MCE
McMurtrie Consulting Engineers

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# 3 Dibdin Street Wandal QLD 4700

Flood Statement

**ROCKHAMPTON REGIONAL COUNCIL**

**APPROVED PLANS**

These plans are approved subject to the current conditions of approval associated with

**Development Permit No.:** D/172-2024

**Dated:** 17 December 2024

**DATE**
15 November 2024

**REF**
R002-24-25-011

**CLIENT**
Howard Veal

**COMMERCIAL IN CONFIDENCE**

Engineering reimagined.

## Contact Information

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## Document Information

| | |
|---|---|
| Prepared for | Howard Veal |
| Document Name | Flood Statement |
| Job Reference | R002-24-25-011 |
| Revision | A |

## Document History

| Revision | Date | Description of Revision | Prepared by | Approved By | | |
|---|---|---|---|---|---|---|
| | | | | Name | Signature | RPEQ No |
| A | 15/11/2024 | Original Issue | T. Lisle | R. Bywater |  | 23569 |
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# Contents



# Appendices

# 1 Introduction

McMurtrie Consulting Engineers (MCE) have been engaged by Howard Veal to provide a Flood Statement report to support the proposed construction of a structure in the Flood Overlay zone. The site is located at 3 Dibdin Street Wandal QLD 4700, on land described as Lot 1 on RP607049.

The proposed development includes:

- A 6m by 4.8m by 2.4m gable garage on the south-eastern side of the property

# 2 Flooding Assessment

## 2.1 Existing Conditions

The site is a single dwelling house with an existing shed in the back yard.

The site is located within the Flood Hazard Overlay area as defined by the Rockhampton Regional Council (Council) Planning Scheme. Specifically, the proposed development is affected by the following overlay triggers:

- Fitzroy River Flood, category H2/H3
- Local Catchment Flood, Planning Area 2

In order to assess the existing flooding characteristics at the site, a Flood Search was requested from RRC, which has been attached in Appendix C. The results of the flood search have been summarised in Table 1.

Table 1 - Summary of Flood Search Results

| | Fitzroy River Flooding | | | | Local Catchment Flooding | | | |
|---|---|---|---|---|---|---|---|---|
| | Level (m AHD) | | Velocity (m/s) | | Level (m AHD) | | Velocity (m/s) | |
| | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| **1% AEP** | 10.75 | 10.75 | 0.03 | 0.07 | 10.38 | 10.40 | 0.08 | 0.69 |
| **2% AEP** | 10.30 | 10.30 | 0.02 | 0.06 | 10.34 | 10.37 | 0.02 | 0.68 |
| **5% AEP** | N/A | N/A | N/A | N/A | 10.33 | 10.36 | 0.04 | 0.68 |
| **10% AEP** | N/A | N/A | N/A | N/A | 10.30 | 10.34 | 0.01 | 0.68 |
| **18% AEP** | N/A | N/A | N/A | N/A | 10.28 | 10.34 | 0.01 | 0.68 |
| **39% AEP** | N/A | N/A | N/A | N/A | 10.23 | 10.30 | 0.01 | 0.68 |

Based on the expected ground surface level at the location of the proposed development, 10.20m AHD, the expected range of flooding depths are presented in Table 2.

Table 2 - 1% AEP Flooding Depths

| | Fitzroy River Flooding | | Local Catchment Flooding | |
|---|---|---|---|---|
| | Depth (m) | | Depth (m) | |
| | Min. | Max. | Min. | Max. |
| **1% AEP** | 0.55 | 0.55 | 0.18 | 0.20 |


Figure 1 - Site Layout Plan

The location and extent of the structure are more accurately represented in Appendix B.

## 2.2 Flood Impact

The results of the flood search indicate that the riverine flooding event is slow moving, and typically indicative of overbank or backwater flooding. The location of the proposed carport is relatively shallow, being up to 0.55m in depth with an expected velocity of 0.03m/s to 0.07m/s.

With reference to the Australian Disaster Resilience Handbook *Guideline 7-3 Flood Hazard*, the flooding at the location of the proposed development would be categorised as H3 flooding, which indicates it is unsafe for vehicles, children and the elderly. While the low velocity of flow is unlikely to be a risk to the structural integrity, it is suggested that the carport should be designed to accommodate for the structural loading that flooding will induce.

