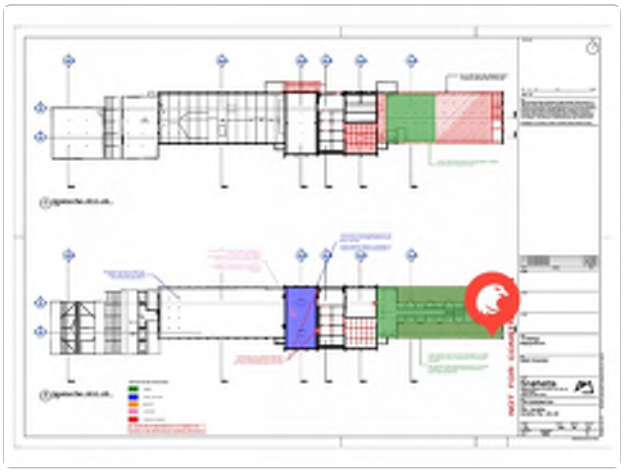
REPORTER
BCRC NSW

COMPONENT
purlin

DEFECT
split

Location





Photos and Sketches

06 Mar 2023, 4:43 PM / BCRC NSW

06 Mar 2023, 4:43 PM / BCRC NSW

Spot 49

SEVERITY
None

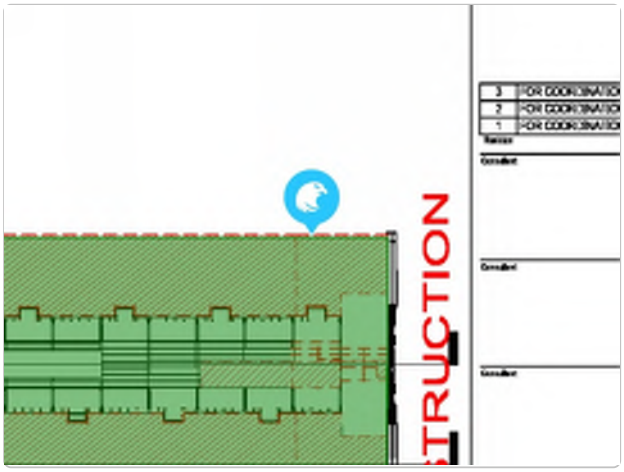
REPORTER
BCRC NSW

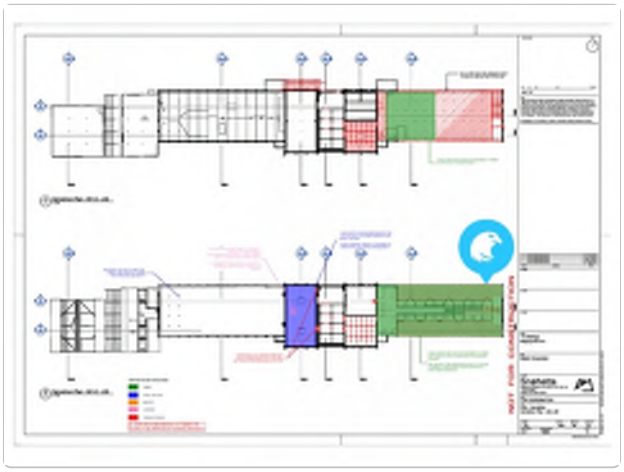
COMPONENT
purlin

DEFECT
none

REMARKS
Size: 120x60
C-C: 1120
Redwood: likely to be Californian red fir
All visible likely to be sound where there is roofing and unsound where no roofing. treat as F11 where sound
Imported softwood

Location





Photos and Sketches

06 Mar 2023, 4:41 PM / BCRC NSW

Spot 48

SEVERITY
None

REPORTER
BCRC NSW

COMPONENT
Batten

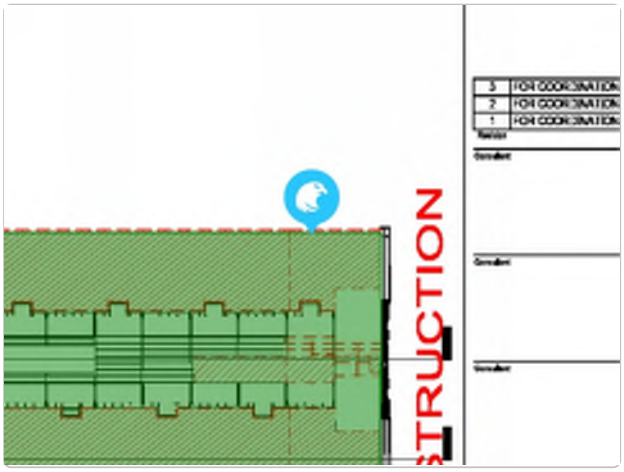
DEFECT
none

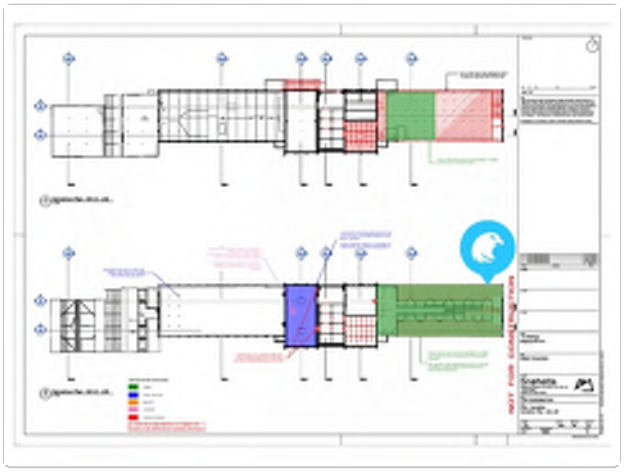
REMARKS
Batten size: 60x50

Likely imported softwood
Underbatten serves little structural

All largely in good condition treat as F11

Location





Photos and Sketches

06 Mar 2023, 4:36 PM / BCRC NSW

Spot 47

SEVERITY
None

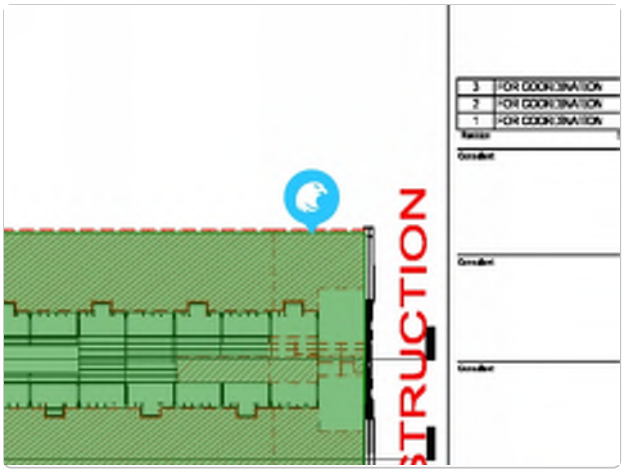
REPORTER
BCRC NSW

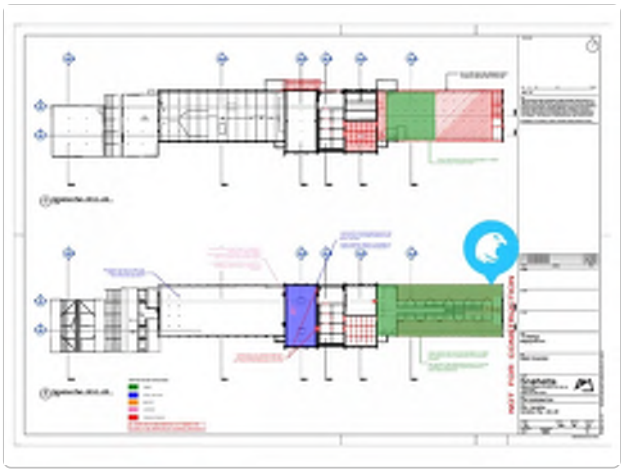
COMPONENT
Rafter

DEFECT
none

REMARKS
Rafter size: 150x100

Location





Photos and Sketches

06 Mar 2023, 4:33 PM / BCRC NSW

Spot 46

SEVERITY
Major

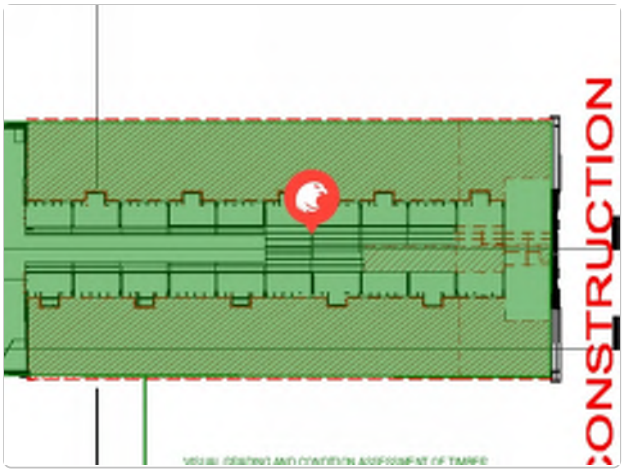
REPORTER
BCRC NSW

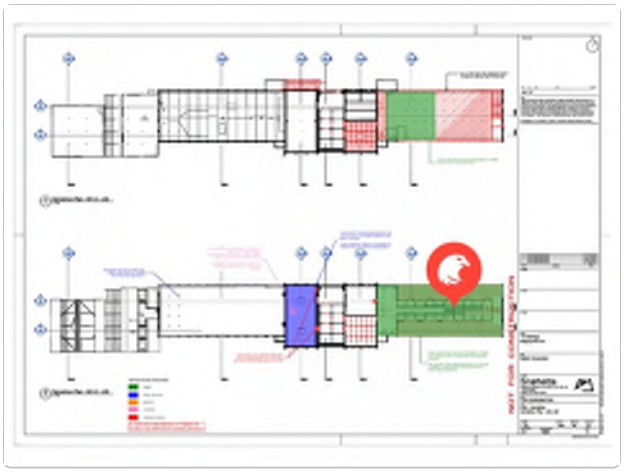
COMPONENT
Bottom Chord

DEFECT
split

REMARKS
Centre section of bottom chord 5 splits face to face
Repair

Location





Photos and Sketches

06 Mar 2023, 4:31 PM / BCRC NSW

Spot 45

SEVERITY
None

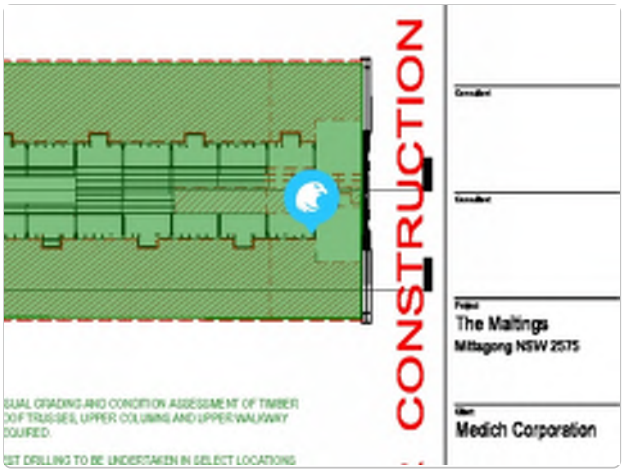
REPORTER
BCRC NSW

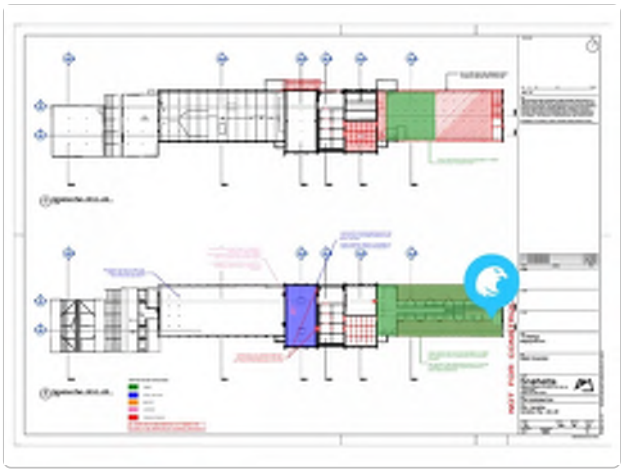
COMPONENT
Bottom Chord

DEFECT
none

REMARKS
Size: 350x150

Location





Photos and Sketches

06 Mar 2023, 4:27 PM / BCRC NSW

Spot 44

SEVERITY
Major

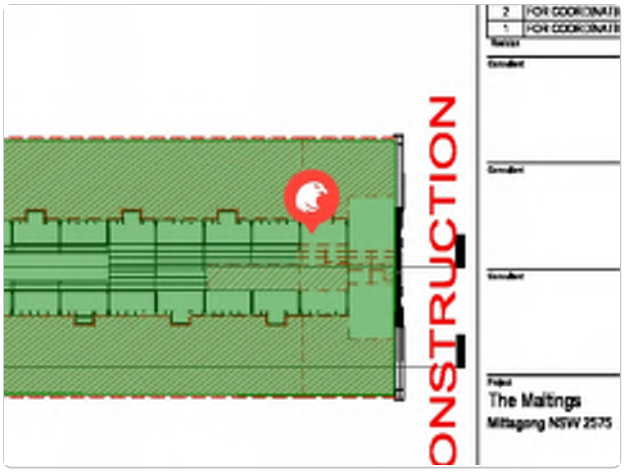
REPORTER
BCRC NSW

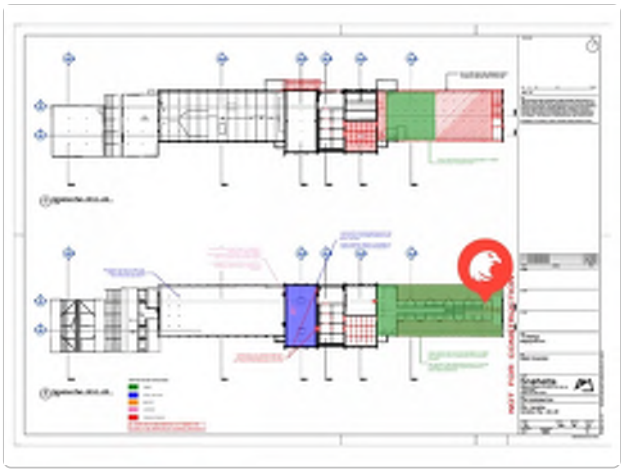
COMPONENT
Post

DEFECT
Split

REMARKS
Every post that has metal bracing/repairs is considered Out of grade
Span 3430

Location





Photos and Sketches

06 Mar 2023, 3:57 PM / BCRC NSW

Spot 43

SEVERITY
Major

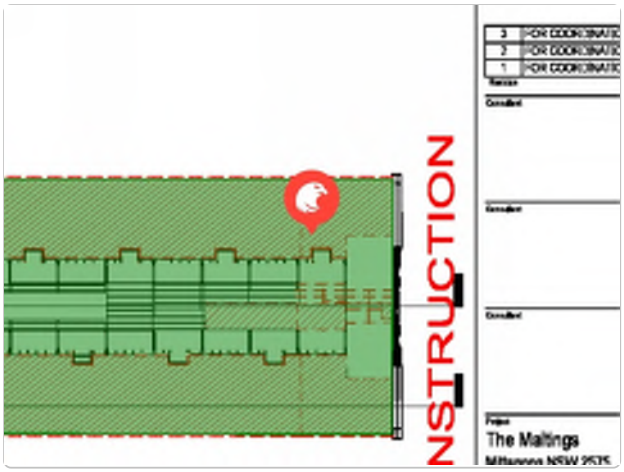
REPORTER
BCRC NSW

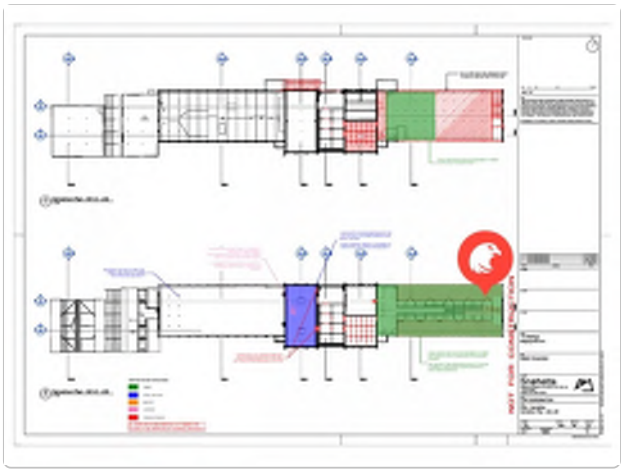
COMPONENT
Post

DEFECT
split

REMARKS
Out of grade

Location





Photos and Sketches

06 Mar 2023, 3:57 PM / BCRC NSW

Spot 42

SEVERITY
None

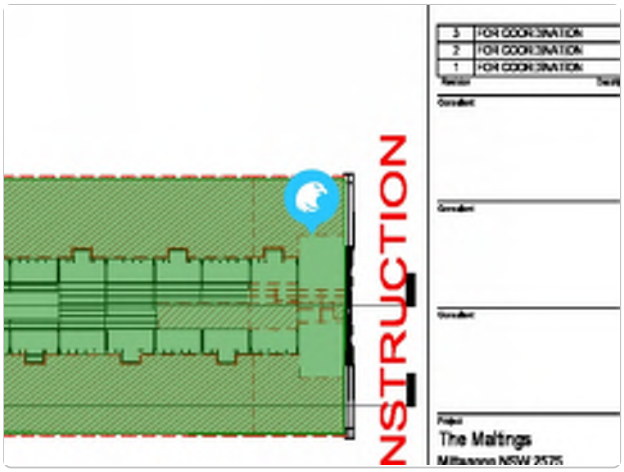
REPORTER
BCRC NSW

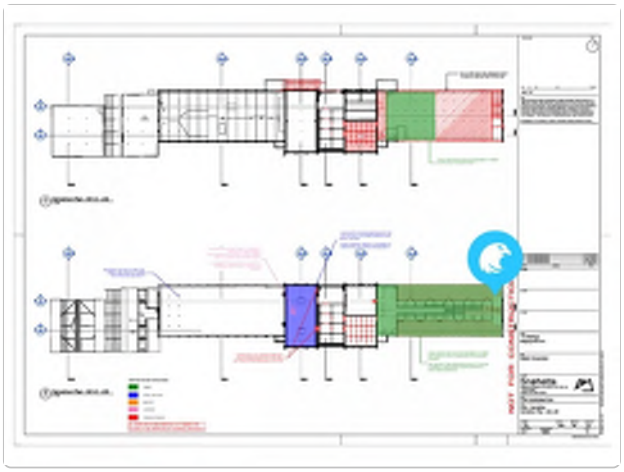
COMPONENT
Post

DEFECT
none

REMARKS
Size
200x150
Repair and split on so many may indicate size too small for the load or poor quality timber

Location





Photos and Sketches

06 Mar 2023, 3:54 PM / BCRC NSW

Spot 41

SEVERITY
Major

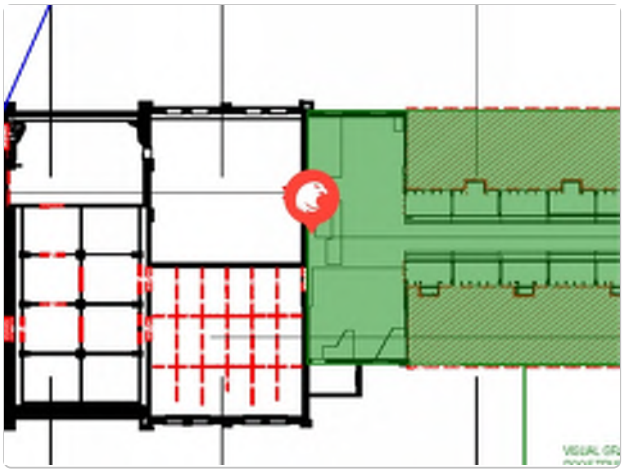
REPORTER
BCRC NSW

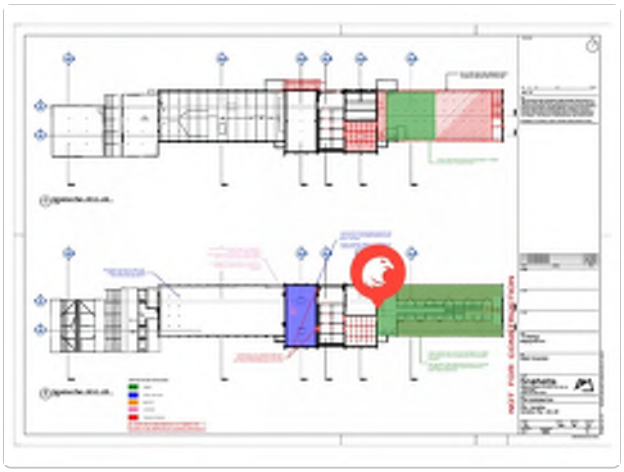
COMPONENT
Floor Joist

DEFECT
Rot

REMARKS
As with the decay in the lower floor end beams are all suspect to rot and decay

Location





Photos and Sketches

06 Mar 2023, 3:48 PM / BCRC NSW

06 Mar 2023, 3:48 PM / BCRC NSW

Spot 41

06 Mar 2023, 3:48 PM / BCRC NSW

Spot 40

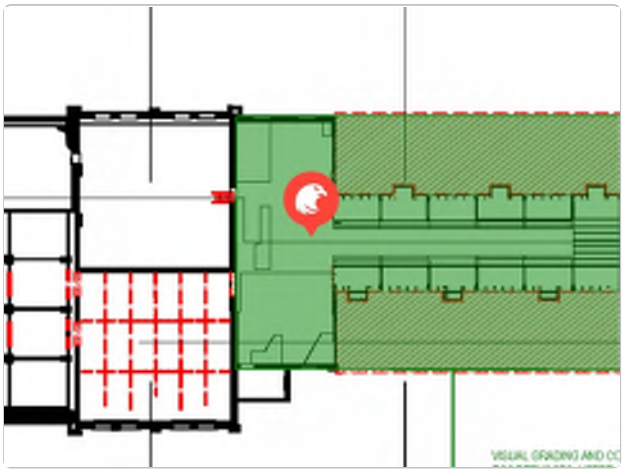
SEVERITY
Major

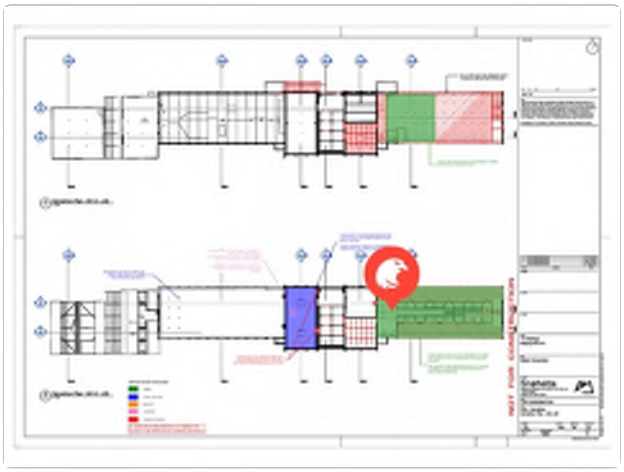
REPORTER
BCRC NSW

COMPONENT
Floor Joist

DEFECT
Split

Location





Photos and Sketches

06 Mar 2023, 3:45 PM / BCRC NSW

Spot 39

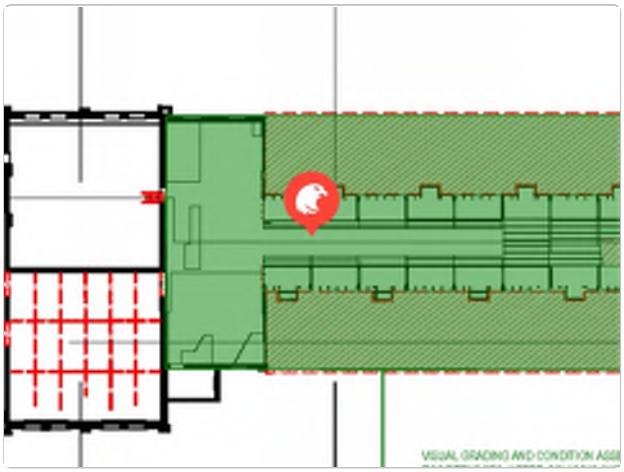
SEVERITY
Major

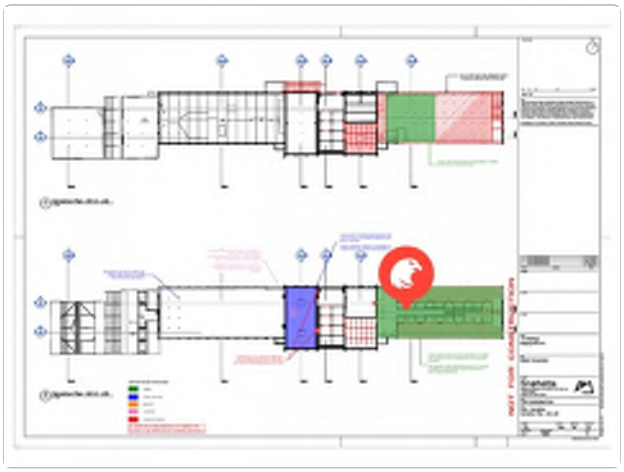
REPORTER
BCRC NSW

COMPONENT
Floor Joist

DEFECT
Split

Location





Photos and Sketches

06 Mar 2023, 3:42 PM / BCRC NSW

Spot 38

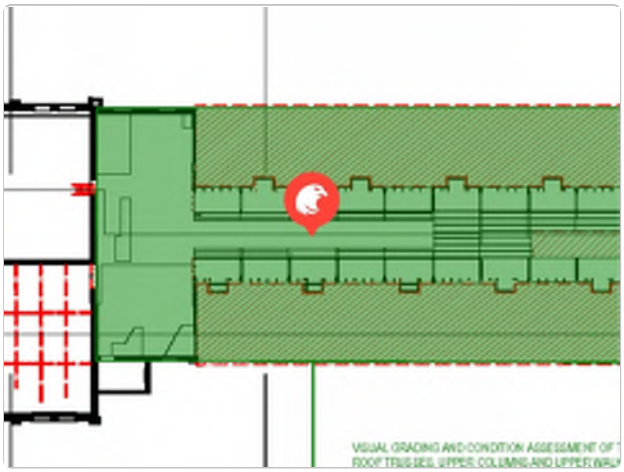
SEVERITY
Major

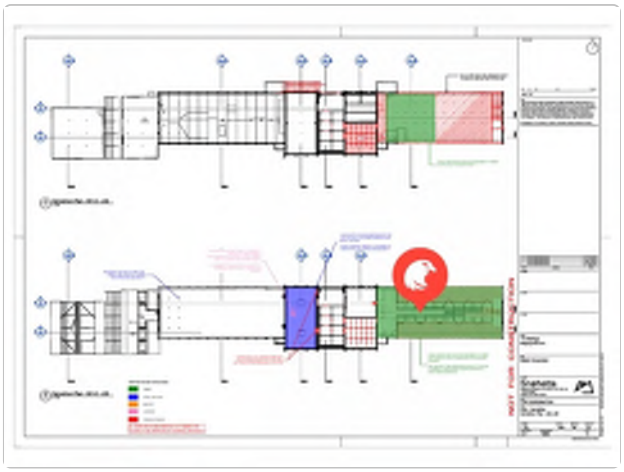
REPORTER
BCRC NSW

COMPONENT
Floor Joist

DEFECT
Check

Location





Photos and Sketches

06 Mar 2023, 3:41 PM / BCRC NSW

Spot 37

SEVERITY
Major

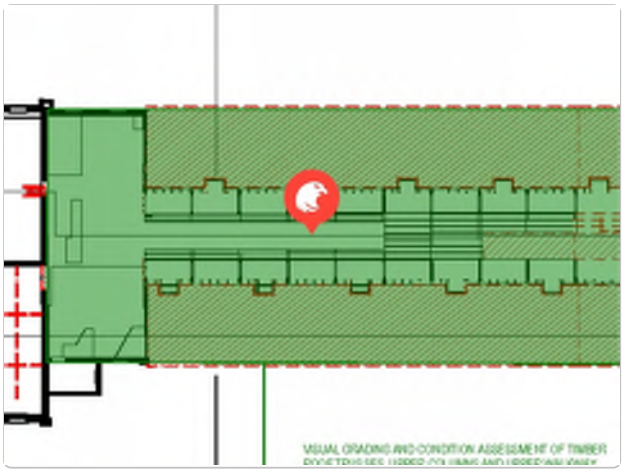
REPORTER
BCRC NSW

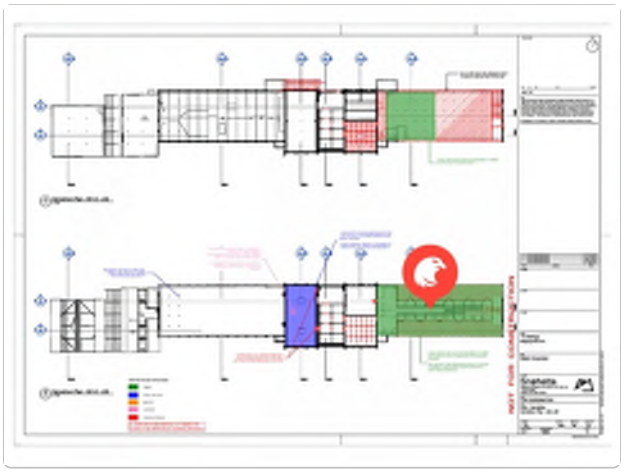
COMPONENT
Floor Joist

DEFECT
Knots

REMARKS
Excessive knot with checking around it

Location





Photos and Sketches

06 Mar 2023, 3:38 PM / BCRC NSW

Spot 36

SEVERITY
Major

REPORTER
BCRC NSW

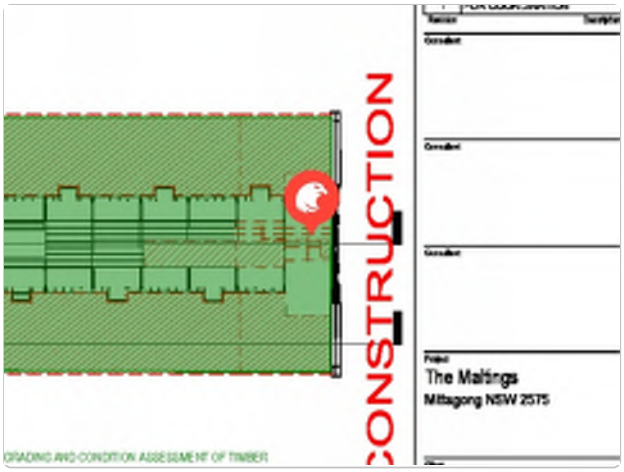
COMPONENT
Floor Joist

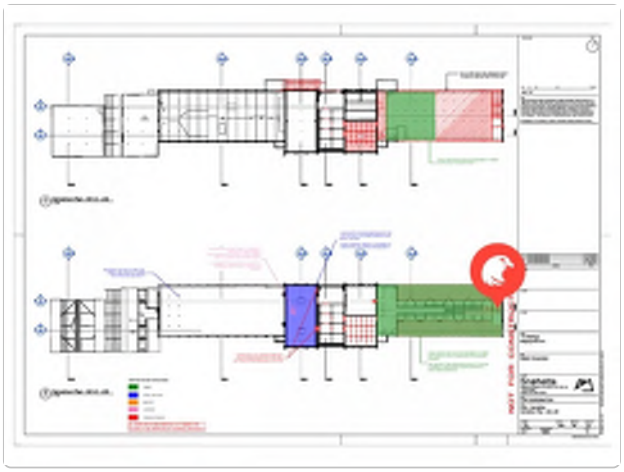
DEFECT
combined

REMARKS
Sizes: 170x60

All unsound

Location





Photos and Sketches

06 Mar 2023, 3:34 PM / BCRC NSW

Spot 35

SEVERITY
Major

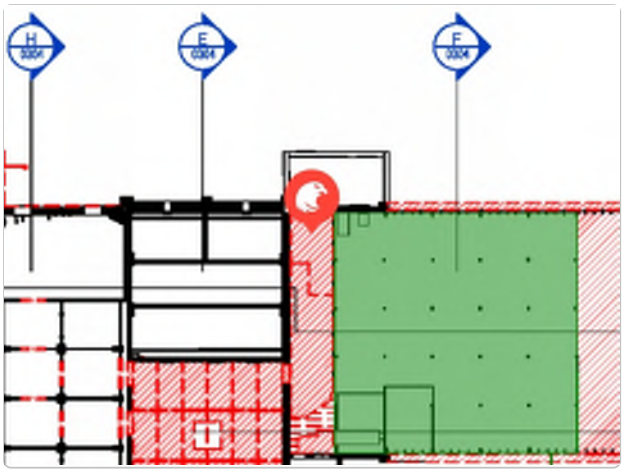
REPORTER
BCRC NSW

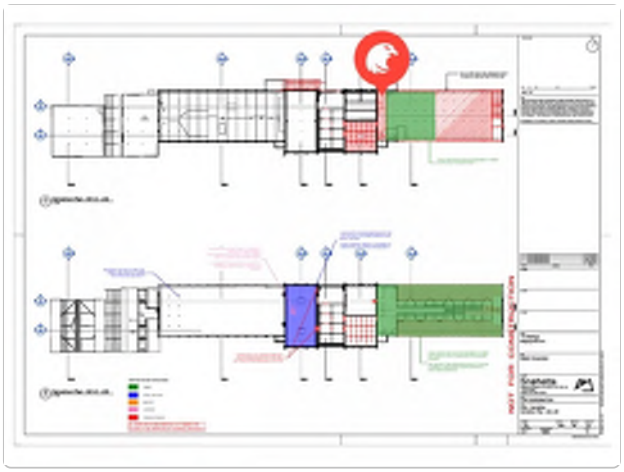
COMPONENT
Floor Joist

DEFECT
Rot

REMARKS
Members connected to wall are rotten at connection all suspect

Location





Photos and Sketches

06 Mar 2023, 3:12 PM / BCRC NSW

Spot 34

SEVERITY
Major

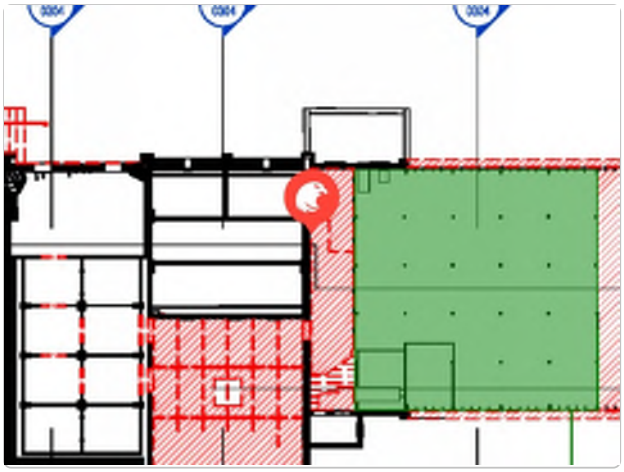
REPORTER
BCRC NSW

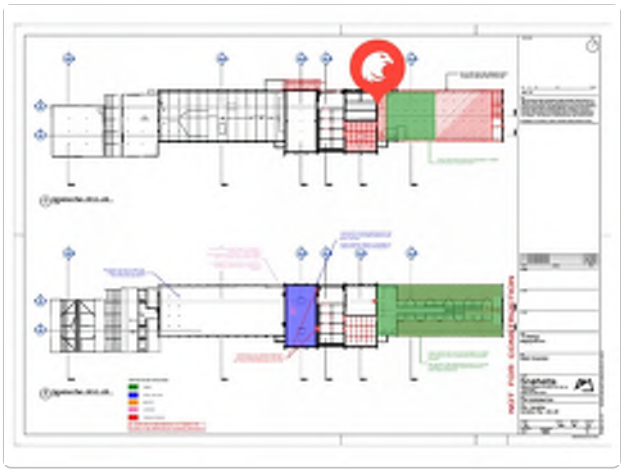
COMPONENT
Floor Joist

DEFECT
Rot

REMARKS
Decayed

Location





Photos and Sketches

06 Mar 2023, 3:11 PM / BCRC NSW

06 Mar 2023, 3:11 PM / BCRC NSW

Spot 33

SEVERITY
None

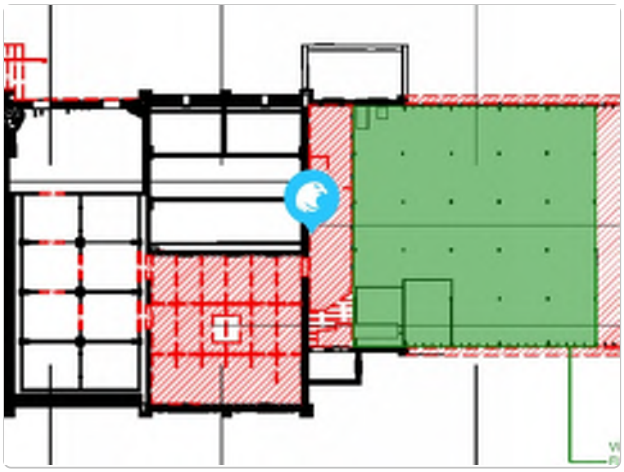
REPORTER
BCRC NSW

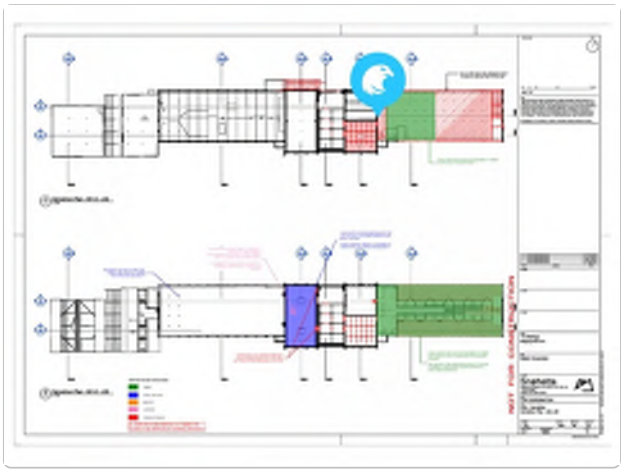
COMPONENT
Floor Joist

DEFECT
none

REMARKS
Recommend ledger plate to be installed under and connected back into solid timber