The creek catchment event is of a slightly lower magnitude, with an approximate depth of 0.18m to 0.20m and an expected velocity of 0.08m/s to 0.69m/s, which would correlate to a hazard category of H1, which typically does not pose a risk to structures or people.

Given the proposed structure is a freestanding carport supported by four narrow steel columns over a ground level slab, if built accordingly, it should be able to withstand the flooding.

## 2.3 Emergency Management Procedure

Given the flooding that affects the site is riverine in nature, significant warning time can be expected due to the size of the basin catchment. The creek catchment flooding does not typically pose a risk to people and therefore sheltering in place would be more appropriate in such events.

The occupants of the dwelling on the site should monitor the Bureau of Meteorology website prior to and during extended rainfall events in order to ensure they are prepared to evacuate the site if needed. It is

expected that evacuation will be via Dibdin Street. All stored items should be moved to ground that is above the flood zone, as well as the site cleaned of debris that could otherwise impact neighbouring properties.

Following the event, the occupants should wait until given advice from the relevant authorities that it is safe to return to the site.

# 3 Conclusion

The proposed development is a carport structure in the Flood Overlay zone located 3 Dibdin Street, Wandal, QLD 4700, on land described as Lot 1 on RP607049. The development is not expected to result in a material increase in flood level or flood hazard upstream, downstream or adjacent to the site.

## 3.1 Qualifications

This flood statement has been prepared by MCE to support a Building Works Assessable Against the Planning Scheme application, for a proposed structure located within the Flood Hazard Overlay zone.

The analysis and overall approach were specifically catered to the requirement of this project and may not be applicable beyond this scope. For this reason, any other third parties are not authorised to utilise this report without further input and advice from MCE.

# Appendix A: Flood Hazard Overlay Code Responses

Table 3 - RRC Flood Hazard Overlay Code Table 8.2.8.3.1

| Performance Outcomes | Acceptable Outcomes | Responses |
|---|---|---|
| **Development in Fitzroy River flood areas – H1 (low hazard area) or H2 (medium hazard area) or North Rockhampton flood management area or Local catchment flood - planning area 2**<br>Editor's note—Refer to overlay maps OM-8A and OM-8C | | |
| **PO1**<br>Development (including extensions) for non-residential purposes is able to provide a safe refuge for people and for the storage of goods during times of flood inundation. | **AO1.1**<br>For non-residential development, at least thirty (30) per cent of the gross floor area of all new buildings and structures is located a minimum of 500 millimetres above the defined flood level.<br><br>Editor's note—Areas less than those nominated above may be supported where accompanied by a flood impact report in accordance with SC6.10—Flood hazard planning scheme policy.<br><br>**AND**<br><br>**AO1.2**<br>A report from a registered professional engineer of Queensland certifies that the development in the flood area will not result in a material increase in flood level or flood hazard on upstream, downstream or adjacent properties. | **AO1.1**<br>Not Applicable<br><br>**AO1.2**<br>Complies – as provided in this document. |

| | | |
|---|---|---|
| **PO2**<br>Development is located to minimise susceptibility to and potential impacts of flooding. | **AO2.1**<br>For residential uses the finished floor levels of all habitable rooms shall be constructed a minimum of 500 millimetres above the defined flood level.<br><br>**AND**<br><br>**AO2.2**<br>A report from a registered professional engineer of Queensland certifies that the development in the flood area will not result in a material increase in flood level or flood hazard on upstream, downstream or adjacent properties.<br><br>Editor's note—Report to be prepared in accordance with SC6.10—Flood hazard planning scheme policy. | **AO2.1**<br>Not Applicable – no habitable rooms proposed as part of the structure.<br><br>**AO2.2**<br>Complies – as provided in this document. |
| **PO3**<br>Development avoids the release of hazardous materials into floodwaters. | **AO3.1**<br>All hazardous materials and hazardous manufacturing equipment and hazardous containers are located and stored a minimum of 500 millimetres above the defined flood level.<br><br>Editor's note—Refer to the Work Health and Safety Act 2011 and associated regulation, the Environmental Protection Act 1994 and the relevant building assessment provisions under the Building Act 1975 for requirements related to the manufacture and storage of hazardous substances. | **AO3.1**<br>Will Comply – no hazardous materials or manufacturing equipment will be stored on the site. |