Location





Spot 32

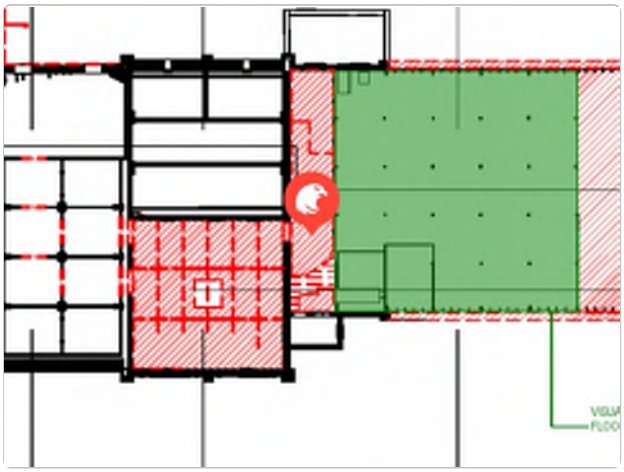
SEVERITY
Major

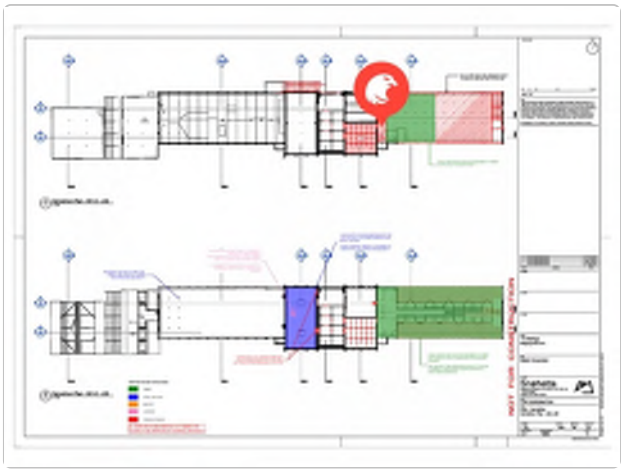
REPORTER
BCRC NSW

COMPONENT
Floor Joist

DEFECT
Fire damage

Location





Photos and Sketches

06 Mar 2023, 3:06 PM / BCRC NSW

Spot 31

SEVERITY
Major

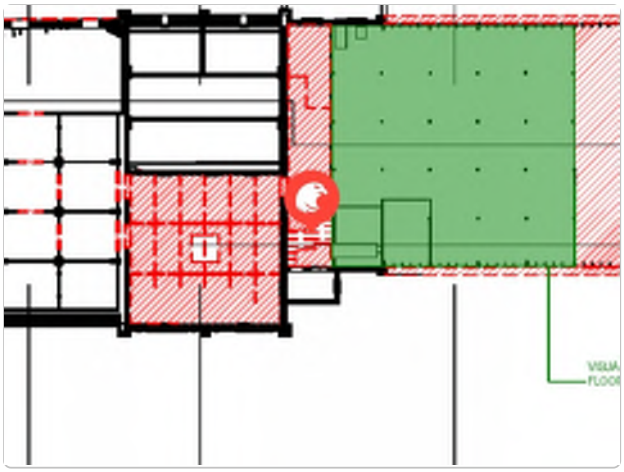
REPORTER
BCRC NSW

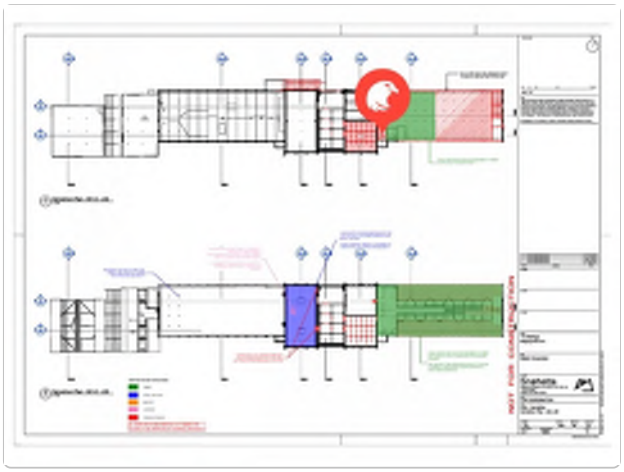
COMPONENT
Floor Joist

DEFECT
fire

REMARKS
1-4 missing, 5 fire damage, 6 and 7 ok, 8 fire damage

Location





Photos and Sketches

06 Mar 2023, 3:06 PM / BCRC NSW

Spot 30

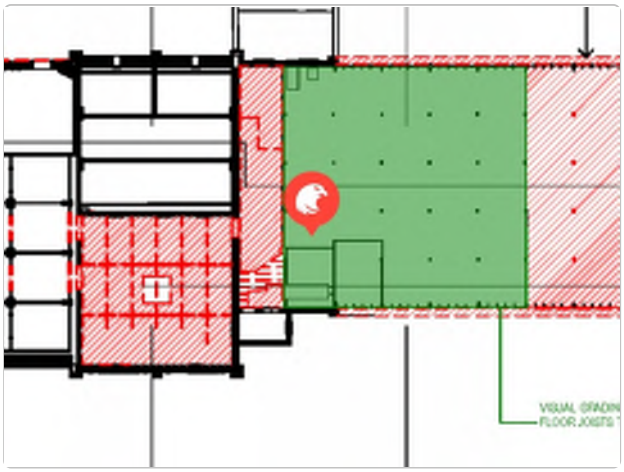
SEVERITY
Major

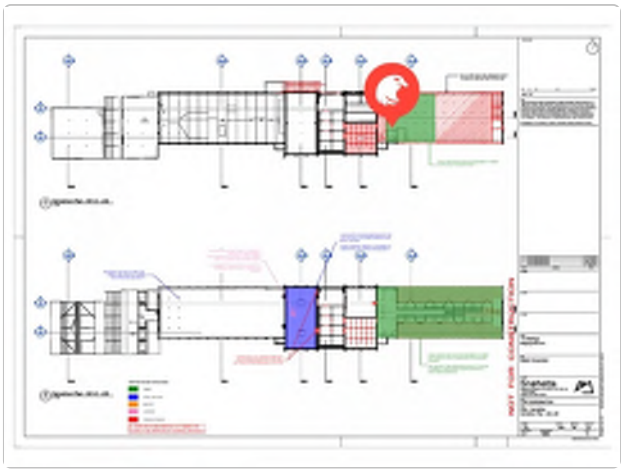
REPORTER
BCRC NSW

COMPONENT
Floor Joist

DEFECT
Fire Damage

Location





Photos and Sketches

06 Mar 2023, 3:03 PM / BCRC NSW

Spot 29

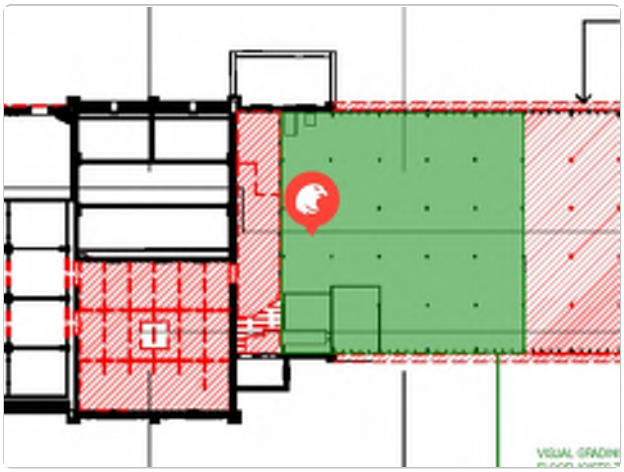
SEVERITY
Major

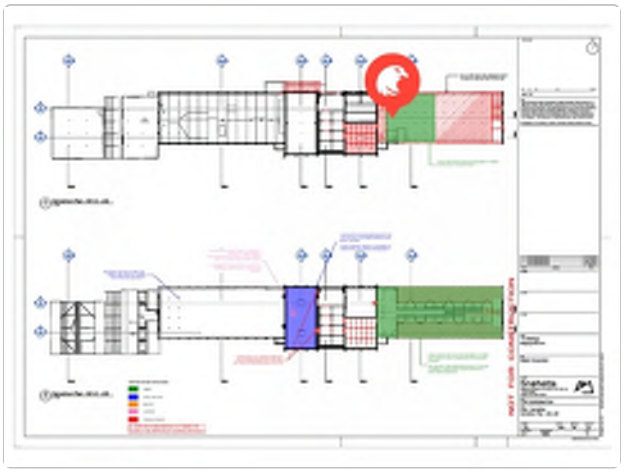
REPORTER
BCRC NSW

COMPONENT
Floor Joist

DEFECT
End Split

Location





Photos and Sketches

06 Mar 2023, 3:02 PM / BCRC NSW

Spot 28

SEVERITY
Major

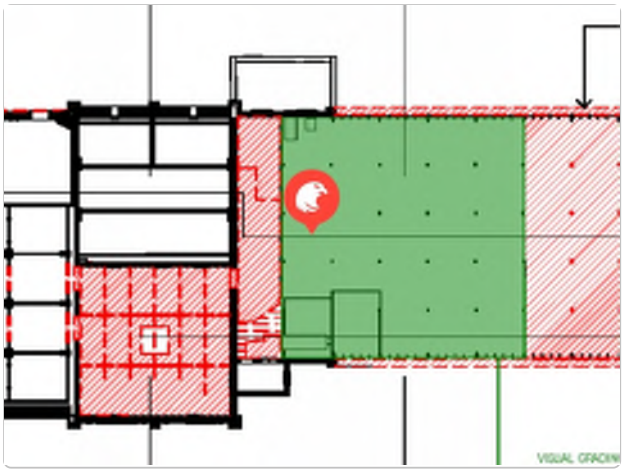
REPORTER
BCRC NSW

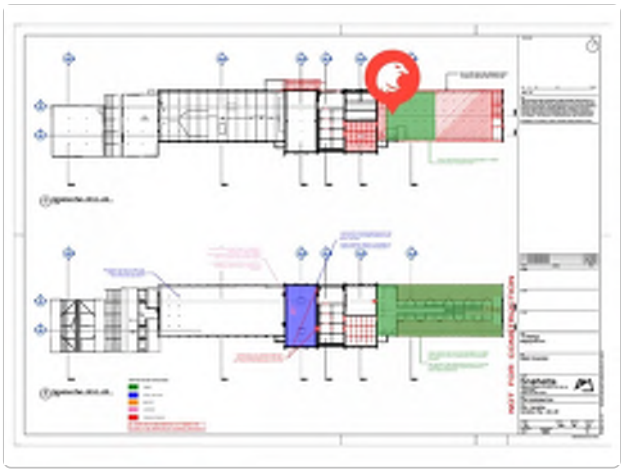
COMPONENT
Floor Joist

DEFECT
End Split

REMARKS
600mm

Location





Photos and Sketches

06 Mar 2023, 3:00 PM / BCRC NSW

06 Mar 2023, 3:00 PM / BCRC NSW

Spot 27

SEVERITY
Major

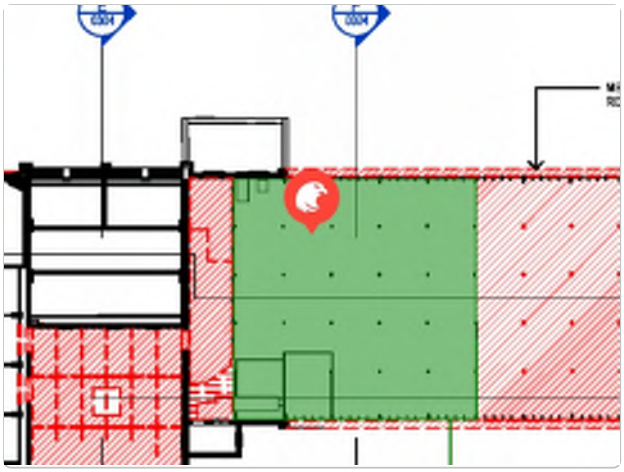
REPORTER
BCRC NSW

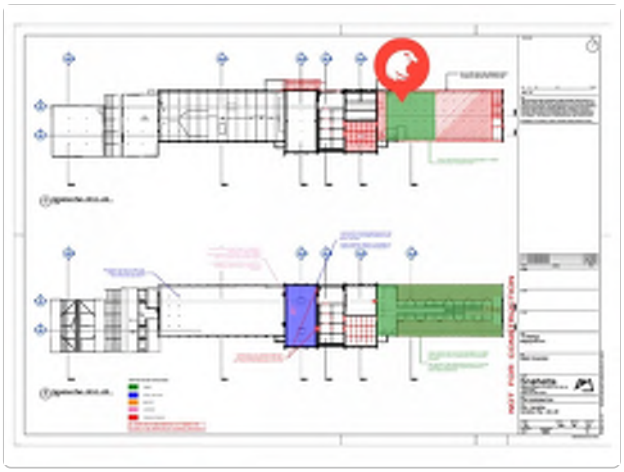
COMPONENT
Floor Joist

DEFECT
End Split

REMARKS
End to end

Location





Photos and Sketches

06 Mar 2023, 2:56 PM / BCRC NSW

06 Mar 2023, 2:56 PM / BCRC NSW

Spot 26

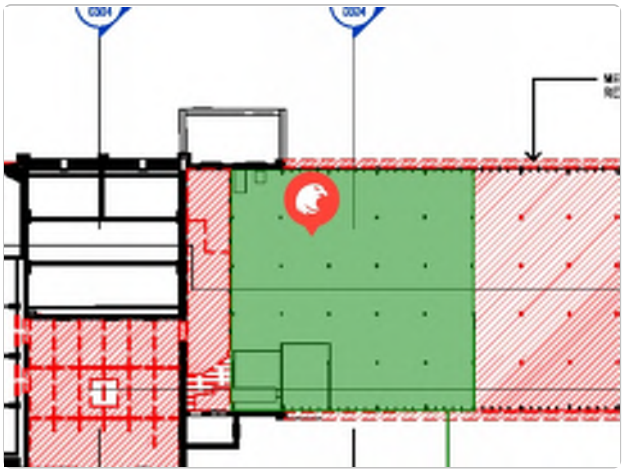
SEVERITY
Major

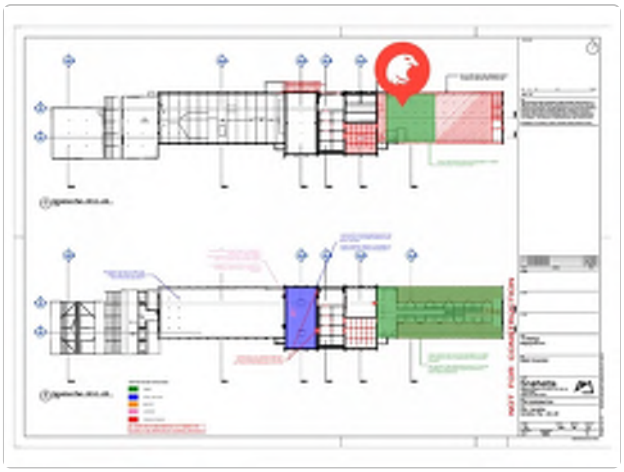
REPORTER
BCRC NSW

COMPONENT
Floor Joist

DEFECT
Fracture/shake

Location





Photos and Sketches

06 Mar 2023, 2:55 PM / BCRC NSW

Spot 25

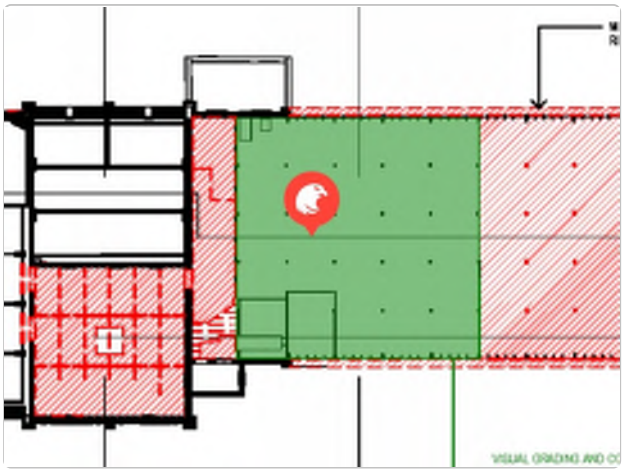
SEVERITY
Major

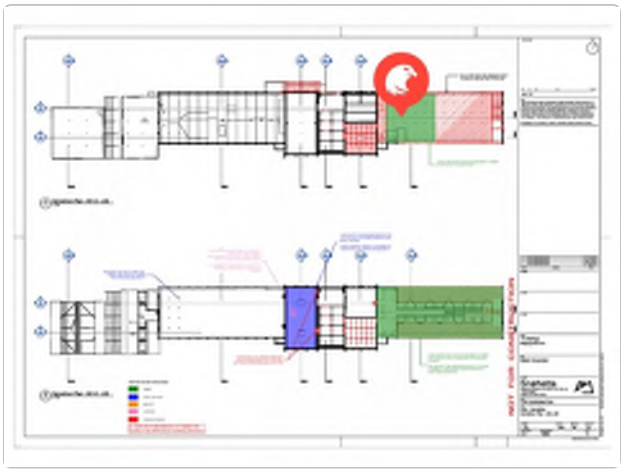
REPORTER
BCRC NSW

COMPONENT
Floor Joist

DEFECT
End Split

Location





Photos and Sketches

06 Mar 2023, 2:53 PM / BCRC NSW

Spot 24

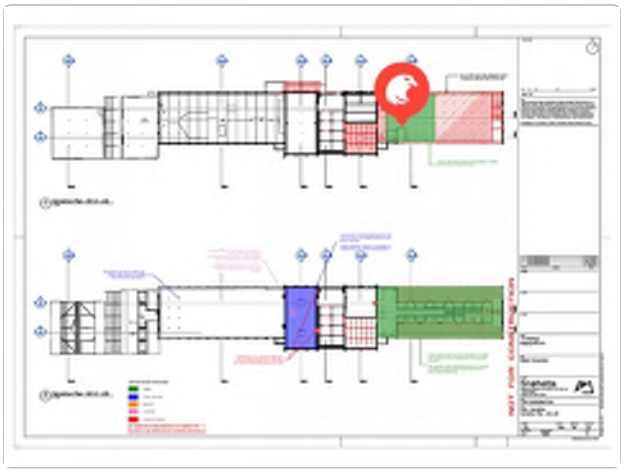
SEVERITY
Major

REPORTER
BCRC NSW

COMPONENT
Floor Joist

DEFECT
Fracture/split

Location



Photos and Sketches

06 Mar 2023, 2:51 PM / BCRC NSW

Spot 23

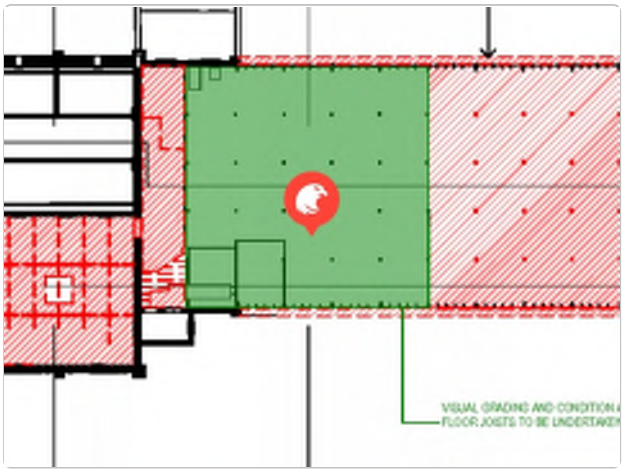
SEVERITY
Major

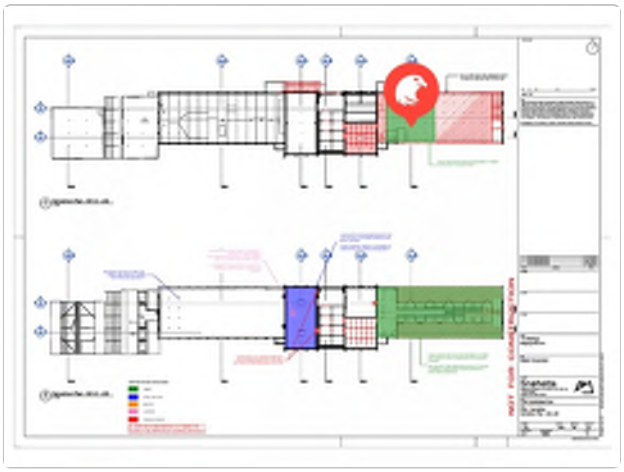
REPORTER
BCRC NSW

COMPONENT
Floor Joist

DEFECT
Check

Location





Photos and Sketches

06 Mar 2023, 2:48 PM / BCRC NSW

Spot 22

SEVERITY
Minor

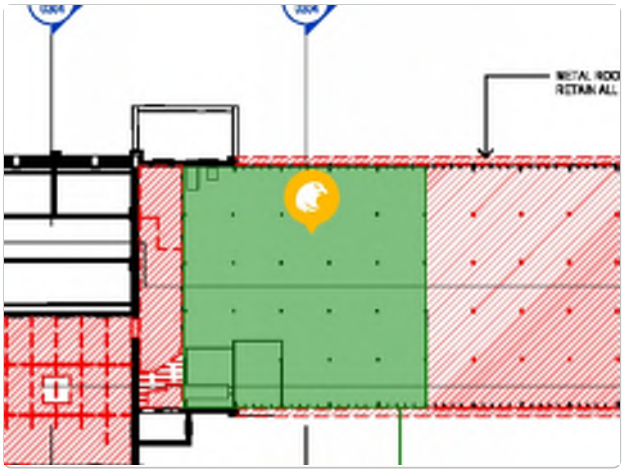
REPORTER
BCRC NSW

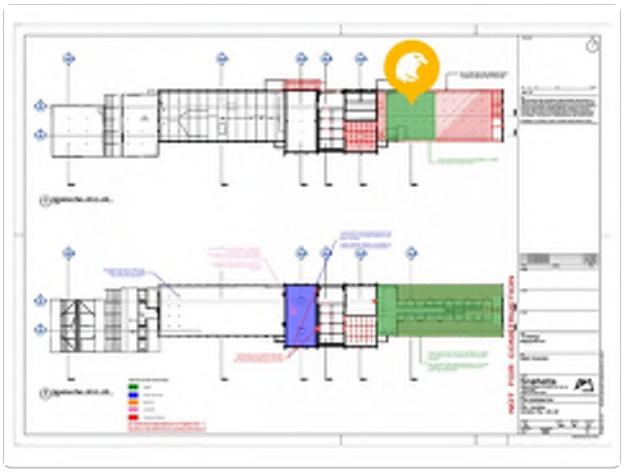
COMPONENT
Floor Joist

DEFECT
Check

REMARKS
Not face to face

Location





Photos and Sketches

06 Mar 2023, 2:46 PM / BCRC NSW

Spot 21

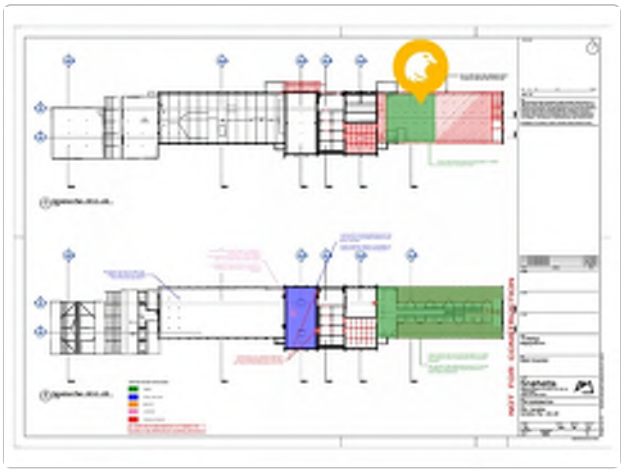
SEVERITY
Minor

REPORTER
BCRC NSW

COMPONENT
Floor Joist

DEFECT
Check

Location



Photos and Sketches

06 Mar 2023, 2:44 PM / BCRC NSW

Spot 20

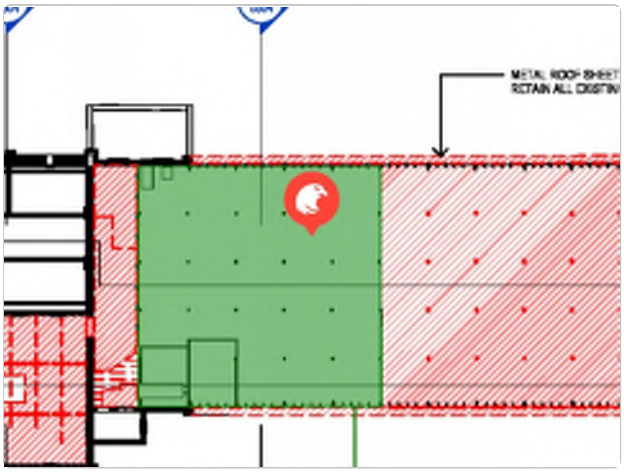
SEVERITY
Major

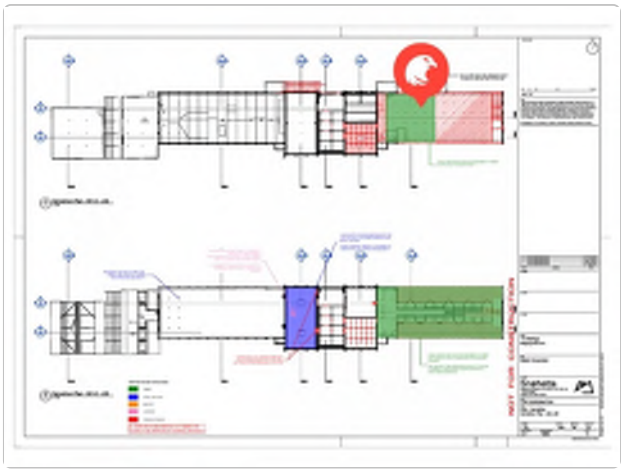
REPORTER
BCRC NSW

COMPONENT
Floor Joist

DEFECT
Check

Location





Photos and Sketches

06 Mar 2023, 2:43 PM / BCRC NSW

Spot 19

SEVERITY
Major

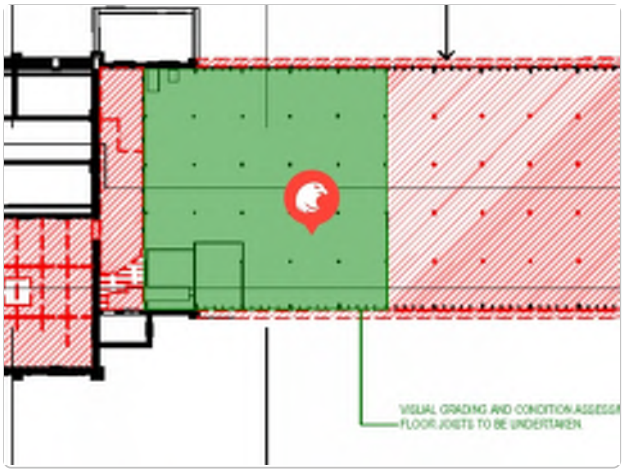
REPORTER
BCRC NSW

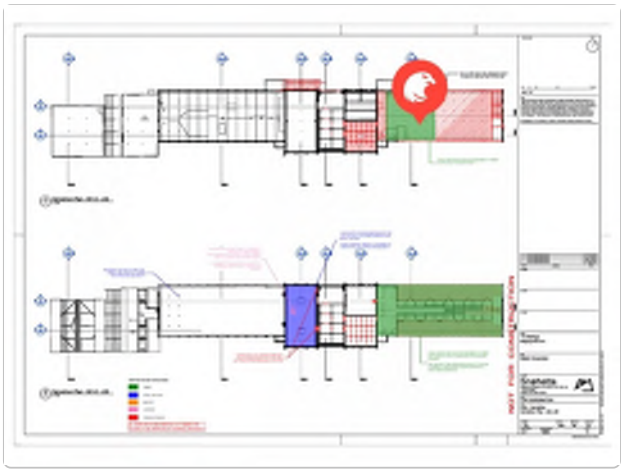
COMPONENT
Floor Joist

DEFECT
Check

REMARKS
Repair

Location





Photos and Sketches

06 Mar 2023, 2:40 PM / BCRC NSW

06 Mar 2023, 2:40 PM / BCRC NSW

Spot 18

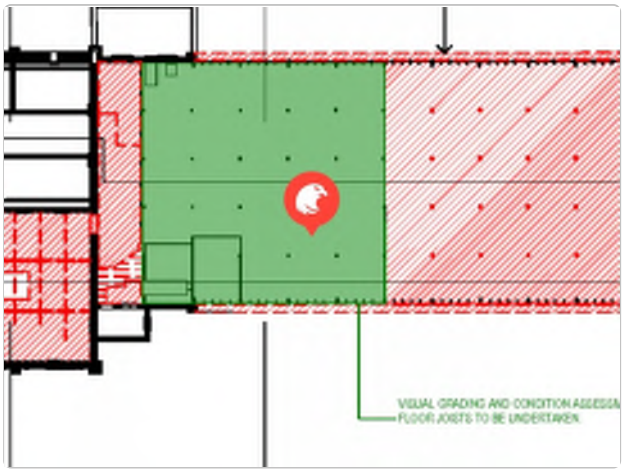
SEVERITY
Major

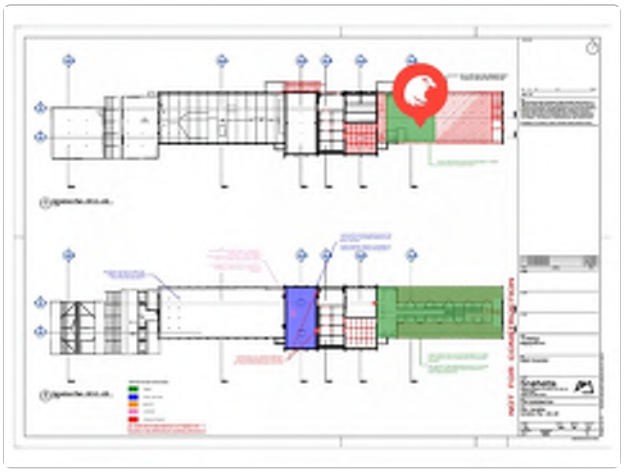
REPORTER
BCRC NSW

COMPONENT
Floor Joist

DEFECT
Fracture

Location





Photos and Sketches

06 Mar 2023, 2:39 PM / BCRC NSW

06 Mar 2023, 2:39 PM / BCRC NSW

Spot 17

SEVERITY
Major

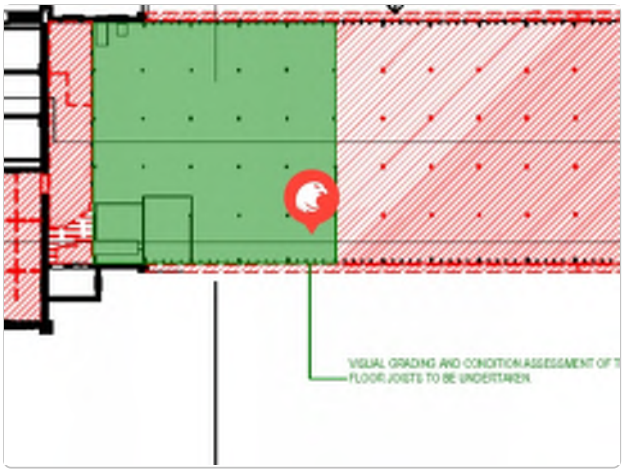
REPORTER
BCRC NSW

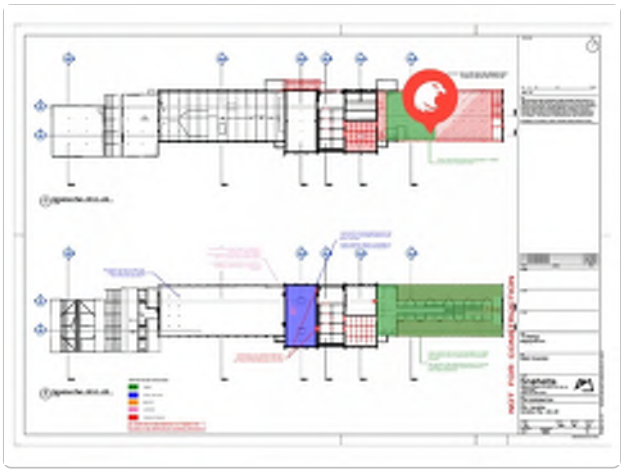
COMPONENT
Floor Joist

DEFECT
Shake

REMARKS
Repair

Location





Photos and Sketches

06 Mar 2023, 2:37 PM / BCRC NSW

Spot 16

SEVERITY
Major

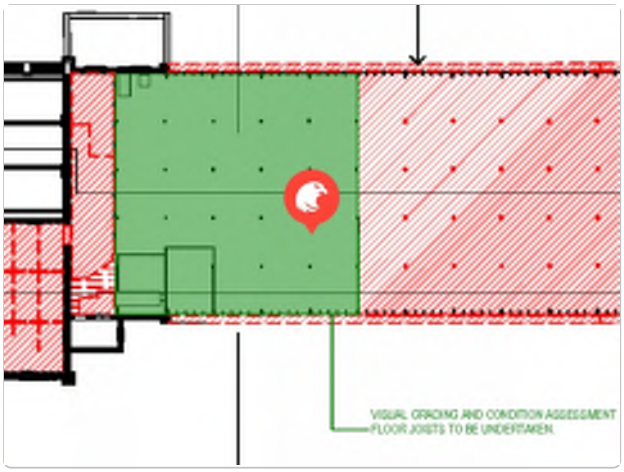
REPORTER
BCRC NSW

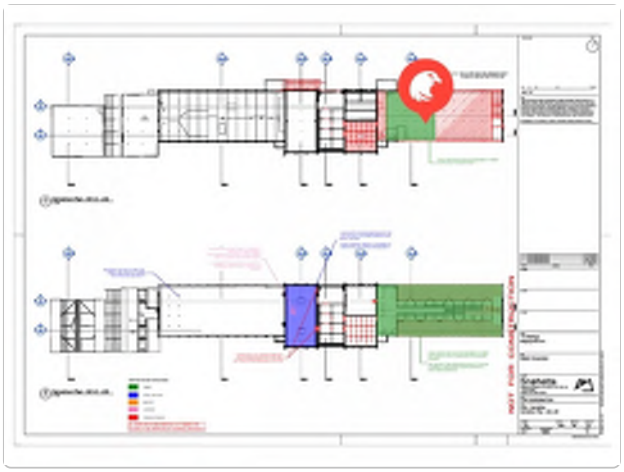
COMPONENT
Floor Joist

DEFECT
Fracture

REMARKS
Repair

Location





Photos and Sketches

06 Mar 2023, 2:35 PM / BCRC NSW

Spot 15

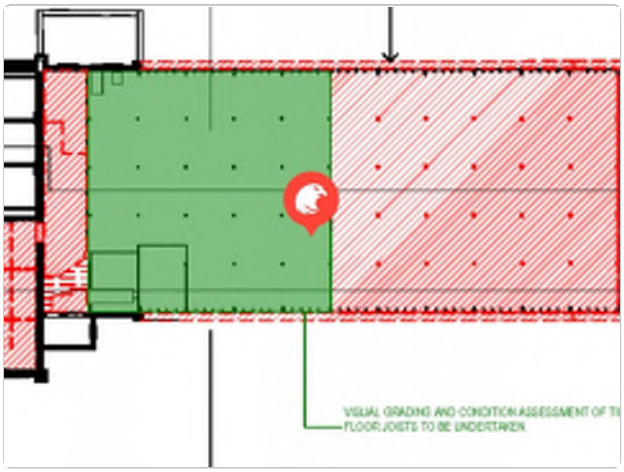
SEVERITY
Major

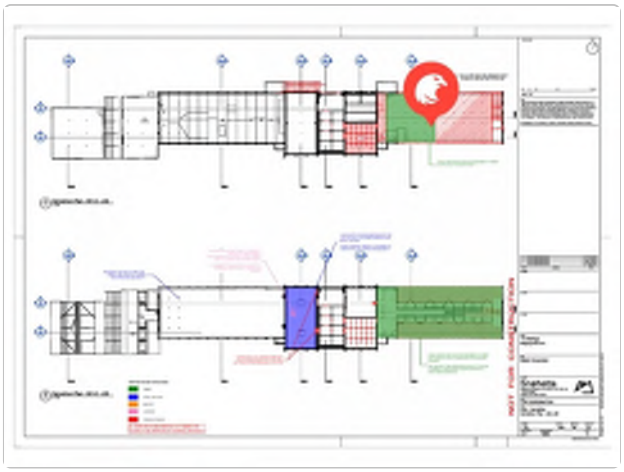
REPORTER
BCRC NSW

COMPONENT
Floor Joist

DEFECT
Fracture

Location





Photos and Sketches

06 Mar 2023, 2:37 PM / BCRC NSW

Spot 14

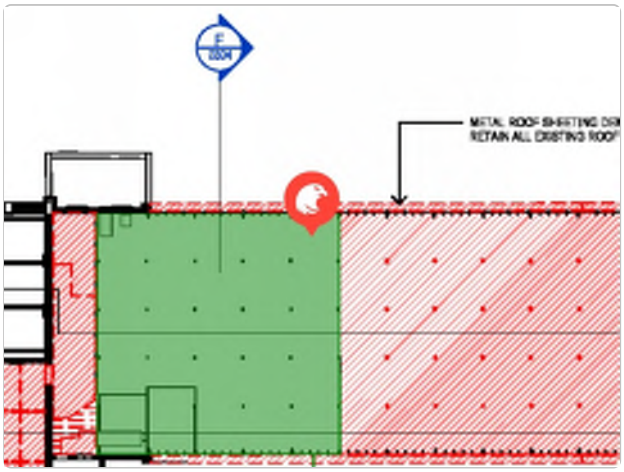
SEVERITY
Major

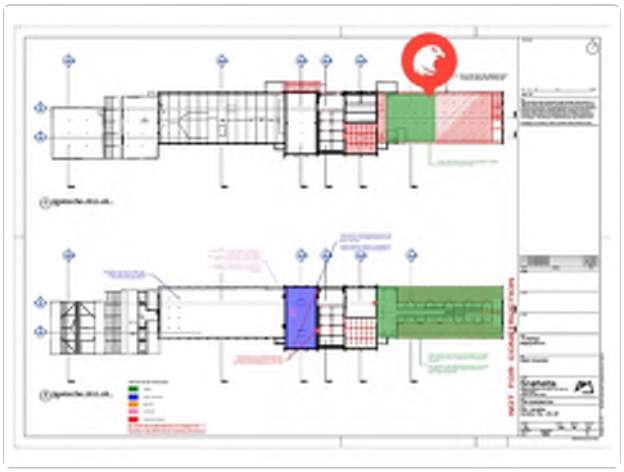
REPORTER
BCRC NSW

COMPONENT
Floor Joist

DEFECT
Split face to face

Location





Photos and Sketches

06 Mar 2023, 2:31 PM / BCRC NSW

06 Mar 2023, 2:31 PM / BCRC NSW

Spot 13

SEVERITY
Minor

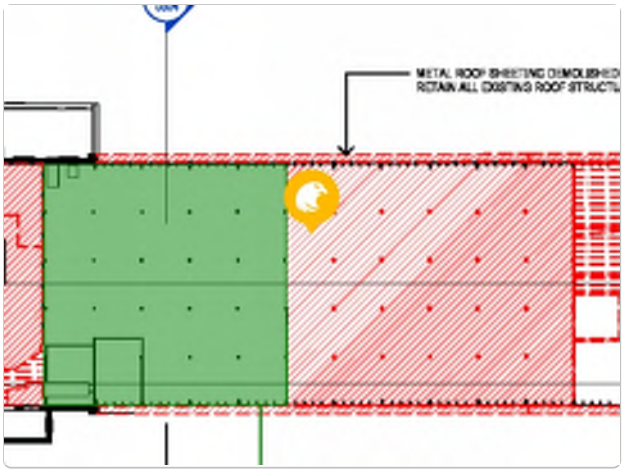
REPORTER
BCRC NSW

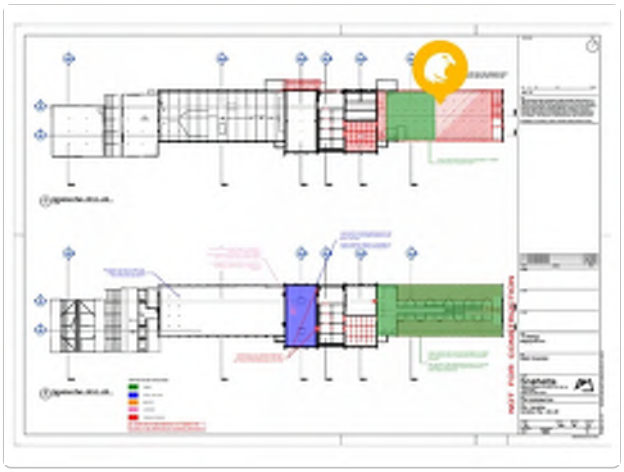
COMPONENT
Floor Joist

DEFECT
Split

REMARKS
30mm deep, repair

Location





Spot 12

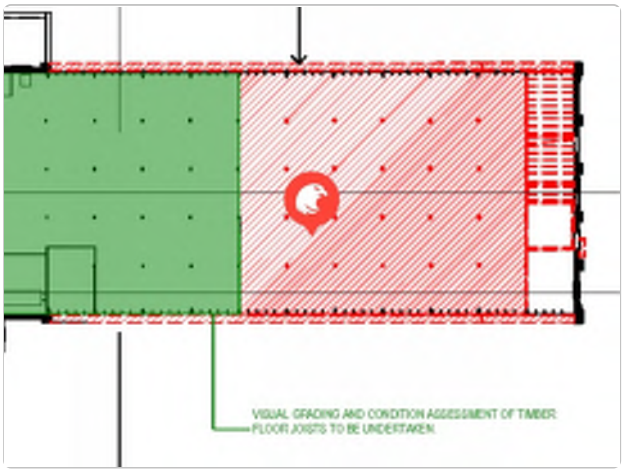
SEVERITY
Major

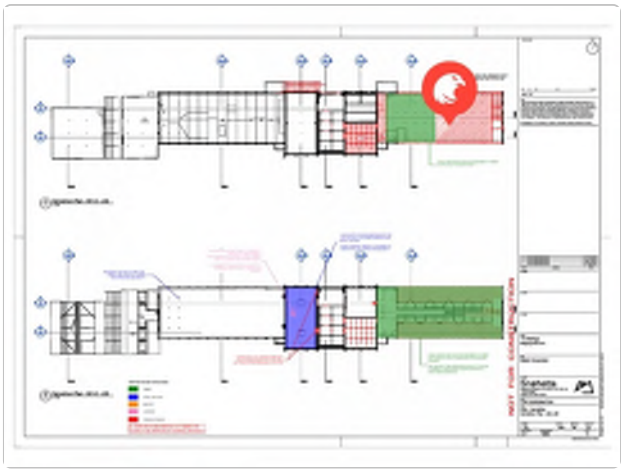
REPORTER
BCRC NSW

COMPONENT
Floor Joist

DEFECT
Fracture

Location





Photos and Sketches

06 Mar 2023, 2:25 PM / BCRC NSW

06 Mar 2023, 2:25 PM / BCRC NSW

Spot 11

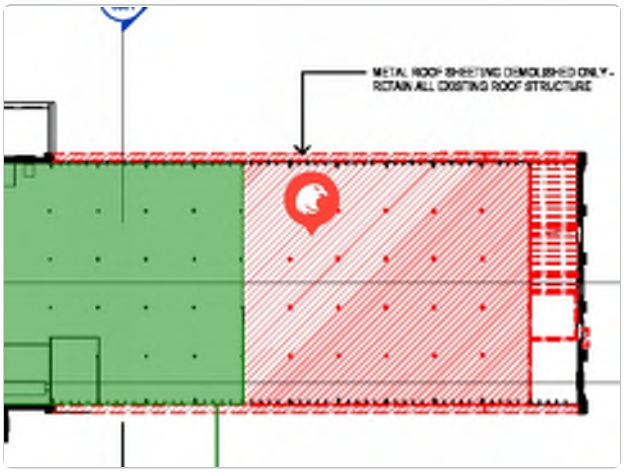
SEVERITY
Major

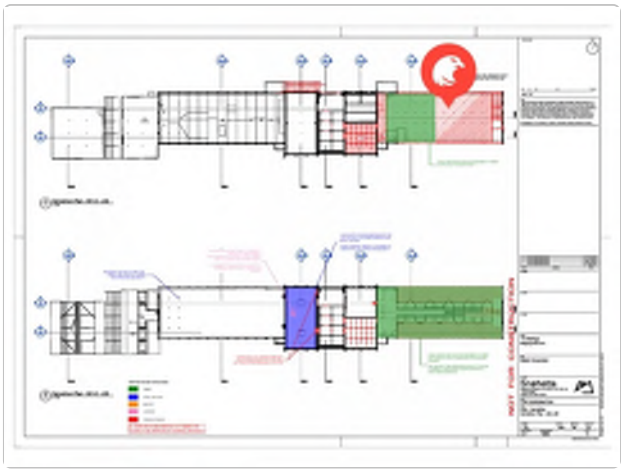
REPORTER
BCRC NSW

COMPONENT
Floor Joist

DEFECT
fracture

Location





Photos and Sketches

06 Mar 2023, 2:21 PM / BCRC NSW

06 Mar 2023, 2:21 PM / BCRC NSW

Spot 10

SEVERITY
Major

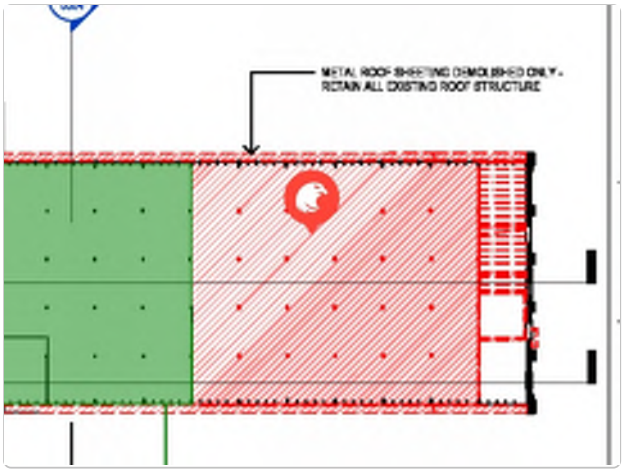
REPORTER
BCRC NSW

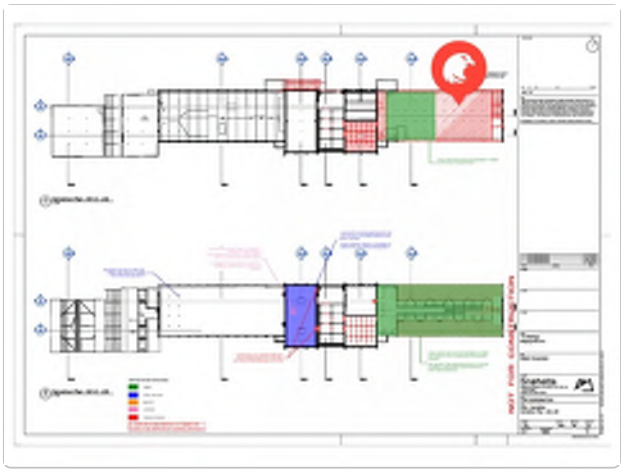
COMPONENT
Floor Joist

DEFECT
Fracture

REMARKS
Unserviceable

Location





Photos and Sketches

06 Mar 2023, 2:17 PM / BCRC NSW

06 Mar 2023, 2:17 PM / BCRC NSW

Spot 9

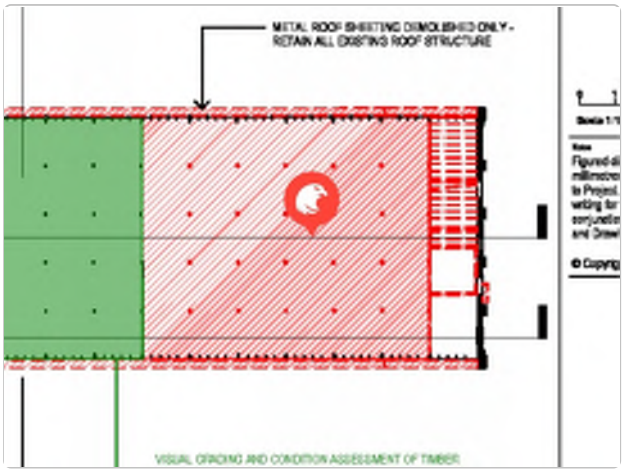
SEVERITY
Major

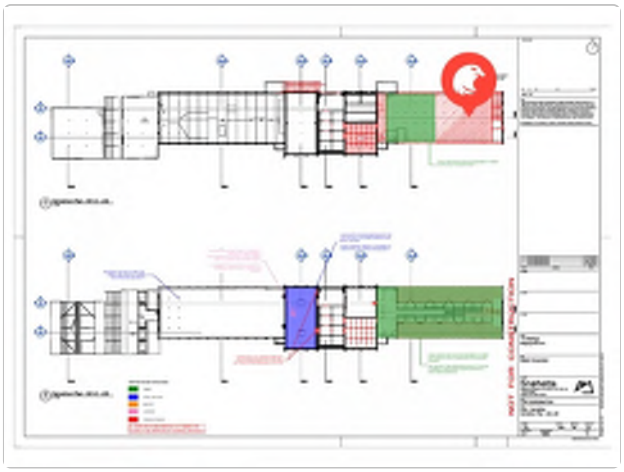
REPORTER
BCRC NSW

COMPONENT
Floor Joist

DEFECT
fire damage

Location





Photos and Sketches

06 Mar 2023, 2:19 PM / BCRC NSW

Spot 8

SEVERITY
Minor

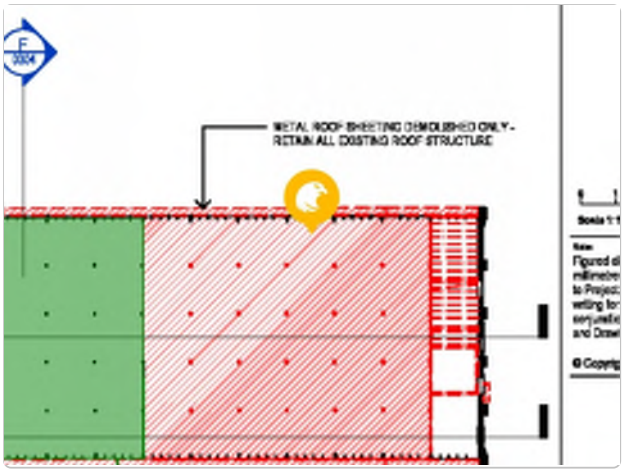
REPORTER
BCRC NSW

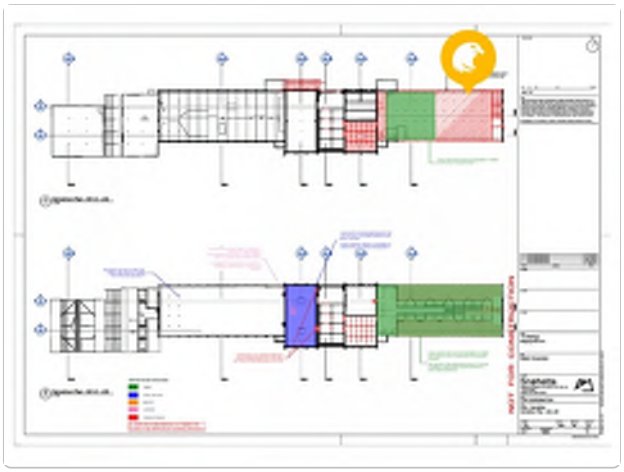
COMPONENT
Floor Joist

DEFECT
End Split

REMARKS
End split 300mm plate over

Location





Spot 7

SEVERITY
Major

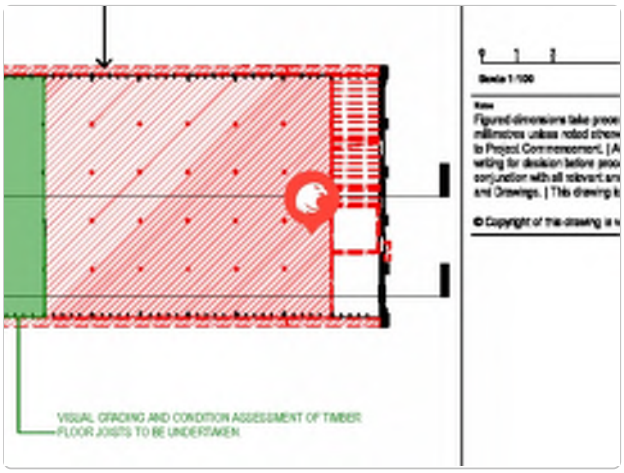
REPORTER
BCRC NSW

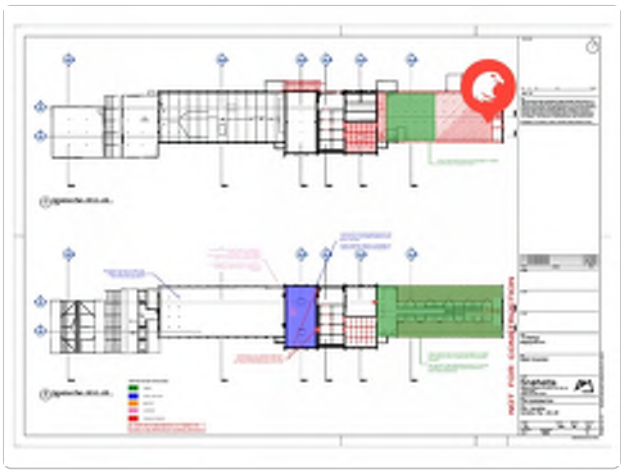
COMPONENT
Floor Joist

DEFECT
none

REMARKS
1 and 3 rot
Short bearers
notches are not affecting structural grade
Connections are sitting on bolt