Table 4 - RRC Flood Hazard Overlay Code Table 8.2.8.3.1

| Performance Outcomes | Acceptable Outcomes | Responses |
|---|---|---|
| **Development in Fitzroy River flood areas – H3-H4 (high hazard areas) or H5-H6 (extreme hazard areas) or Local catchment flood - planning area 1**<br>Editor's note—Refer to overlay maps OM-8A and OM-8C | | |

| | | |
|---|---|---|
| **PO4**<br>Development does not involve the further intensification of land uses and does not increase the risk to people and property.<br><br>Editor's Note—Flood hazard risk assessment can be undertaken in accordance with SC6.10 — Flood hazard planning scheme policy. | **AO4.1.1**<br>Development does not involve new buildings or structures.<br>**OR**<br>**AO4.1.2**<br>Where involving the replacement or alteration to an existing non-residential building or structure:<br>(a) there is no increase in the existing or previous buildings' gross floor area; and<br>(b) the finished floor level of any replacement or alteration to an existing building is constructed a minimum of 500 millimetres above the defined flood level.<br>**OR**<br>**AO4.1.3**<br>Where involving the replacement or alteration to an existing caretaker's accommodation, dwelling house or dwelling unit:<br>(a) there is no increase in the number of dwellings;<br>(b) there is no increase in the existing or previous buildings' gross floor area; and<br>(c) the finished floor level of all habitable rooms shall be constructed a minimum of 500 millimetres above the defined flood level.<br>**AND**<br>**AO4.1.4**<br>Where located in the rural zone, the total floor area of class 10a buildings and structures on the site do not exceed a total of fifty (50) square metres, and | **PO4**<br>Complies – the construction of a carport does not constitute intensification of the use of the land.<br><br>**AO4.1.2**<br>Not Applicable.<br><br>**AO4.1.3**<br>Not Applicable.<br><br>**AO4.1.4**<br>Not Applicable – not in the rural zone. |

| | | |
|---|---|---|
| | are set back a minimum of twenty (20) metres from all site boundaries. | |
| **PO5**<br>Development avoids the release of hazardous materials into floodwaters. | **AO5.1**<br>Materials manufactured, used or stored on site are not hazardous in nature. | **AO5.1**<br>Will Comply – no hazardous materials or manufacturing equipment will be stored on the site. |

Table 5 - RRC Flood Hazard Overlay Code Table 8.2.8.3.1

| Performance Outcomes | Acceptable Outcomes | Responses |
|---|---|---|
| **Development in floodplain investigation area**<br>Editor's note—Refer to overlay map overlay map OM-8B | | |
| **PO6**<br>Development is located to minimise susceptibility to and potential impacts of flooding.<br><br>Editor's note—The floodplain investigation area is mapping supplied by the Queensland Reconstruction Authority for possible flood affected areas, where local verification is yet to be completed. A flood hazard assessment in accordance with SC6.10 — Flood hazard planning scheme policy can be undertaken to verify the potential risk of a flood event occurring. | **AO6.1**<br>Development does not involve new buildings or structures. | **AO6.1**<br>Not applicable – not within the floodplain investigation area. |
| **PO7**<br>Development avoids the release of hazardous materials into floodwaters. | **AO7.1**<br>Materials manufactured, used or stored on site are not hazardous in nature. | **AO7.1**<br>Not applicable – not within the floodplain investigation area. |

Table 6 - RRC Flood Hazard Overlay Code Table 8.2.8.3.2

| Performance Outcomes | Acceptable Outcomes | Responses |
|---|---|---|
| **Development in Fitzroy River flood area – all hazard areas, North Rockhampton flood management area or Local catchment flood – all planning areas**<br>Editor's note—Refer to overlay maps OM-8A and OM-8C | | |
| **PO8**<br>Development is located to minimise susceptibility to and potential impacts of flooding. | No acceptable outcome is nominated. | **PO8**<br>Complies – the proposed structure has been sited on the highest area of available ground. |
| **PO9**<br>Underground car parks are designed to prevent the intrusion of floodwaters. | **AO9.1**<br>Development with underground car parking is designed to prevent the intrusion of floodwaters by the incorporation of a bund or similar barrier a minimum of 500 millimetres above the defined flood level. | **AO9.1**<br>Not Applicable – no underground car parking proposed. |

| | | |
|---|---|---|
| **PO10**<br>Development:<br>(a) does not result in any reduction of onsite flood storage capacity; or<br>(b) does not result in any change to depth, duration or velocity of floodwaters within the premises; and<br>(c) does not change flood characteristics outside the premises, including but not limited to causing:<br>a. loss of flood storage; or<br>b. loss of or changes to flow paths; or<br>c. acceleration or retardation of flows; or<br>d. any reduction in flood warning times elsewhere on the floodplain.<br><br>Editor's note—Council may require the applicant to submit a site-based flood study that investigates the impact of the development on the floodplain and demonstrates compliance with the relevant performance outcome. | No acceptable outcome is nominated. | **PO10**<br>Complies – the proposal does not result in a loss of flood storage, increase in depth/velocity and does not change the characteristics of flooding. |
| **PO11**<br>Essential community infrastructure and community facilities are protected from, and able to function effectively during and immediately after, a defined flood event. | **AO11.1**<br>A use for a purpose listed in Table 8.2.8.3.3:<br>(a) is not located within the flood hazard area; and<br>(b) has at least one (1) flood free access road. | **AO11.1**<br>Not Applicable – not for a use listed in the table. |

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|---|---|---|
| **PO12**<br>Development provides safe and trafficable access to the local evacuation centres and evacuation services and have regard to:<br>(a) evacuation time;<br>(b) number of persons affected;<br>(c) types of vehicles necessary for evacuation purposes;<br>(d) the distance to flood free land; and<br>(e) the evacuation route. | **AO12.1**<br>Trafficable access to and from the development complies with the Capricorn Municipal Guidelines.<br>**AND**<br>**AO12.2**<br>Trafficable access to and from the development within the local catchment planning areas are in accordance with the Queensland Urban Drainage Manual.<br><br>Note—Trafficable access for emergency services or community related uses is obtained from at least one (1) route (minor collector or higher) for emergency services purposes. The development is to ensure that safe access, to the road network between the development site and the closest centre zone, is provided.<br><br>Editor's note—Trafficable access requirements for local catchment planning areas has not been identified and reference has been made to the provisions under the Queensland Urban Drainage Manual. This is due to the short period that property may be isolated. | **AO12.1**<br>Complies – direct access to Dibdin St is available.<br><br>**AO12.2**<br>Complies – direct access to Dibdin St is available. |

Table 7 - RRC Flood Hazard Overlay Code Table 8.2.8.3.2

| Performance Outcomes | Acceptable Outcomes | Responses |
|---|---|---|
| **Development in Fitzroy River flood areas – H3-H4 (high hazard areas) or H5-H6 (extreme hazard areas), North Rockhampton flood management area or Local catchment flood – planning area 1**<br>Editor's note—Refer to overlay maps OM-8A and OM-8C | | |
| **PO13**<br>Development that involves temporary or moveable residential structures (for example caravan parks and camping grounds) are not located with the Fitzroy River high and extreme hazard areas, North Rockhampton flood management area and Local catchment planning area 1. | No acceptable outcome is nominated. | **PO13**<br>Complies – does not include temporary or movable structures. |

Table 8 - RRC Flood Hazard Overlay Code Table 8.2.8.3.2

| Performance Outcomes | Acceptable Outcomes | Responses |
|---|---|---|
| **Reconfiguring a lot** | | |
| **Development in Fitzroy River flood area – all hazard areas, North Rockhampton flood management area or Local catchment flood - all planning areas**<br>Editor's note—Refer to overlay map OM-8A and OM-8C | | |
| **PO14**<br>Development does not result in the creation of additional lots. | **AO14.1**<br>Reconfiguring a lot does not result in new lots. | **AO14.1**<br>Not Applicable – not an ROL |

Table 9 - RRC Flood Hazard Overlay Code Table 8.2.8.3.2

| Performance Outcomes | Acceptable Outcomes | Responses |
|---|---|---|
| **Development in floodplain investigation area**<br>Editor's note—Refer to overlay map OM-8B | | |