Location





Photos and Sketches

06 Mar 2023, 4:04 PM / BCRC NSW

07 Mar 2023, 7:55 AM / BCRC NSW

Spot 6

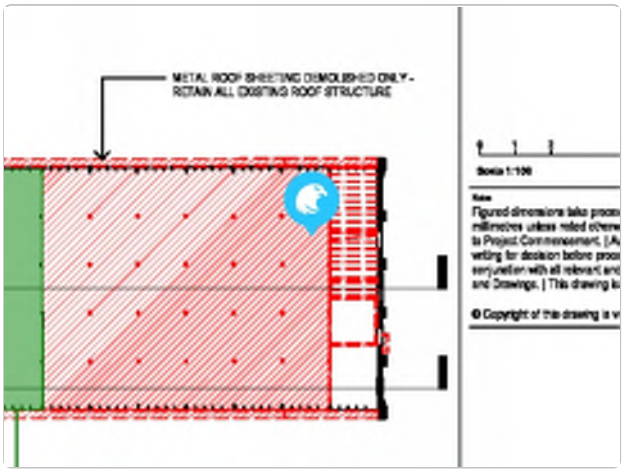
SEVERITY
None

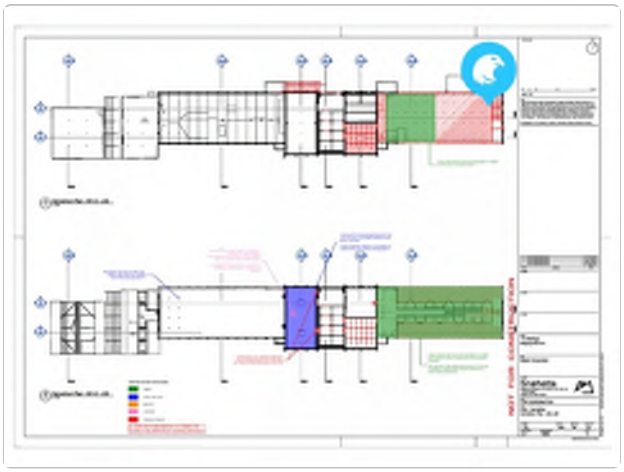
REPORTER
BCRC NSW

COMPONENT
Floor Joist

DEFECT
none

Location





Spot 5

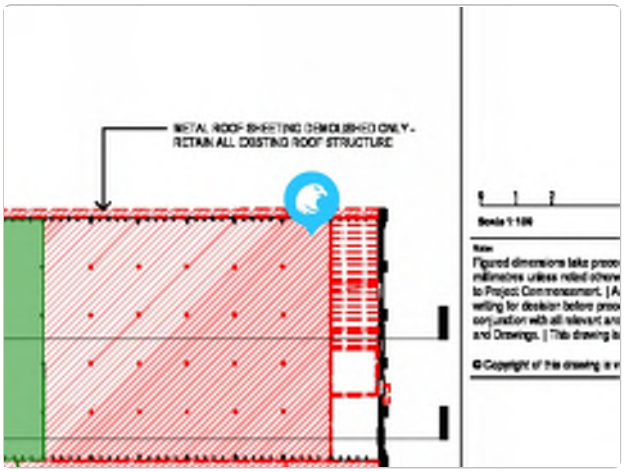
SEVERITY
None

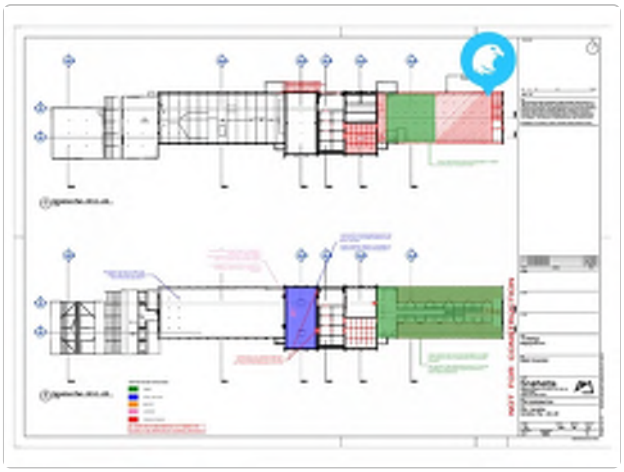
REPORTER
BCRC NSW

COMPONENT
Floor Joist

DEFECT
none

Location





Spot 4

SEVERITY
Major

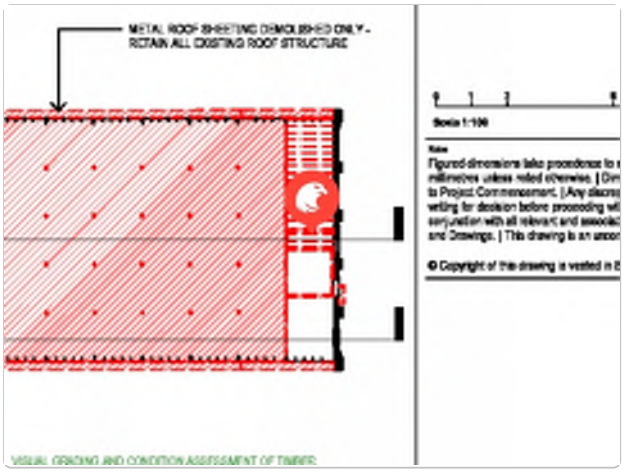
REPORTER
BCRC NSW

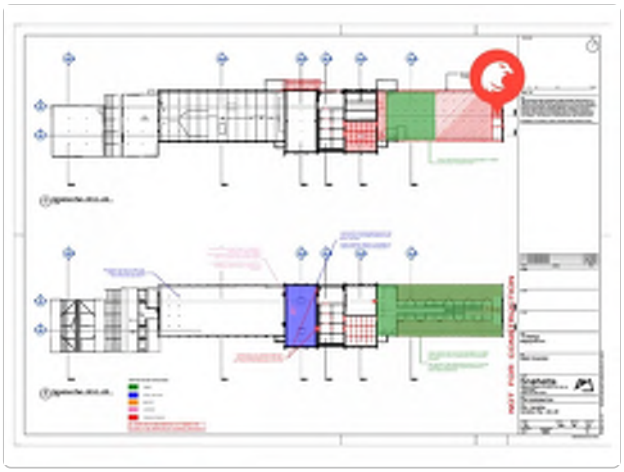
COMPONENT
Floor Joist

DEFECT
Rot

REMARKS
Unsound 50mm deep from top for all plate beside

Location





Photos and Sketches

06 Mar 2023, 2:03 PM / BCRC NSW

Spot 3

SEVERITY
Major

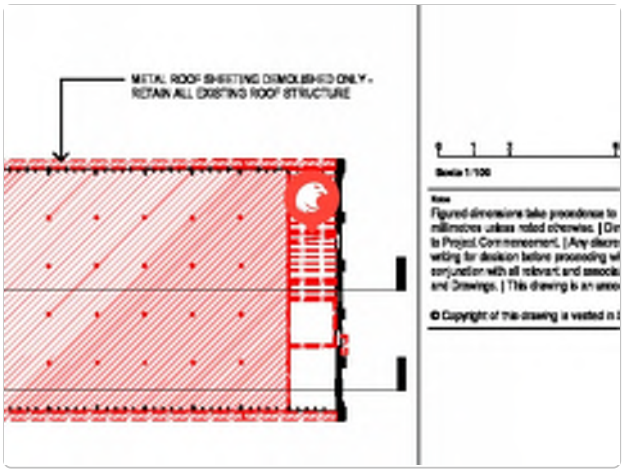
REPORTER
BCRC NSW

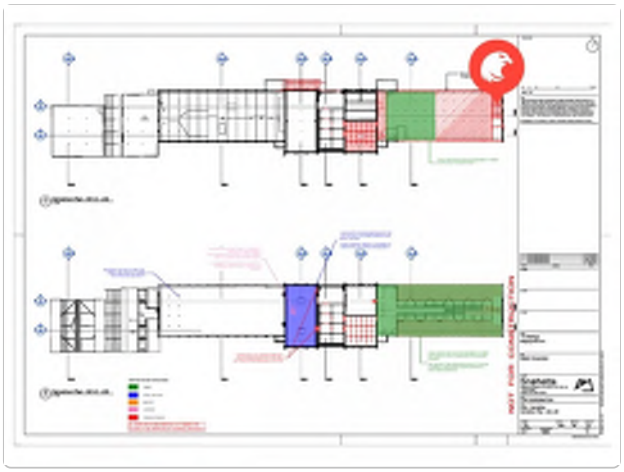
COMPONENT
Floor Joist

DEFECT
Rot

REMARKS
Decayed top 75mm for all members, plate besides

Location





Photos and Sketches

06 Mar 2023, 1:59 PM / BCRC NSW

Spot 2

SEVERITY
None

REPORTER
BCRC NSW

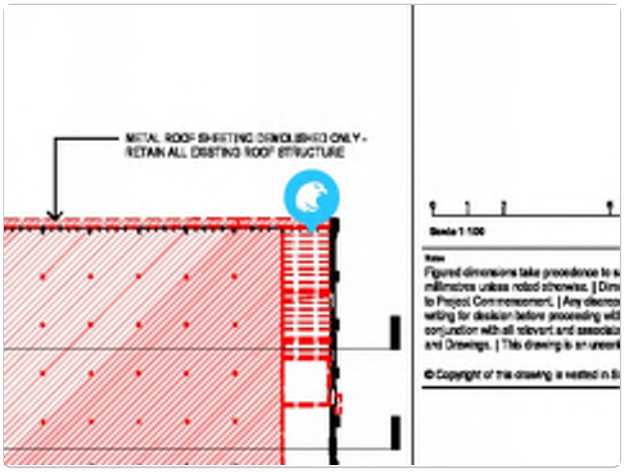
COMPONENT
Floor Joist

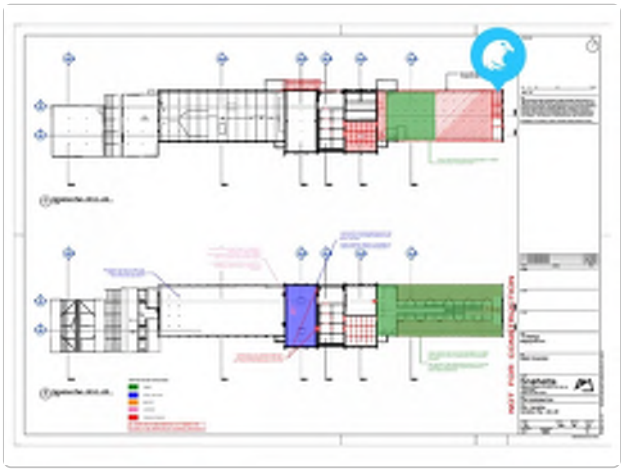
DEFECT
none

REMARKS
Sound
Cannot see the inside of joists against the wall

Size: 300x50
Span 3380
C-C 480

Location





Spot 1

SEVERITY
None

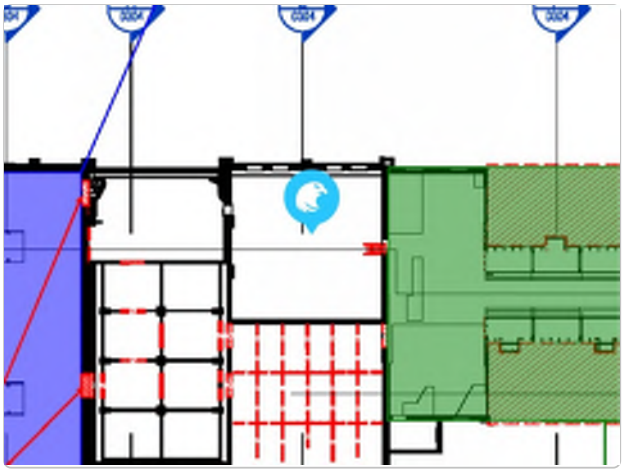
REPORTER
BCRC NSW

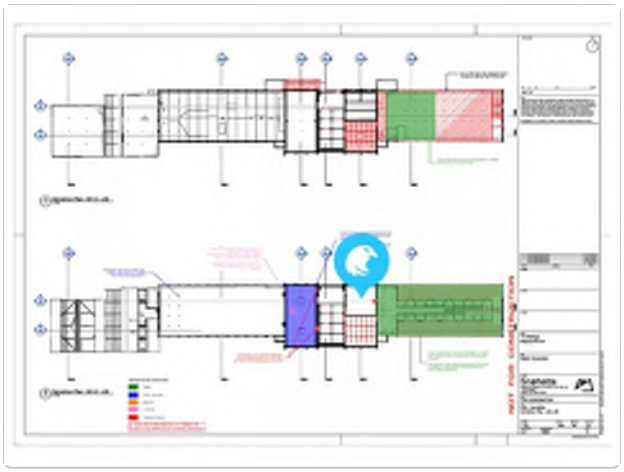
COMPONENT
Timber

DEFECT
none

REMARKS
Unsafe for physical inspection

Location





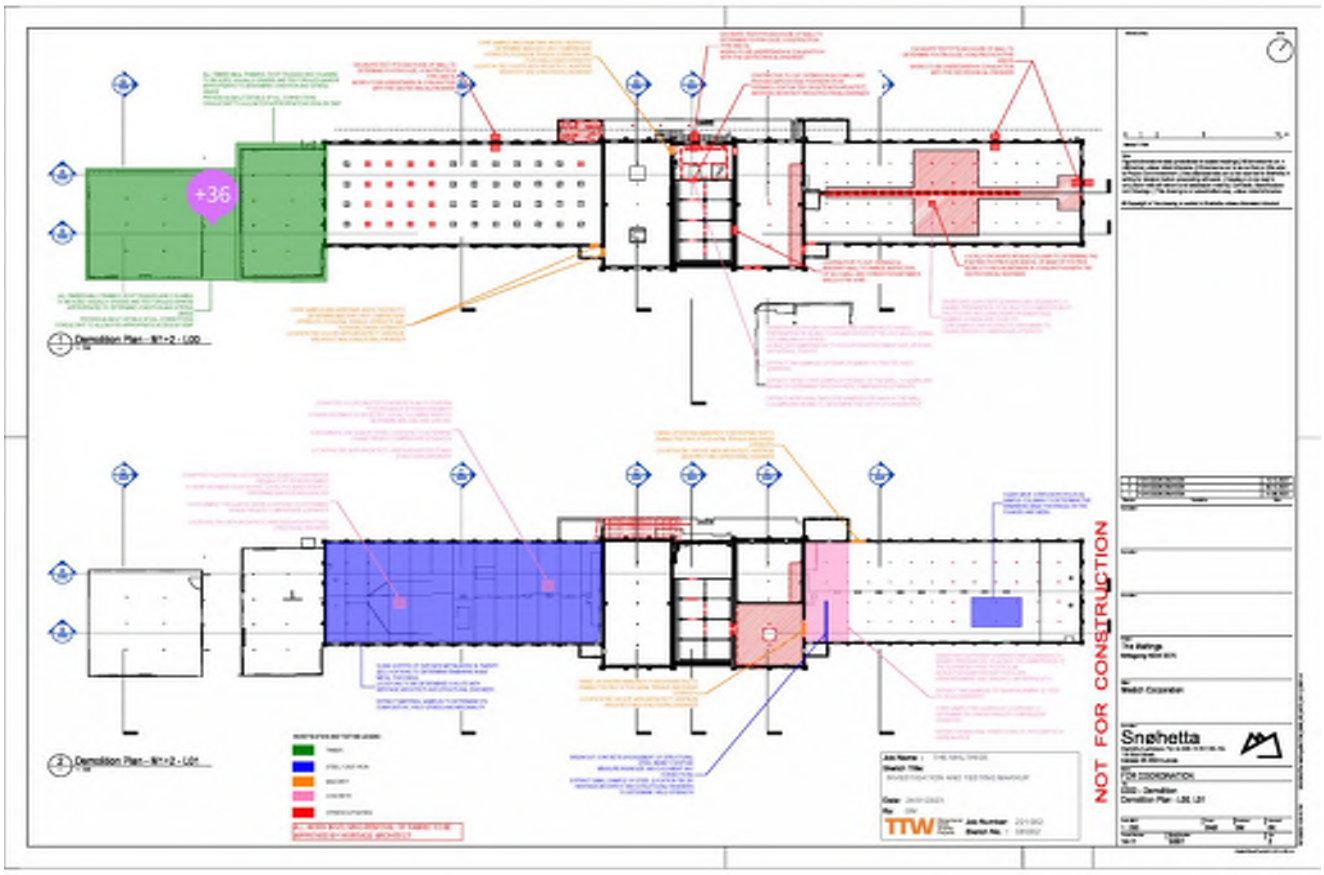
Photos and Sketches

06 Mar 2023, 11:45 AM / BCRC NSW

2D View

FILE NAME
1 - TTW DWG - M1 and M2

TOTAL SPOTS IN VIEW
36 Spots



Spot 91

SEVERITY
Major

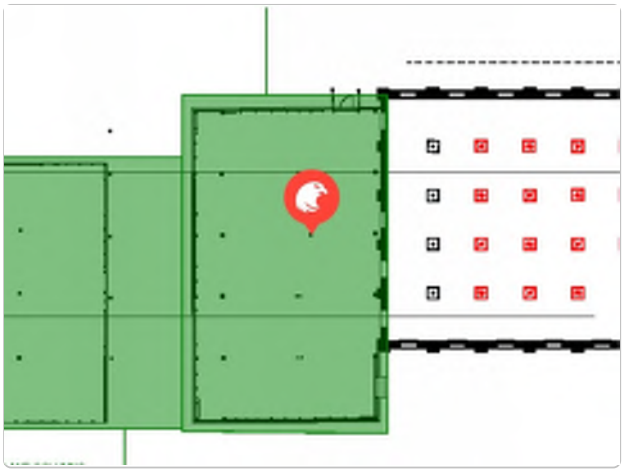
REPORTER
BCRC NSW

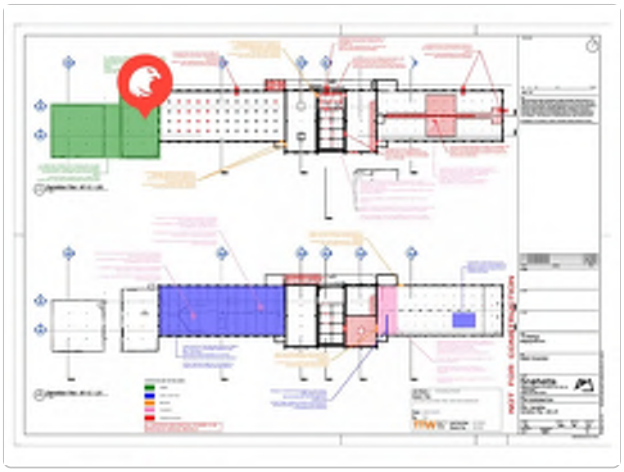
COMPONENT
Post

DEFECT
Rot

REMARKS
Rot at top of post under walkway and connected bottom cord and joists
This post 170x170mm
Joist 110x75

Location





Photos and Sketches

28 Apr 2023, 10:01 AM / BCRC NSW

28 Apr 2023, 10:01 AM / BCRC NSW

Spot 91

28 Apr 2023, 10:01 AM / BCRC NSW

Spot 90

SEVERITY
None

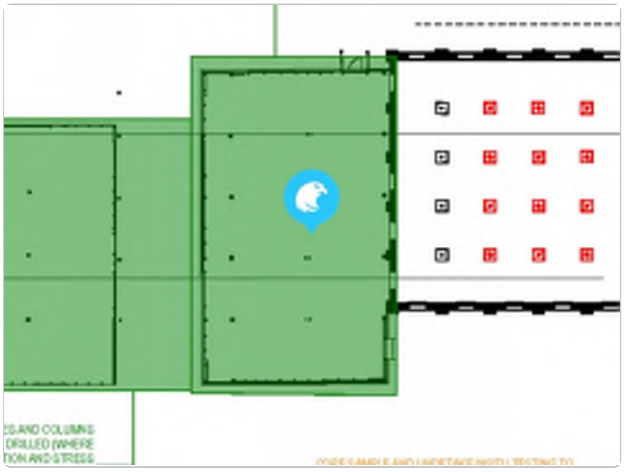
REPORTER
BCRC NSW

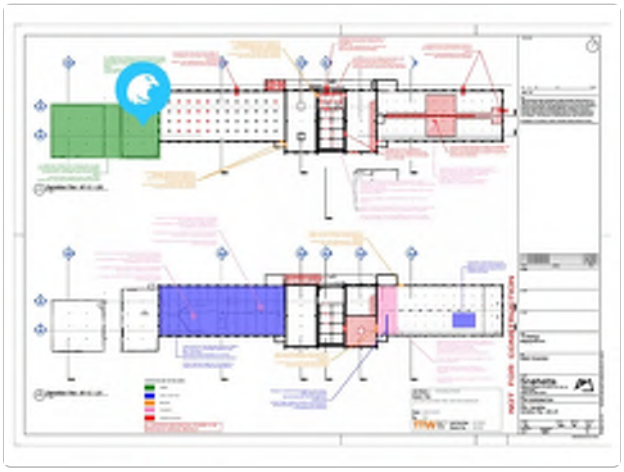
COMPONENT
Roof

DEFECT
None

REMARKS
Roof truss in general good condition. Some areas of roof sheeting have holes mainly walkway affected, trusses are OK. Trusses are Oregon F11
Struts 100x100mm
Purlin 120x75
Bottom chord 290x100
Top chord 190x100
Additional Angle struts at queen post 75x75
Beam 240x110