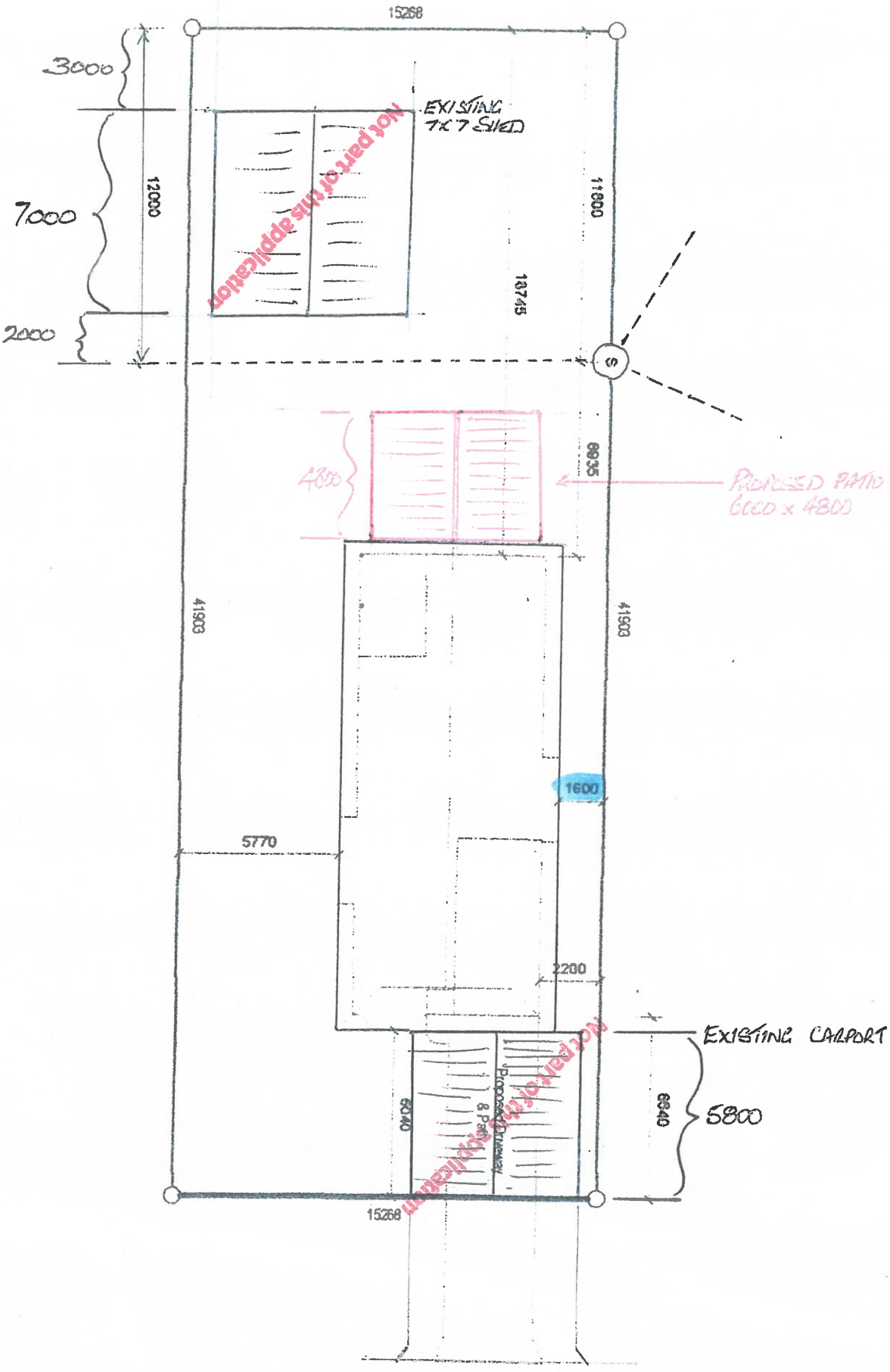
| | | |
|---|---|---|
| **PO15**<br>Development provides vehicle access to a road network that is sufficient to enable safe access.<br><br>Editor's note—The floodplain investigation area is mapping supplied by the Queensland Reconstruction Authority for possible flood affected areas, where local verification is yet to be completed. A flood hazard assessment in accordance with SC6.10 — Flood hazard planning scheme policy can be undertaken to verify the potential risk of a flood event occurring. | No acceptable outcome is nominated. | **PO15**<br>Not applicable – not within the floodplain investigation area. |
| **PO16**<br>Onsite access is provided to a building envelope or fill area in which a building is to be constructed. The access is located on land classified as a low flood hazard in the defined flood event. | **AO16.1**<br>Onsite access is provided to a building envelope or fill area in which a building is to be constructed. The access is located on land classified as a low flood hazard in the defined flood event.<br>Editor's note—For the purposes of the above requirements in respect of an access area or a road which provides access to the development a low flood hazard means:<br>(a) inundation is a maximum depth of 300 millimetres during events up to and including the defined flood event;<br>(b) inundation extends for a maximum distance of 200 metres during events up to and including the defined flood event; and<br>(c) The product of velocities and depth does not exceed D*V=0.4m2/s. | **AO16.1**<br>Not applicable – not within the floodplain investigation area. |

Table 10 - RRC Flood Hazard Overlay Code Table 8.2.8.3.2

| Performance Outcomes | Acceptable Outcomes | Responses |
|---|---|---|
| **Operational work** | | |
| **PO17**<br>Development does not materially impede the flow of floodwaters through the site or worsen flood flows external to the site. | **AO17.1**<br>Development does not involve:<br>(a) filling with a height greater than 100 millimetres; or<br>(b) block or solid walls or fences; or<br>(c) garden beds or other structures with a height more than 100 millimetres; or<br>(d) the planting of dense shrub hedges. | **PO17**<br>Complies – no material impedance of flow expected or worsening of flood flows external to the site expected. |

# Appendix B: Site Layout & Structure Plans

REFER TO ATTACHMENT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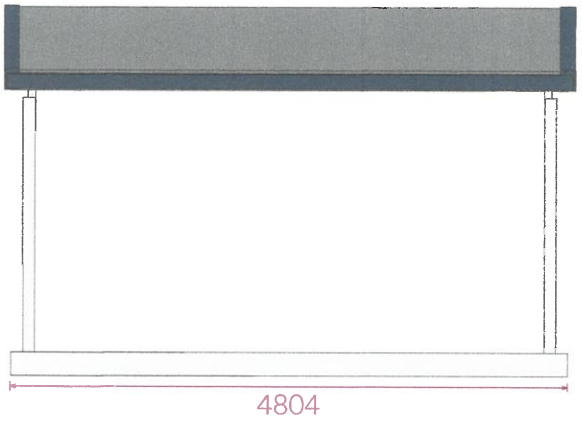


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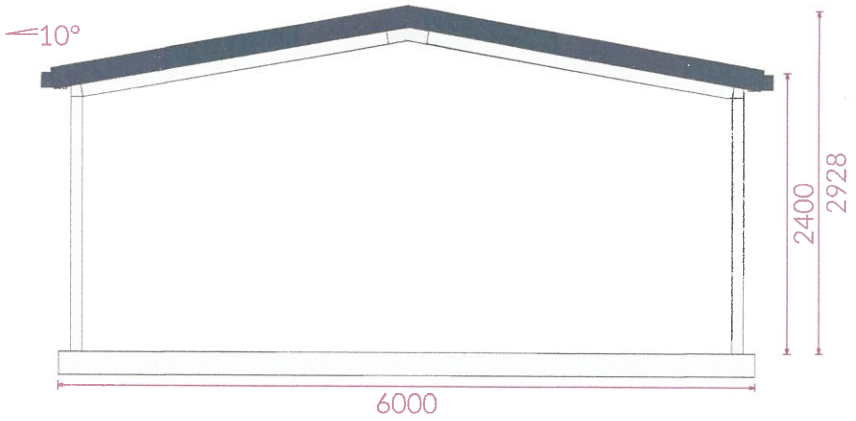


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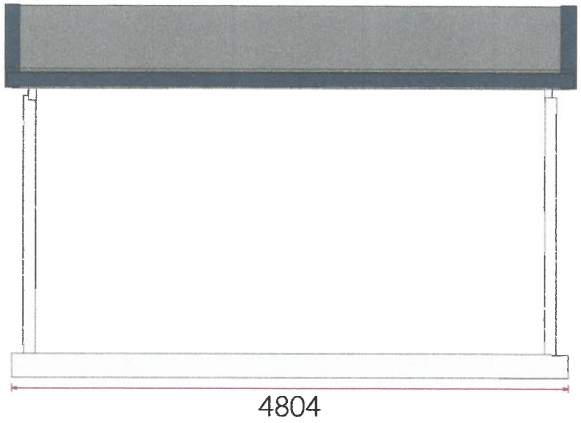