Location





Photos and Sketches

28 Apr 2023, 9:57 AM / BCRC NSW

28 Apr 2023, 9:57 AM / BCRC NSW

Spot 90

28 Apr 2023, 9:57 AM / BCRC NSW

28 Apr 2023, 9:57 AM / BCRC NSW

Spot 89

SEVERITY
Major

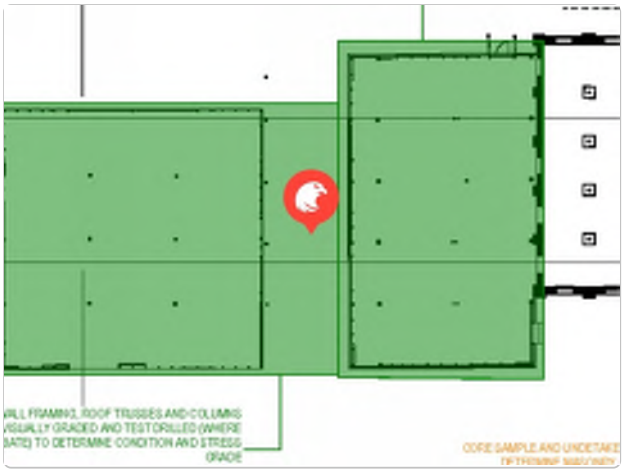
REPORTER
BCRC NSW

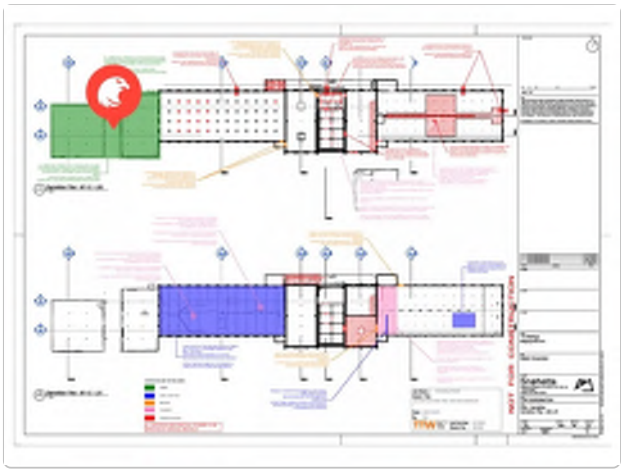
COMPONENT
all between sheds

DEFECT
exposure to elements

REMARKS
All elements between the sheds out of grade

Location





Spot 88

SEVERITY
Major

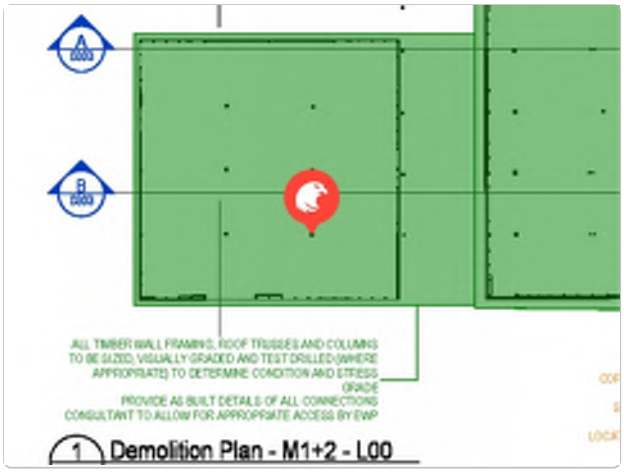
REPORTER
BCRC NSW

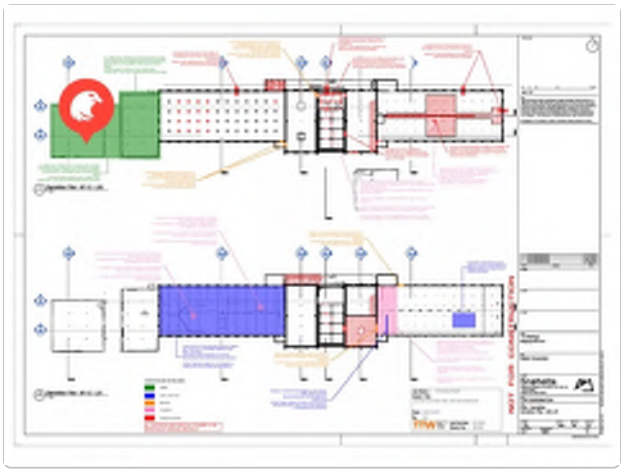
COMPONENT
Post

DEFECT
Rot

REMARKS
Severe decay 50mm

Location





Photos and Sketches

07 Mar 2023, 1:42 PM / BCRC NSW

Spot 87

SEVERITY
Major

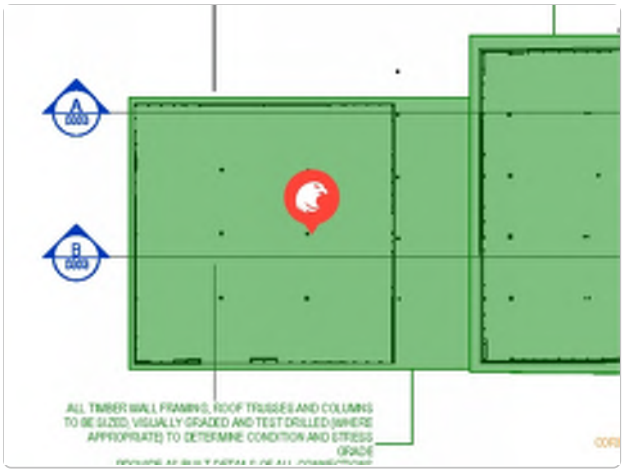
REPORTER
BCRC NSW

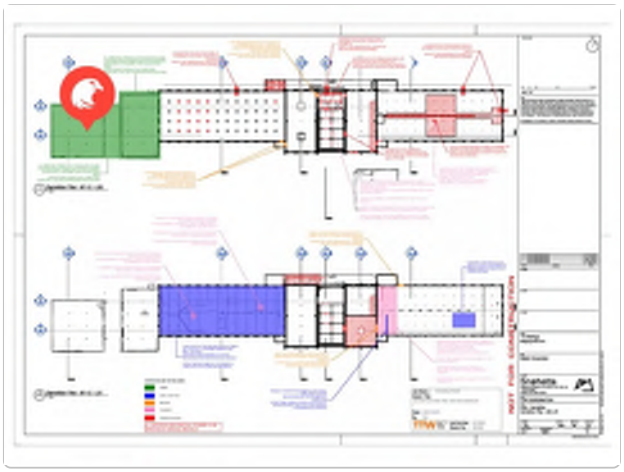
COMPONENT
Post

DEFECT
Rot

REMARKS
Severe decay at ground 50mm

Location





Photos and Sketches

07 Mar 2023, 1:41 PM / BCRC NSW

Spot 86

SEVERITY
Major

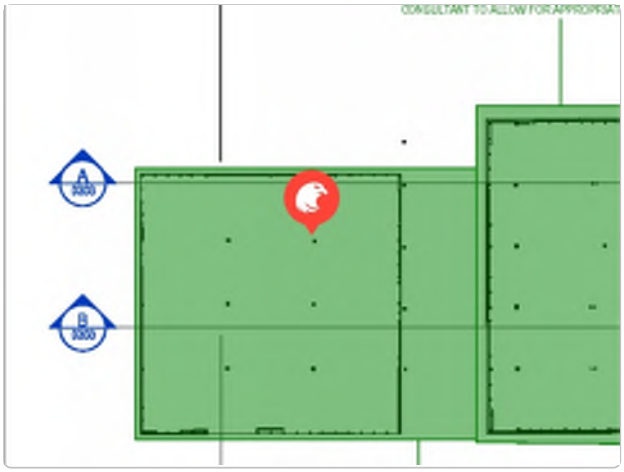
REPORTER
BCRC NSW

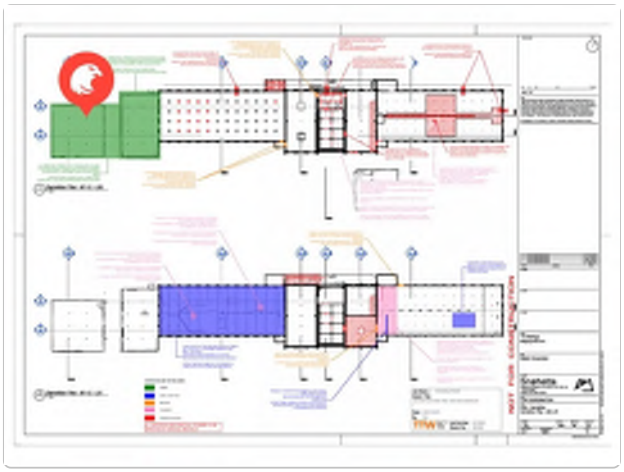
COMPONENT
Post

DEFECT
Rot

REMARKS
Severe decay at ground

Location





Photos and Sketches

07 Mar 2023, 1:40 PM / BCRC NSW

Spot 85

SEVERITY
Major

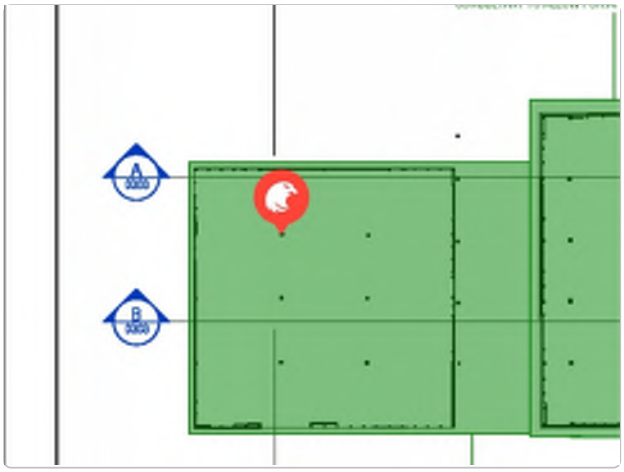
REPORTER
BCRC NSW

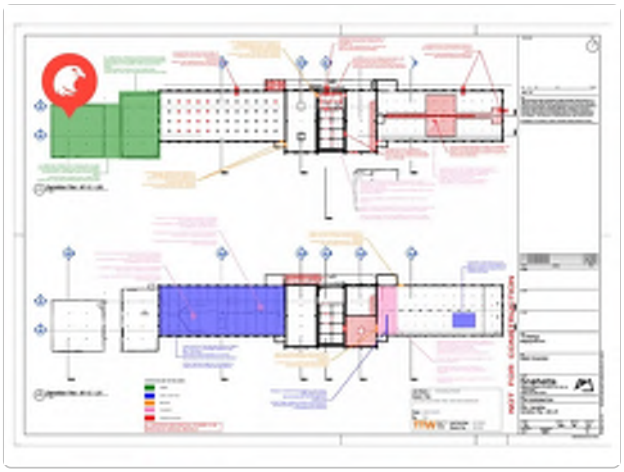
COMPONENT
Post

DEFECT
Rot

REMARKS
Severe decay at ground level

Location





Photos and Sketches

07 Mar 2023, 1:39 PM / BCRC NSW

Spot 84

SEVERITY
Major

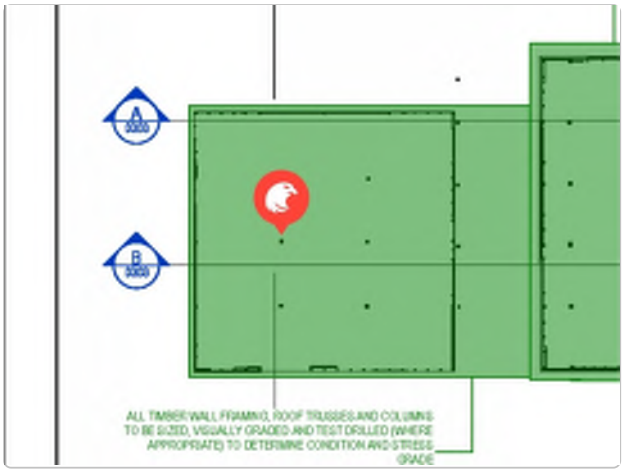
REPORTER
BCRC NSW

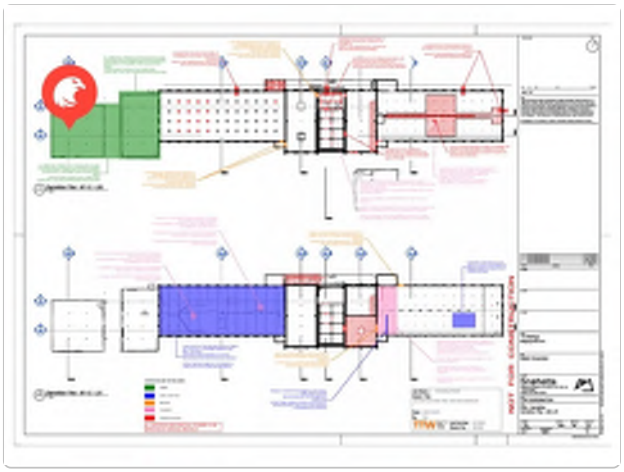
COMPONENT
Post

DEFECT
rot and want and wane

REMARKS
Out of grade but repairable

Location





Photos and Sketches

07 Mar 2023, 12:33 PM / BCRC NSW

07 Mar 2023, 12:35 PM / BCRC NSW

Spot 84

07 Mar 2023, 12:35 PM / BCRC NSW

Spot 83

SEVERITY
Major

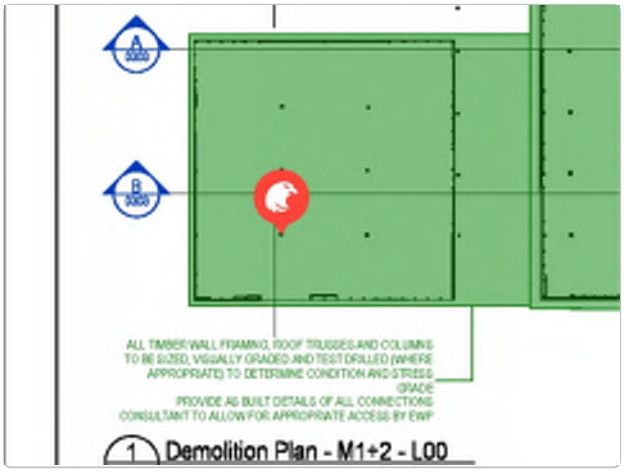
REPORTER
BCRC NSW

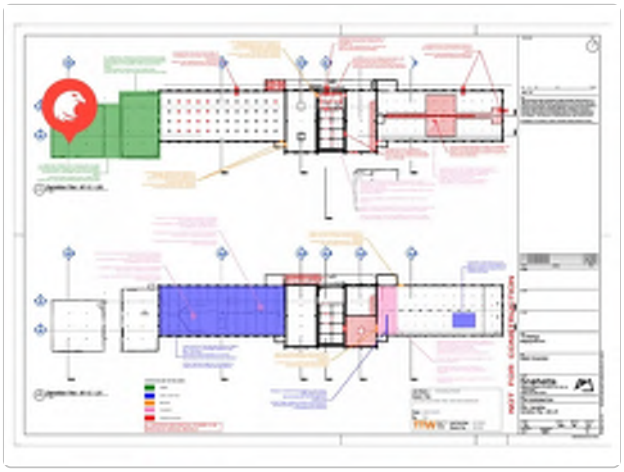
COMPONENT
Post

DEFECT
Rot

REMARKS
Size 190x190
C-C:
between wall 5980
Between posts 6080
Decay 25mm

Location





Photos and Sketches

07 Mar 2023, 12:31 PM / BCRC NSW

Spot 82

SEVERITY
None

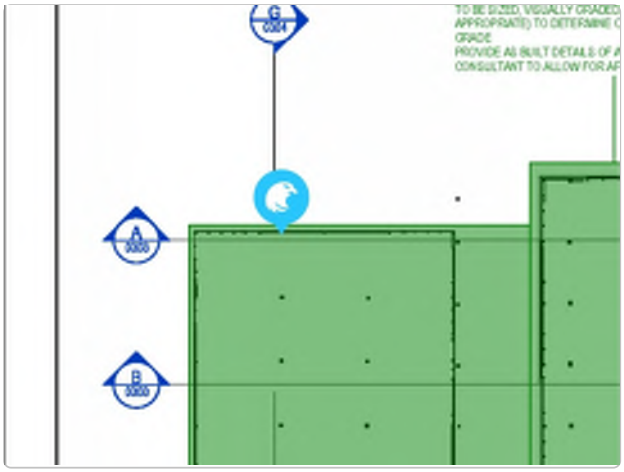
REPORTER
BCRC NSW

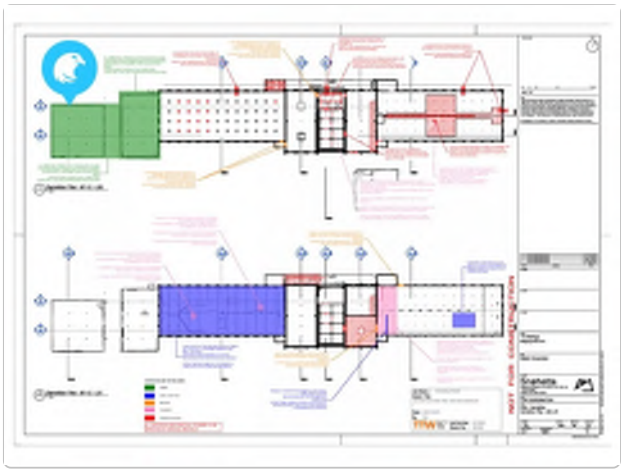
COMPONENT
inaccessible

DEFECT
debris

REMARKS
Could not inspect due to access

Location





Photos and Sketches

07 Mar 2023, 12:28 PM / BCRC NSW

07 Mar 2023, 12:28 PM / BCRC NSW

Spot 82

07 Mar 2023, 12:28 PM / BCRC NSW

Spot 81

SEVERITY
Minor

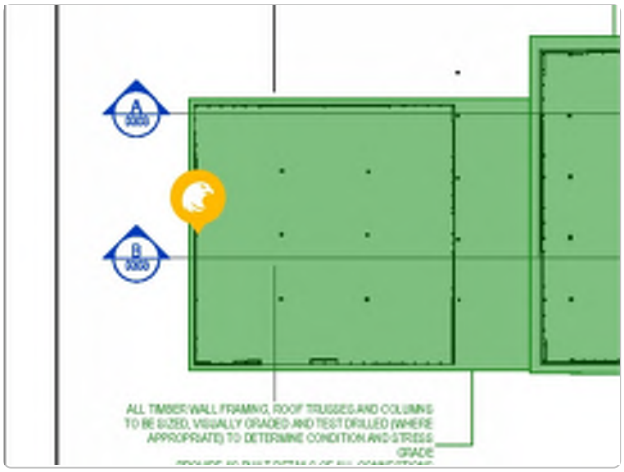
REPORTER
BCRC NSW

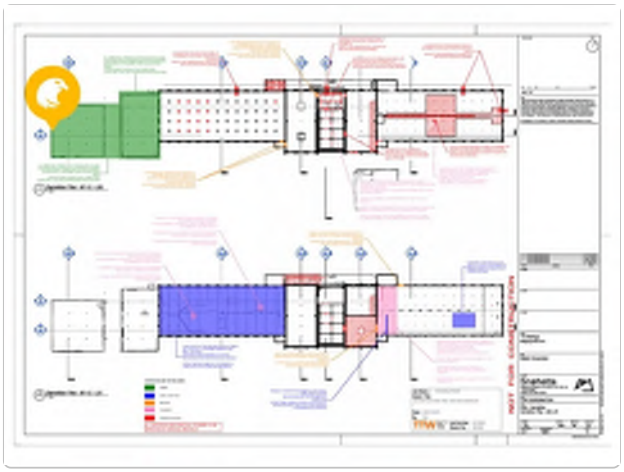
COMPONENT
bottom plate

DEFECT
Rot

REMARKS
Attachment of post to plate is minimal

Location





Photos and Sketches

07 Mar 2023, 12:27 PM / BCRC NSW

Spot 80

SEVERITY
Minor

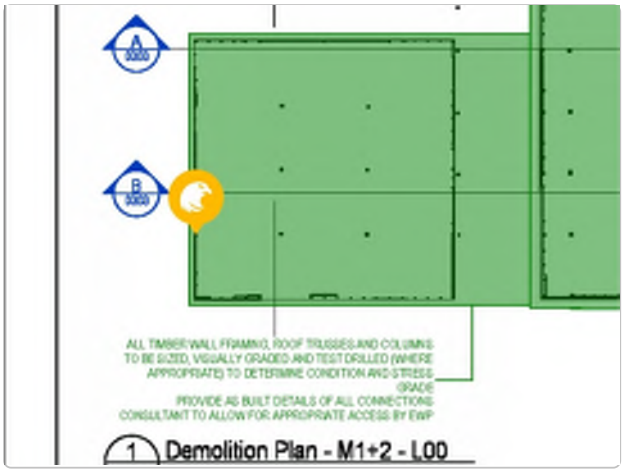
REPORTER
BCRC NSW

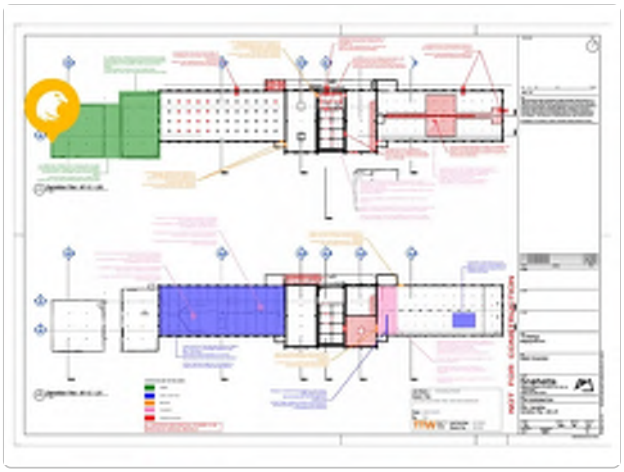
COMPONENT
Post

DEFECT
Rot

REMARKS
Minor decay in corner

Location





Photos and Sketches

07 Mar 2023, 12:23 PM / BCRC NSW

Spot 79

SEVERITY
None

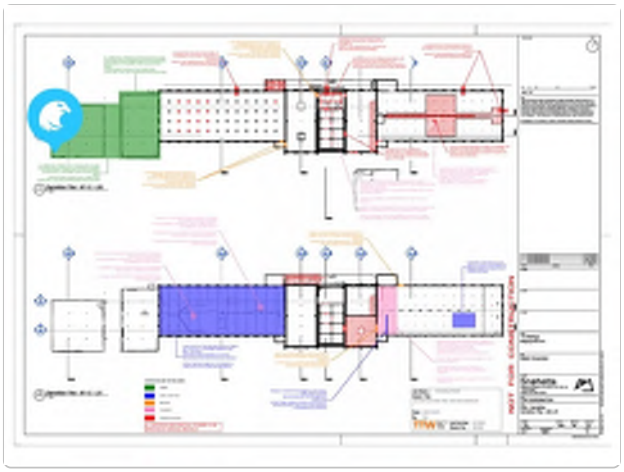
REPORTER
BCRC NSW

COMPONENT
loose timber

DEFECT
termite loose timber

REMARKS
Loose timber shows signs of termite damage and presence, ideally removed
Cannot inspect behind

Location



Photos and Sketches

07 Mar 2023, 12:21 PM / BCRC NSW

Spot 78

SEVERITY
Major

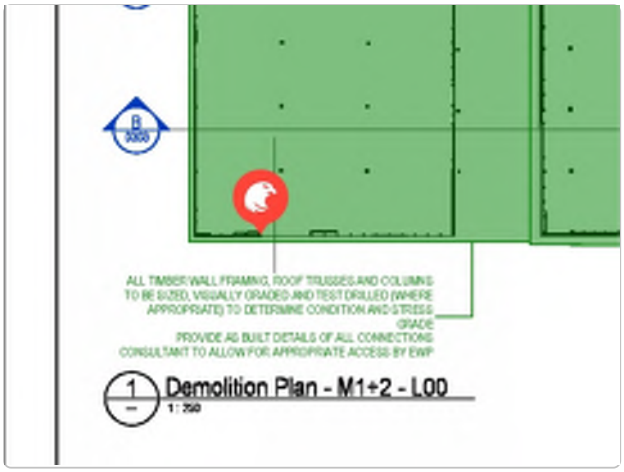
REPORTER
BCRC NSW

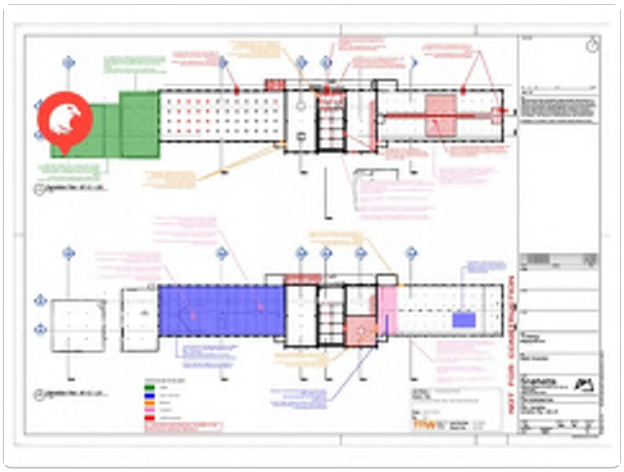
COMPONENT
Post

DEFECT
Rot

REMARKS
Rot at ground level

Location





Photos and Sketches

07 Mar 2023, 12:20 PM / BCRC NSW

Spot 77

SEVERITY
Major

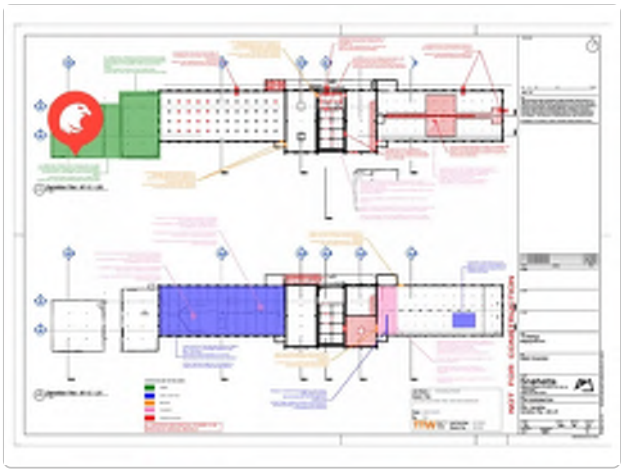
REPORTER
BCRC NSW

COMPONENT
Post

DEFECT
Rot

REMARKS
Decayed at ground level

Location



Photos and Sketches

07 Mar 2023, 12:18 PM / BCRC NSW

07 Mar 2023, 12:18 PM / BCRC NSW

Spot 76

SEVERITY
Major

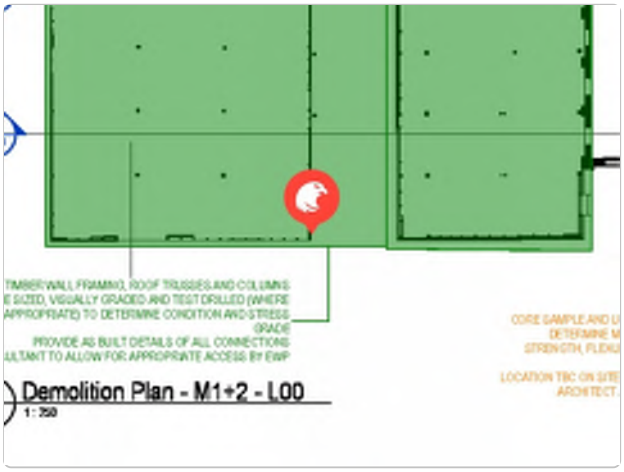
REPORTER
BCRC NSW

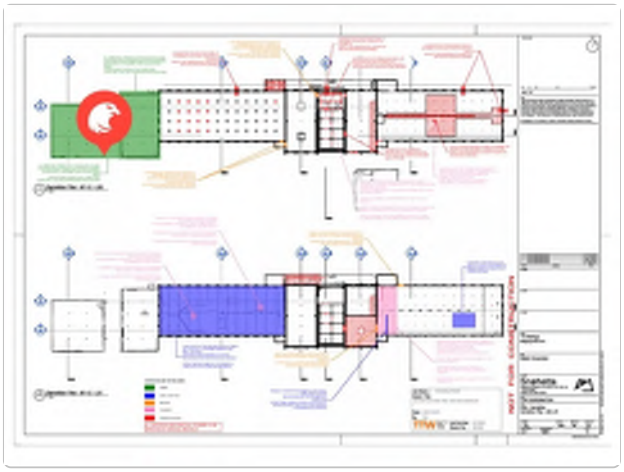
COMPONENT
Post

DEFECT
Termites

REMARKS
Termite damage minimal and in battening
Battening around the post 75x38
Belt rail 75x38 @1000mm c-c
Stud framing 95x75 @900mmc-c
Cross brace 145-50mm

Location





Photos and Sketches

07 Mar 2023, 12:10 PM / BCRC NSW

Spot 75

SEVERITY
Major

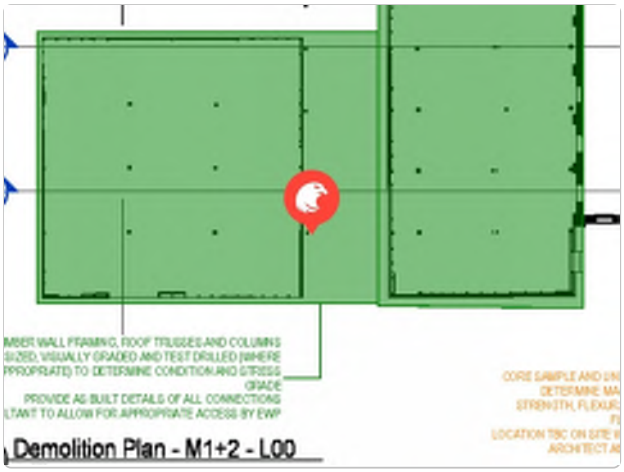
REPORTER
BCRC NSW

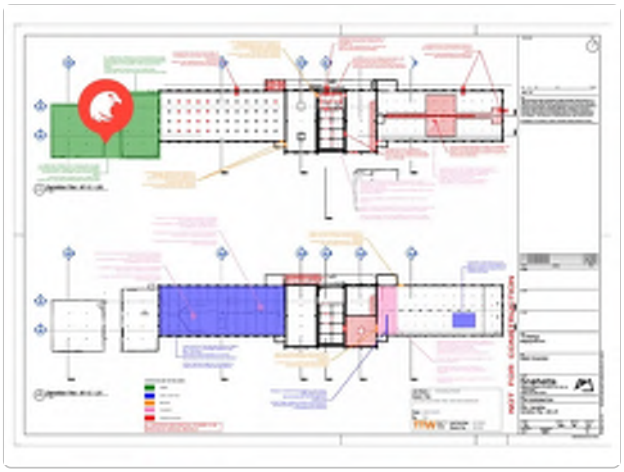
COMPONENT
bottom plate

DEFECT
Rot

REMARKS
Decay in bottom plate

Location





Photos and Sketches

07 Mar 2023, 12:07 PM / BCRC NSW

Spot 74

SEVERITY
None

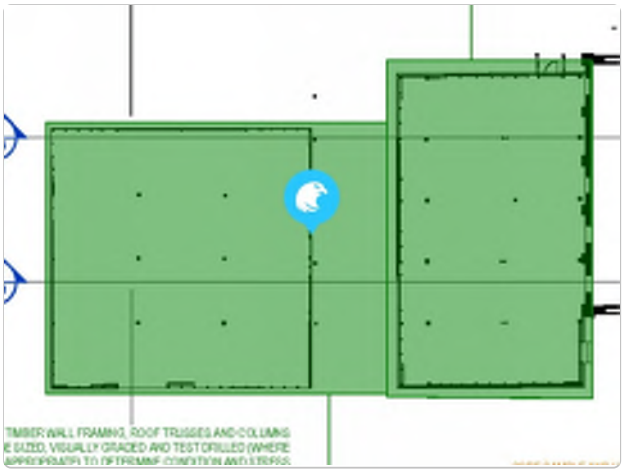
REPORTER
BCRC NSW

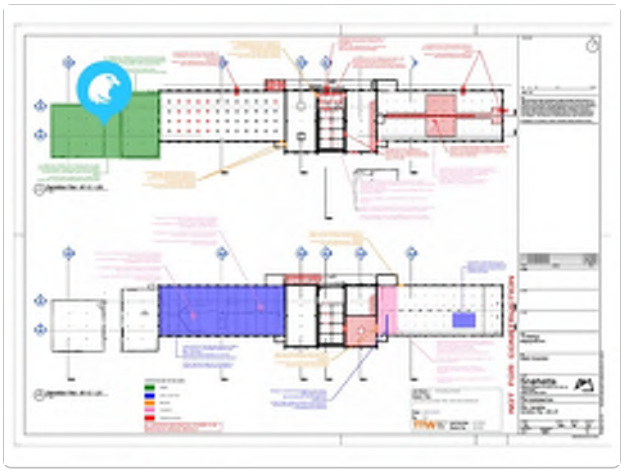
COMPONENT
Post

DEFECT
none

REMARKS
Area had debris could not inspect closely, decay in bottom plate/sill plate

Location





Photos and Sketches

07 Mar 2023, 12:06 PM / BCRC NSW

Spot 73

SEVERITY
Major

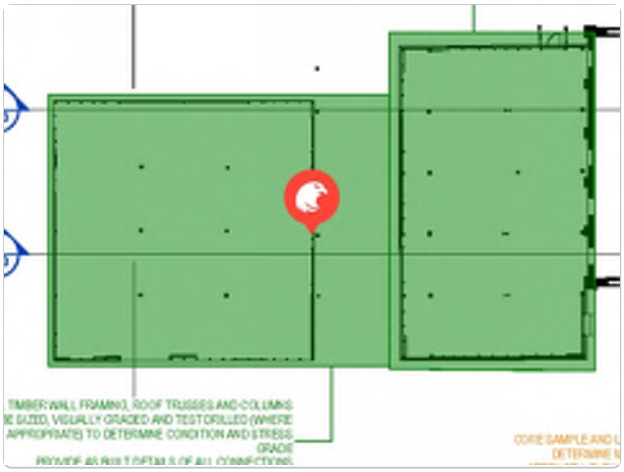
REPORTER
BCRC NSW

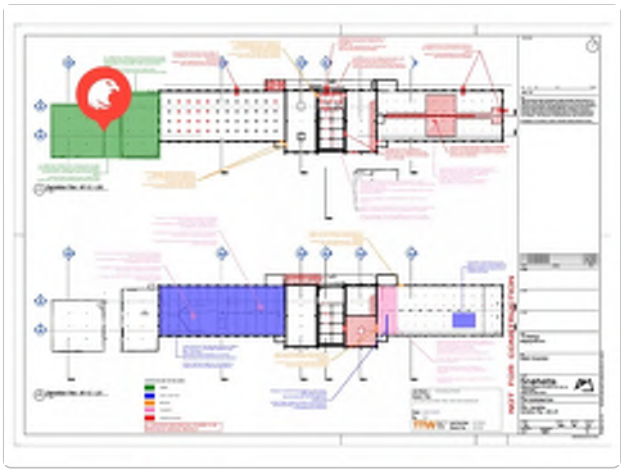
COMPONENT
Post

DEFECT
Rot

REMARKS
Post decayed at ground line

Location





Photos and Sketches

07 Mar 2023, 12:02 PM / BCRC NSW

07 Mar 2023, 12:02 PM / BCRC NSW

Spot 72

SEVERITY
Major

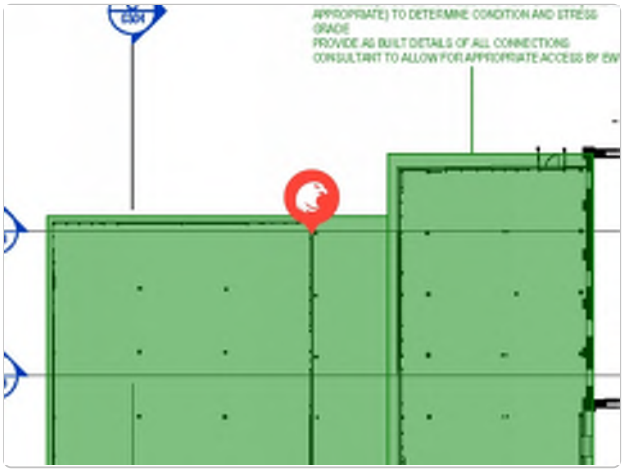
REPORTER
BCRC NSW

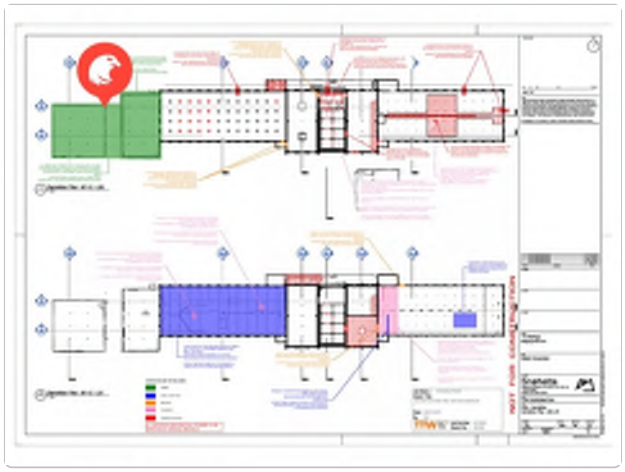
COMPONENT
post bottom plate frame

DEFECT
Termites

REMARKS
150x150
Posts @4480c-c
Post bottom plate and door framing termite damage. Active termites
Hardwood post seems largely unaffected due to Oregon presence (termites move through soft timber wherever they can) potential that hardwood post bottom compromised

Location





Photos and Sketches

07 Mar 2023, 11:54 AM / BCRC NSW

07 Mar 2023, 11:54 AM / BCRC NSW

Spot 72

07 Mar 2023, 11:54 AM / BCRC NSW

07 Mar 2023, 11:54 AM / BCRC NSW

07 Mar 2023, 12:00 PM / BCRC NSW

Spot 71

SEVERITY
None

REPORTER
BCRC NSW

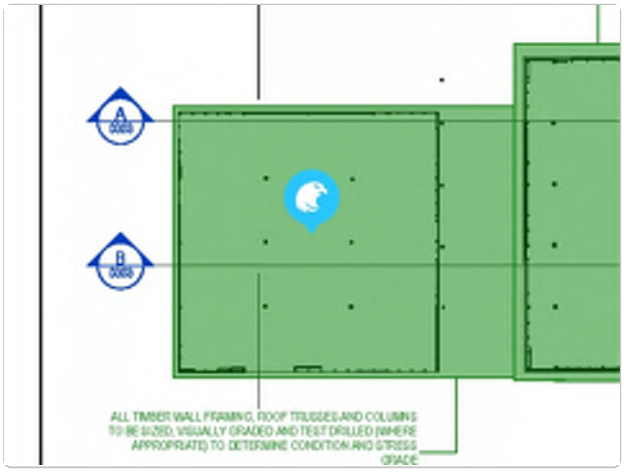
COMPONENT
general

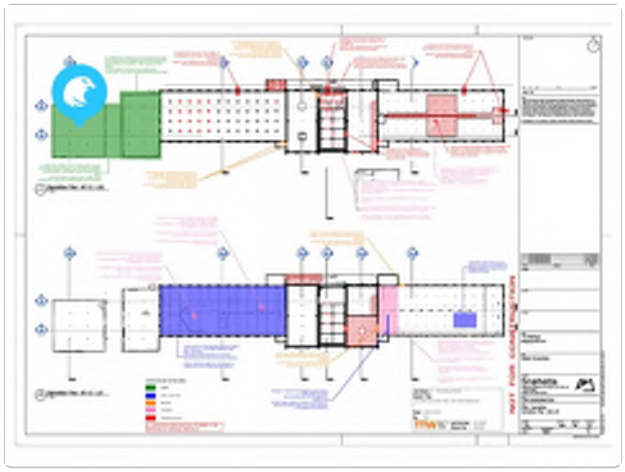
DEFECT
none

REMARKS
Shed roof in genereral good condition all mixed nsw hardwood

Size: 200mm x 155mm x 2400mm
75mm x 140mm
140 mm x 100mm

Location





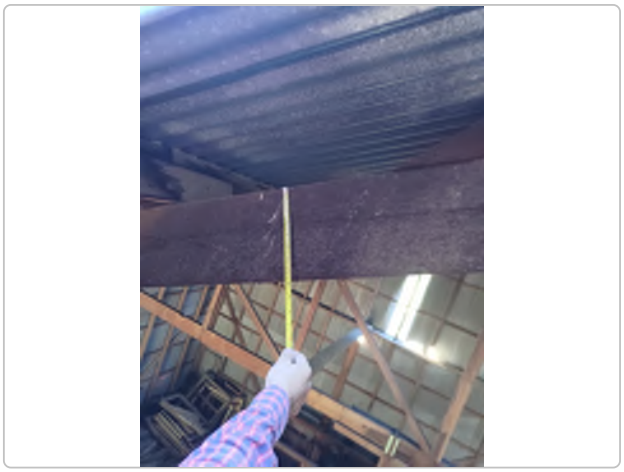
Photos and Sketches

07 Mar 2023, 11:46 AM / BCRC NSW

07 Mar 2023, 11:46 AM / BCRC NSW

Spot 71

07 Mar 2023, 11:46 AM / BCRC NSW



27 Apr 2023, 10:09 AM / BCRC NSW

27 Apr 2023, 10:09 AM / BCRC NSW

27 Apr 2023, 10:09 AM / BCRC NSW

27 Apr 2023, 10:09 AM / BCRC NSW

27 Apr 2023, 10:09 AM / BCRC NSW

Spot 71

27 Apr 2023, 10:09 AM / BCRC NSW

27 Apr 2023, 10:09 AM / BCRC NSW

27 Apr 2023, 10:09 AM / BCRC NSW

27 Apr 2023, 10:09 AM / BCRC NSW

27 Apr 2023, 10:09 AM / BCRC NSW

27 Apr 2023, 10:09 AM / BCRC NSW

Spot 71

27 Apr 2023, 10:09 AM / BCRC NSW

27 Apr 2023, 10:09 AM / BCRC NSW

27 Apr 2023, 10:09 AM / BCRC NSW

27 Apr 2023, 10:09 AM / BCRC NSW

27 Apr 2023, 10:09 AM / BCRC NSW

Spot 70

SEVERITY
Major

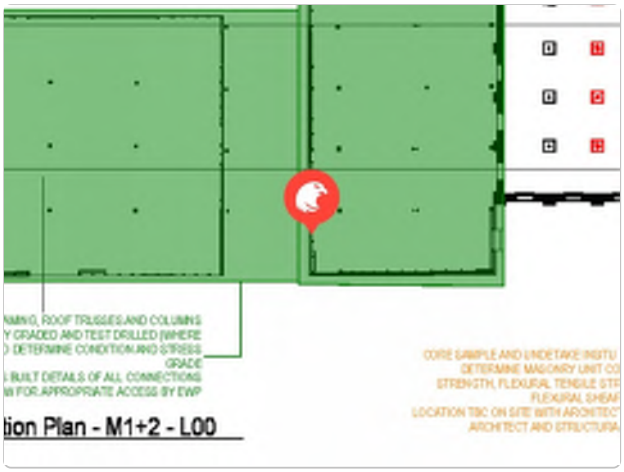
REPORTER
BCRC NSW

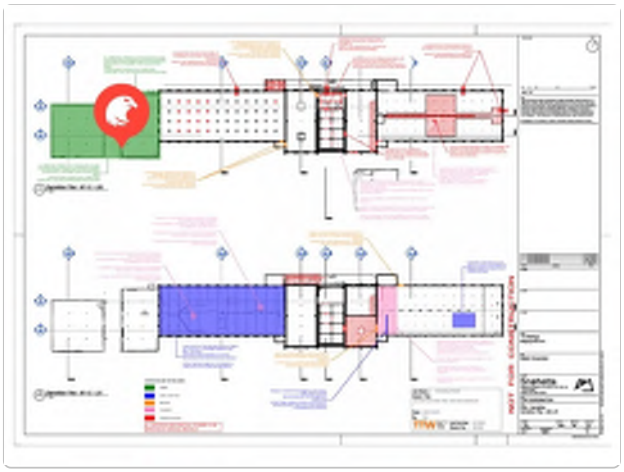
COMPONENT
end wall frame

DEFECT
Rot

REMARKS
Rot at ground level

Location





Photos and Sketches

07 Mar 2023, 11:34 AM / BCRC NSW

Spot 69

SEVERITY
Minor

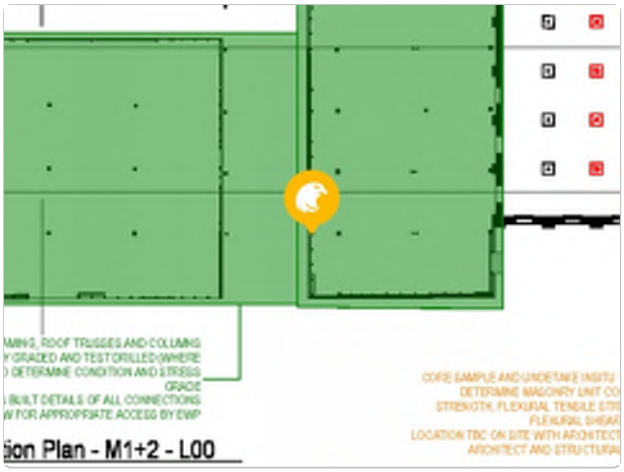
REPORTER
BCRC NSW

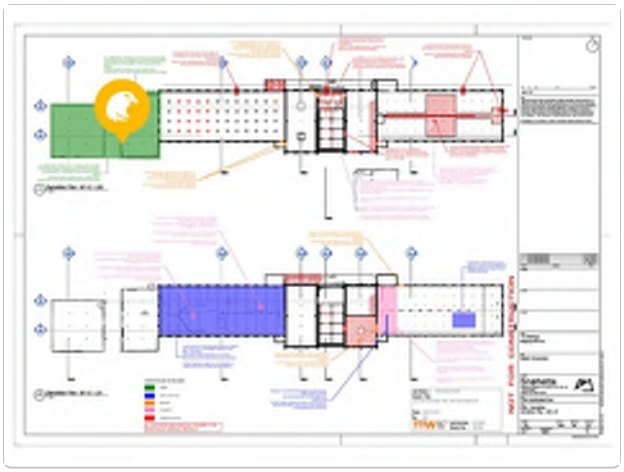
COMPONENT
Post

DEFECT
Rot

REMARKS
Hardwood post
20mm decay

Location





Photos and Sketches

07 Mar 2023, 11:31 AM / BCRC NSW

Spot 68

SEVERITY
Major

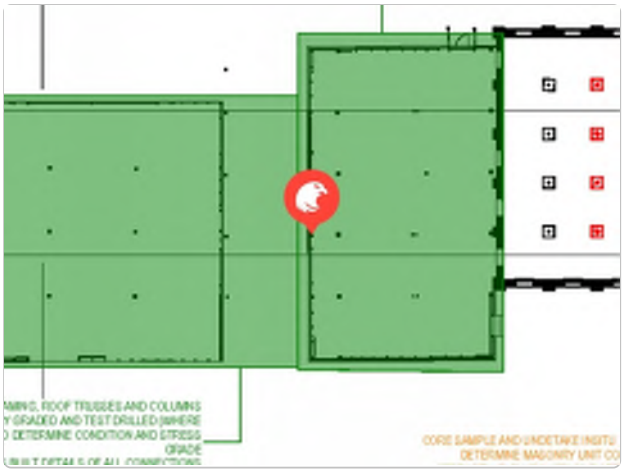
REPORTER
BCRC NSW

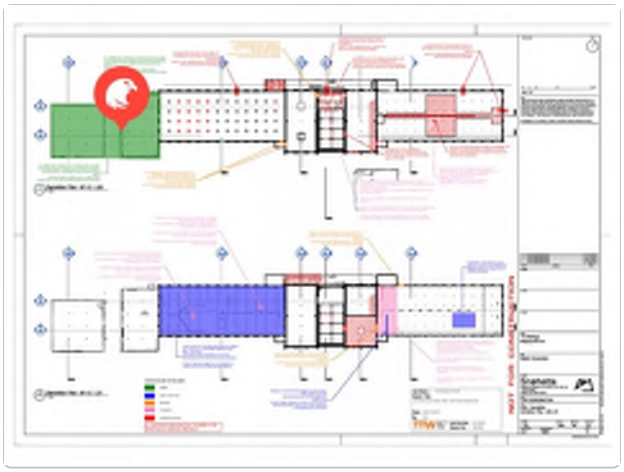
COMPONENT
Post

DEFECT
Rot

REMARKS
Decay at ground line 30mm
Oregon

Location





Photos and Sketches

07 Mar 2023, 11:29 AM / BCRC NSW

Spot 67

SEVERITY
Minor

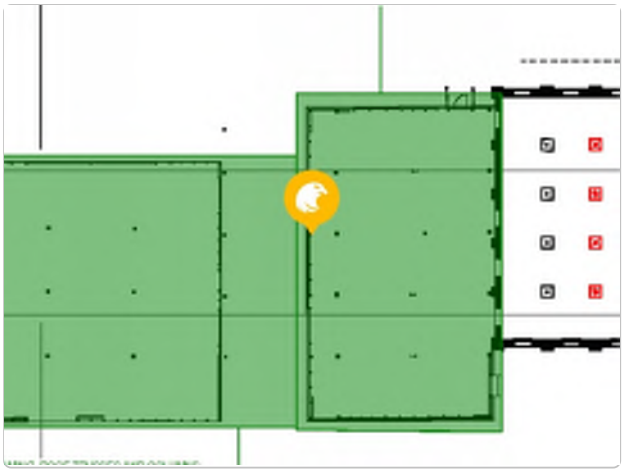
REPORTER
BCRC NSW

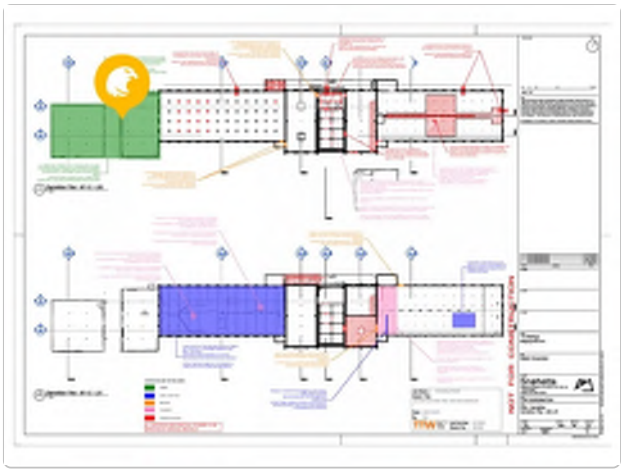
COMPONENT
Post

DEFECT
notch

REMARKS
Void at ground line
Hardwood

Location





Photos and Sketches

07 Mar 2023, 11:27 AM / BCRC NSW

Spot 66

SEVERITY
Major

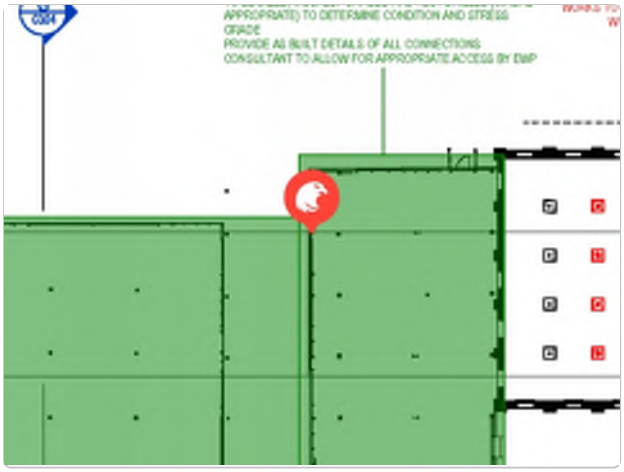
REPORTER
BCRC NSW

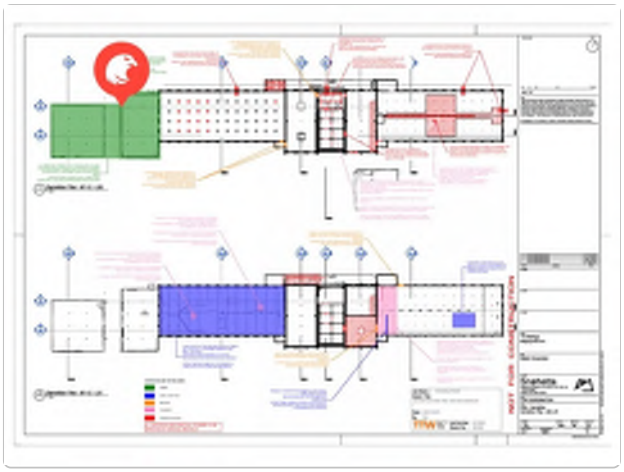
COMPONENT
Post

DEFECT
Rot

REMARKS
Size 170x170 Oregon post
Rot at ground level

Location





Photos and Sketches

07 Mar 2023, 11:21 AM / BCRC NSW

Spot 65

SEVERITY
Major

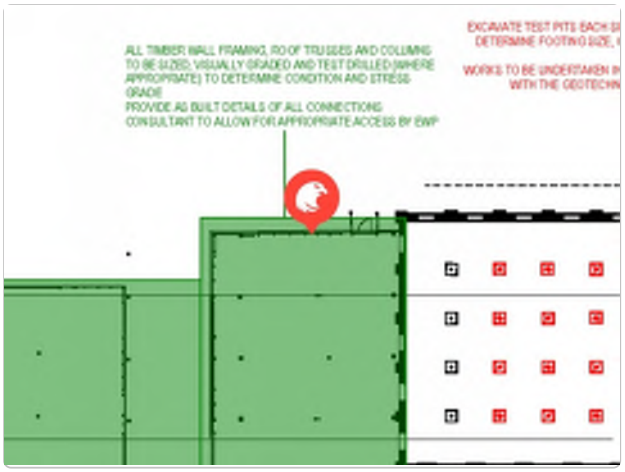
REPORTER
BCRC NSW

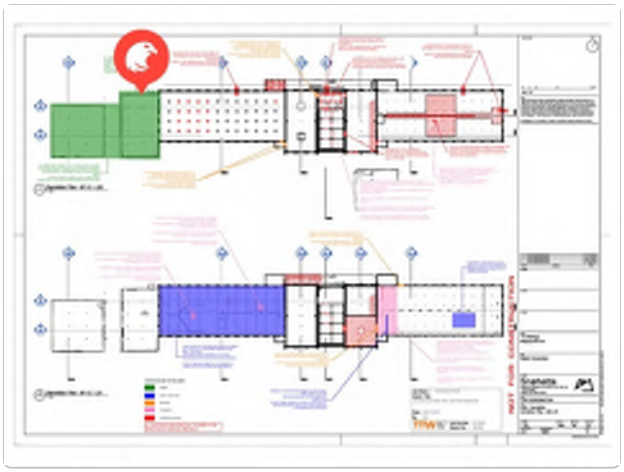
COMPONENT
end wall framing

DEFECT
Rot

REMARKS
Rot at the bottom of some end wall framing set in concrete, repair

Location





Photos and Sketches

07 Mar 2023, 11:18 AM / BCRC NSW

07 Mar 2023, 11:18 AM / BCRC NSW

Spot 64

SEVERITY
Major

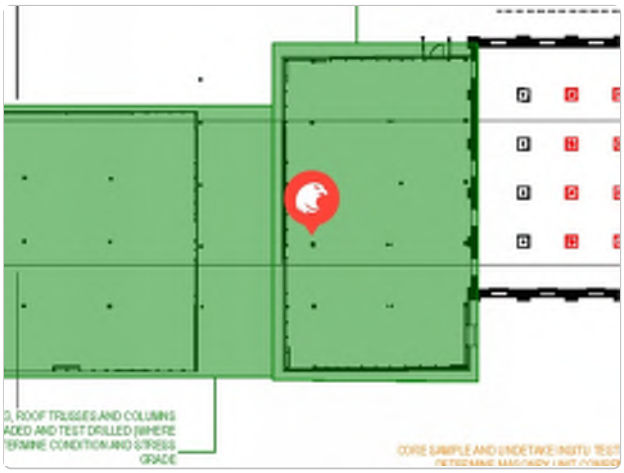
REPORTER
BCRC NSW

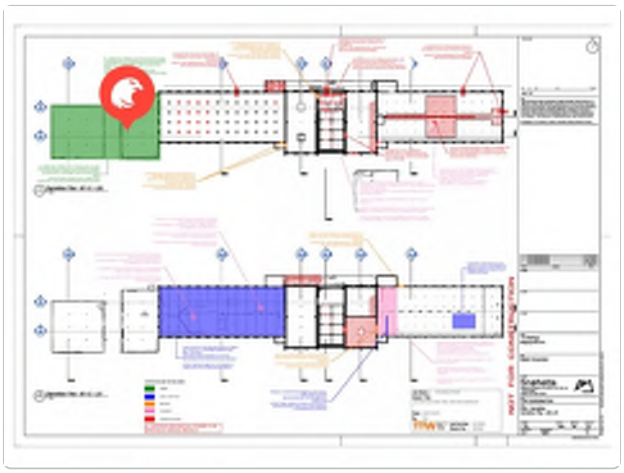
COMPONENT
Post

DEFECT
Rot

REMARKS
Decay at the bottom at ground level about 30mm deep
Size: 250mm x 240mm
75mm x 120mm
240 mm x 110mm

Location





Photos and Sketches

16 Mar 2023, 2:29 PM / BCRC NSW

16 Mar 2023, 2:29 PM / BCRC NSW

Spot 64

16 Mar 2023, 2:29 PM / BCRC NSW

Spot 63

SEVERITY
Major

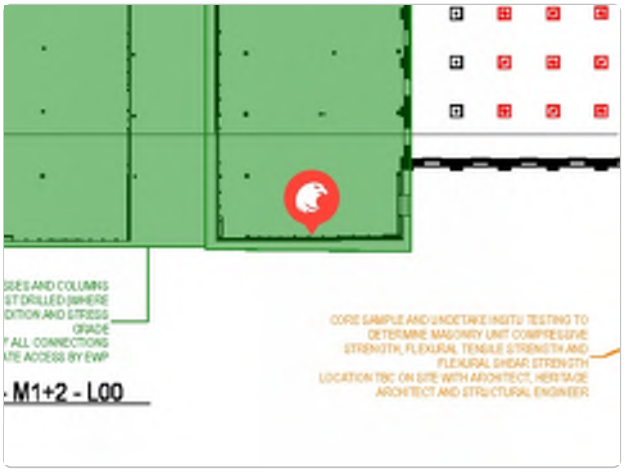
REPORTER
BCRC NSW

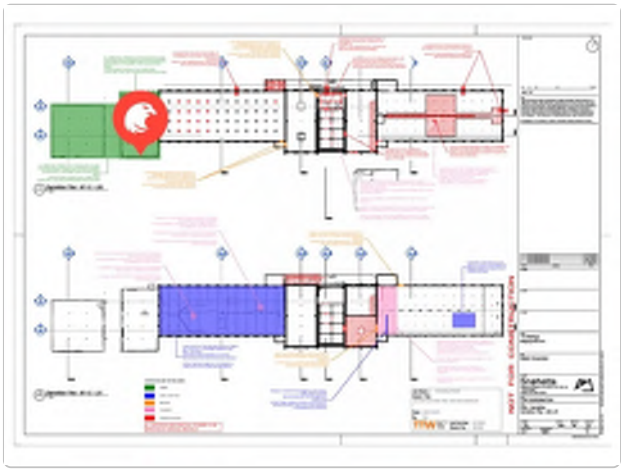
COMPONENT
end wall framing

DEFECT
Rot

REMARKS
End wall framing decayed at ground line
Wall framing Oregon
Sizes: centre hardwood 210x100, 75x50 notches
Vertical Oregon 120x75 @1060c-c
Horizontal Oregon 75x50 @1080c-c
Diagonal brace Oregon 100x75

Location





Photos and Sketches

07 Mar 2023, 11:08 AM / BCRC NSW

Spot 62

SEVERITY
Major

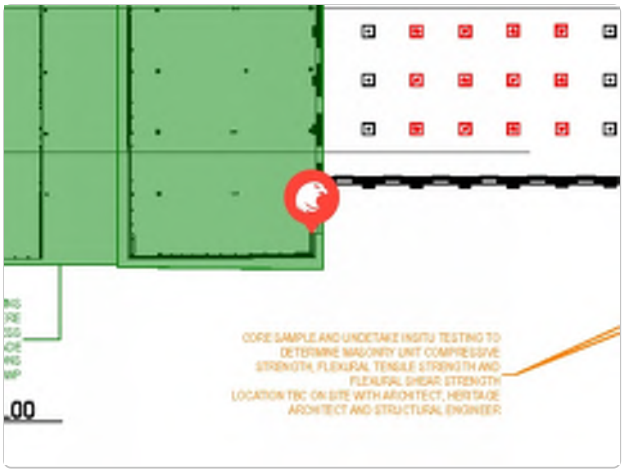
REPORTER
BCRC NSW

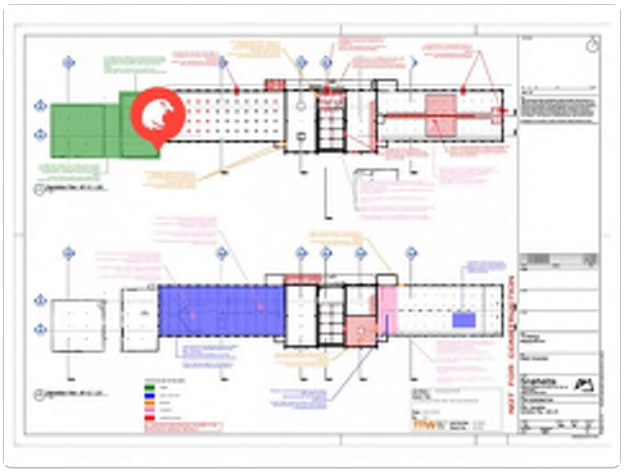
COMPONENT
door jamb east

DEFECT
Rot

REMARKS
Complete decay at ground line

Location





Photos and Sketches

07 Mar 2023, 10:54 AM / BCRC NSW

Spot 61

SEVERITY
Major

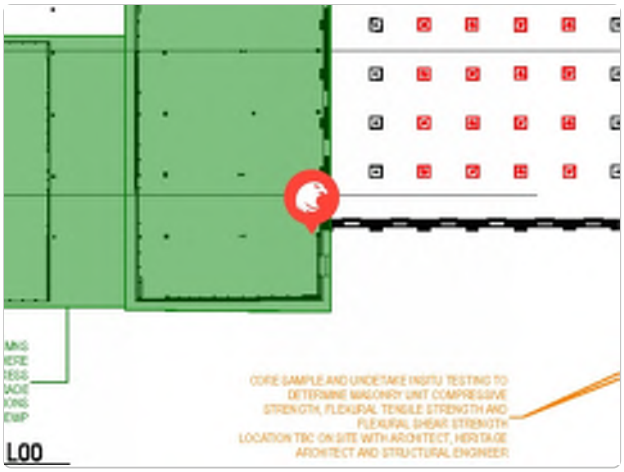
REPORTER
BCRC NSW

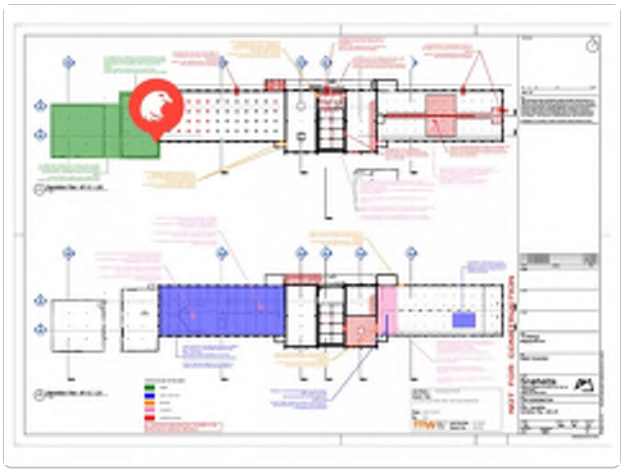
COMPONENT
Post

DEFECT
rot and termites

REMARKS
Complete decay at ground line
Extent of termite damage hard to determine OOG

Location





Photos and Sketches

07 Mar 2023, 10:52 AM / BCRC NSW

Spot 60

SEVERITY
Major

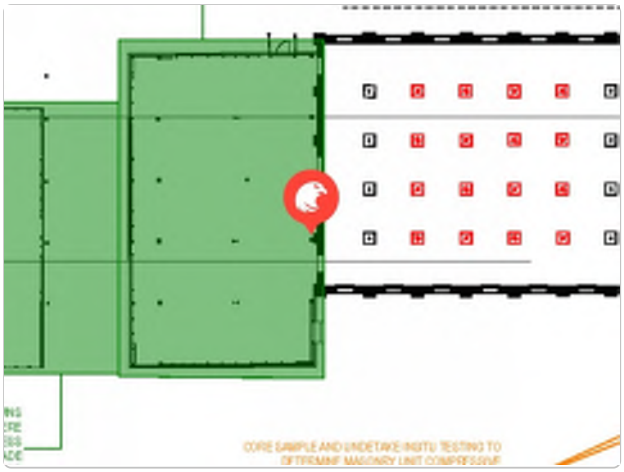
REPORTER
BCRC NSW

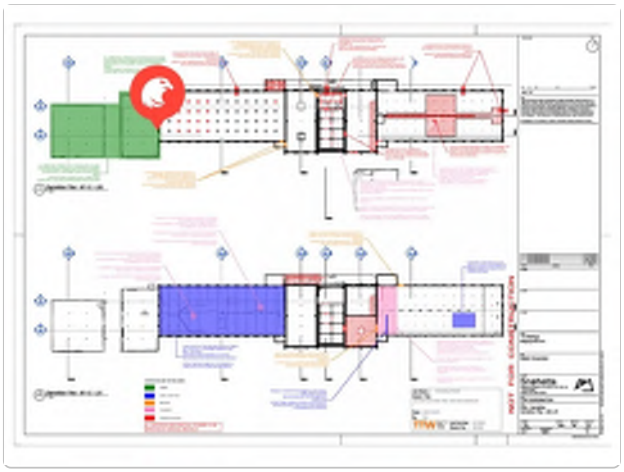
COMPONENT
Post

DEFECT
Rot

REMARKS
Complete decay at ground line

Location





Photos and Sketches

07 Mar 2023, 10:51 AM / BCRC NSW

Spot 59

SEVERITY
Major

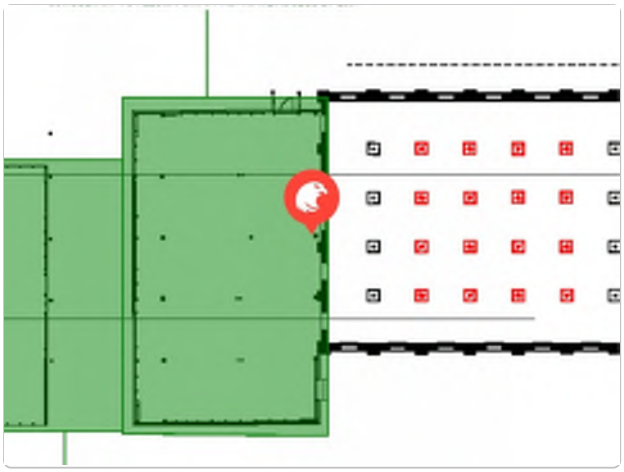
REPORTER
BCRC NSW

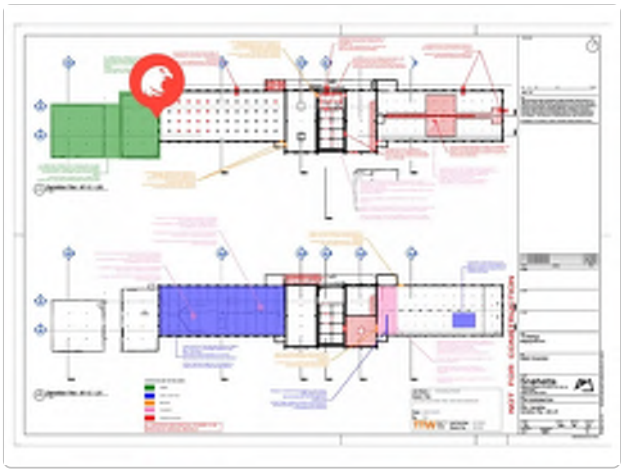
COMPONENT
Post

DEFECT
missing section

REMARKS
Repair

Location





Photos and Sketches

07 Mar 2023, 10:50 AM / BCRC NSW

Spot 58

SEVERITY
Major

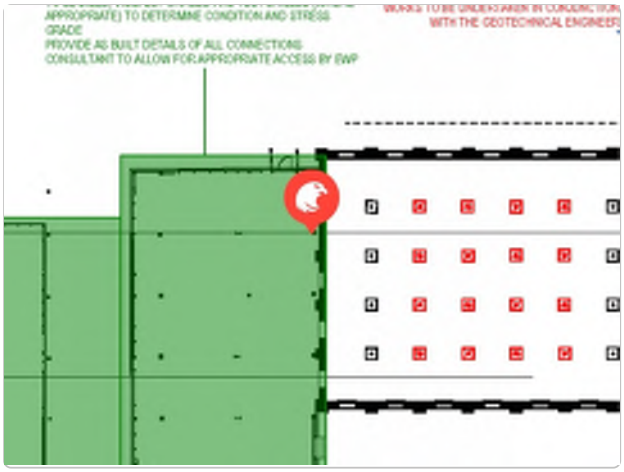
REPORTER
BCRC NSW

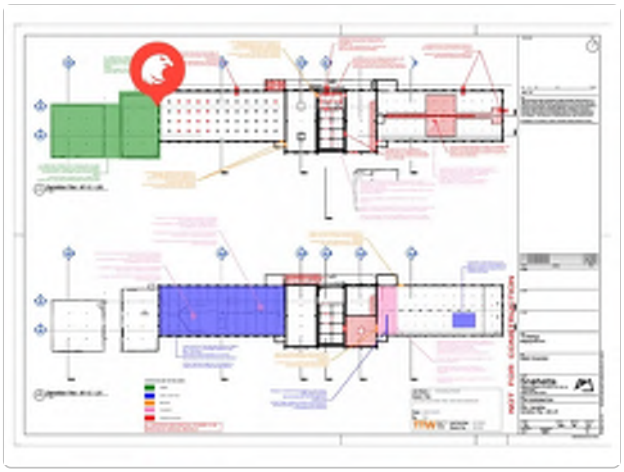
COMPONENT
Post

DEFECT
Rot

REMARKS
Hearting is no issue but severe each at the bottom

Location





Photos and Sketches

07 Mar 2023, 10:49 AM / BCRC NSW

Spot 57

SEVERITY
Minor

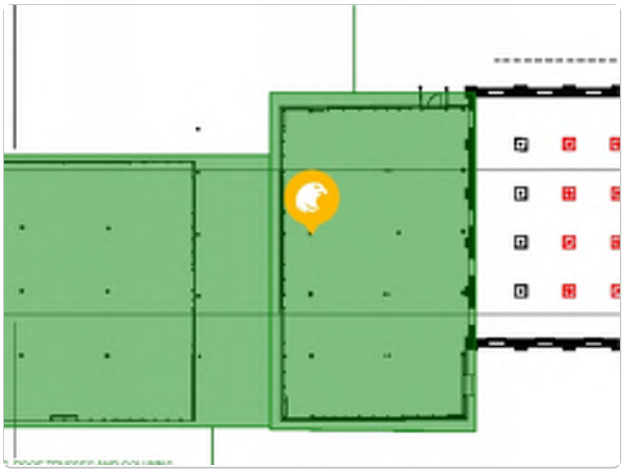
REPORTER
BCRC NSW

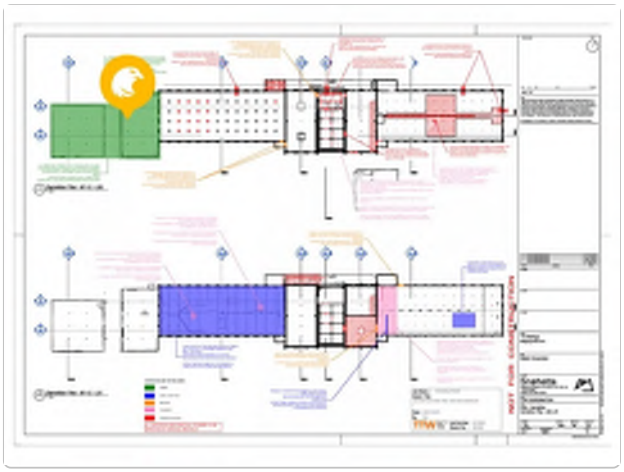
COMPONENT
Post

DEFECT
Termites

REMARKS
Termite tracks on outside post sound

Location





Photos and Sketches

07 Mar 2023, 11:13 AM / BCRC NSW

07 Mar 2023, 11:13 AM / BCRC NSW

Spot 57

16 Mar 2023, 2:28 PM / BCRC NSW

Spot 56

SEVERITY
None

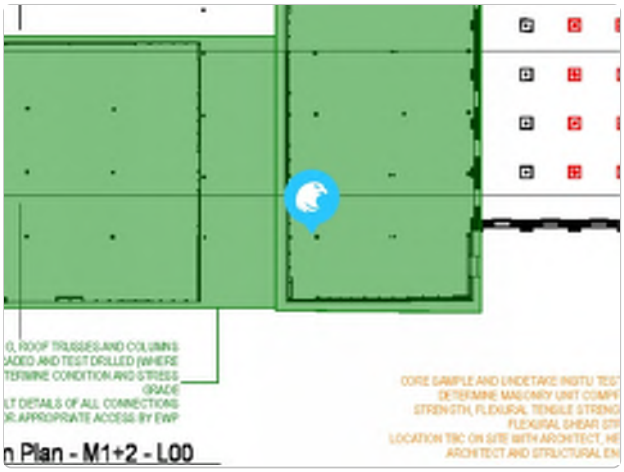
REPORTER
BCRC NSW

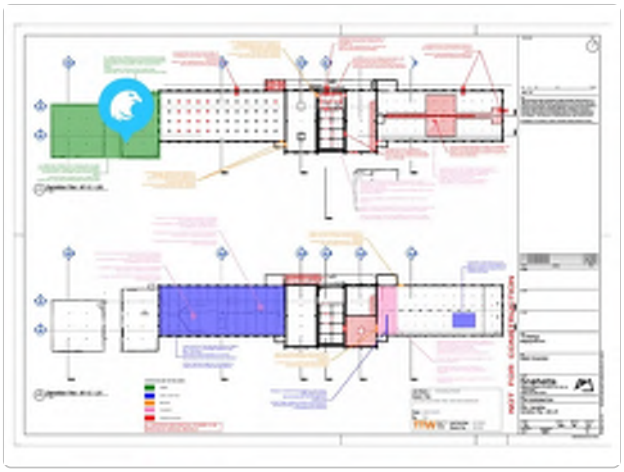
COMPONENT
Post

DEFECT
none

REMARKS
Size: 240x240
Mixed nsw hardwood
Span 2320mm

Location





Photos and Sketches

16 Mar 2023, 2:20 PM / BCRC NSW

Closing

This is a sample text which can be edited in the web.screeningeagle.com under the Report Template section.

NAME

JOB TITLE

Signature