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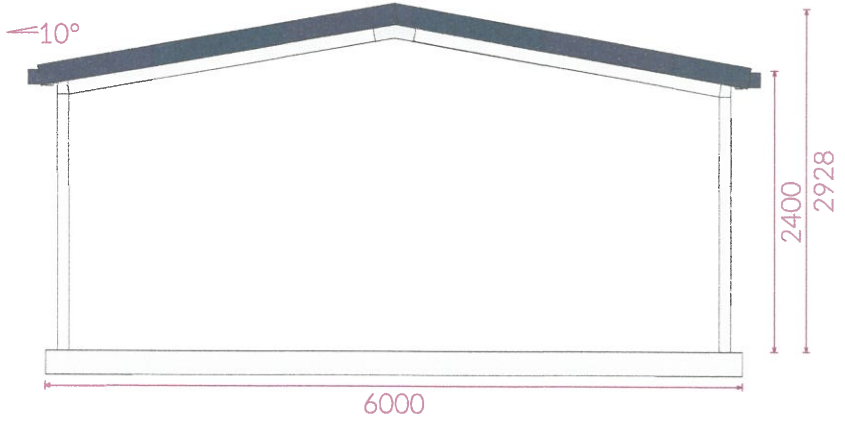


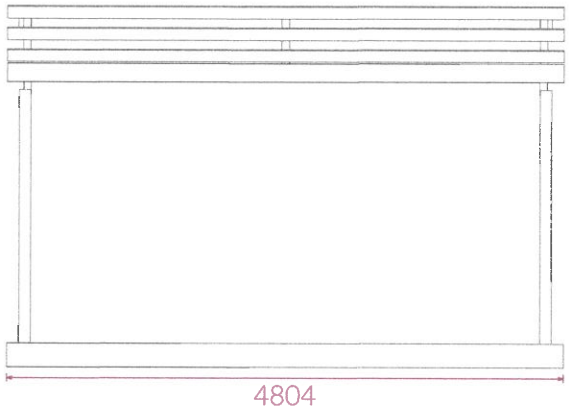

green steel

Registered Professional Engineer
Graeme C Moulston
FIE Aust CPEng 5590 RPEQ4431
Signature Date 08/10/24

| | |
|---|---|
| **Project** | 6m (w) x 4.8m (l) x 2.4m (h) Gable Garage - Roof Only |
| **Client** | HOWARD VEAL |
| **Site Address** | 3 DIBDIN STREET WANDAL QLD 4700 |

**Job#** 68587_VEAL
**Date** 08 Oct 2024

## FRAME LEFT ELEVATION

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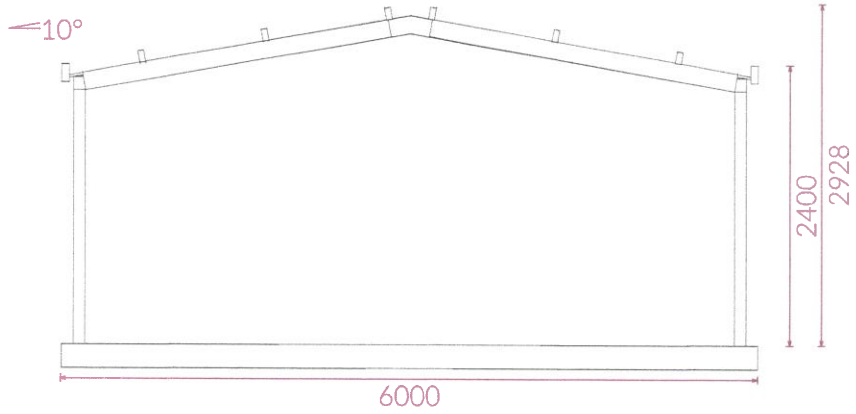


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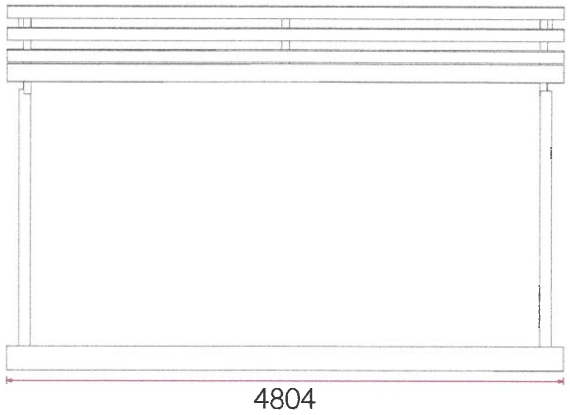


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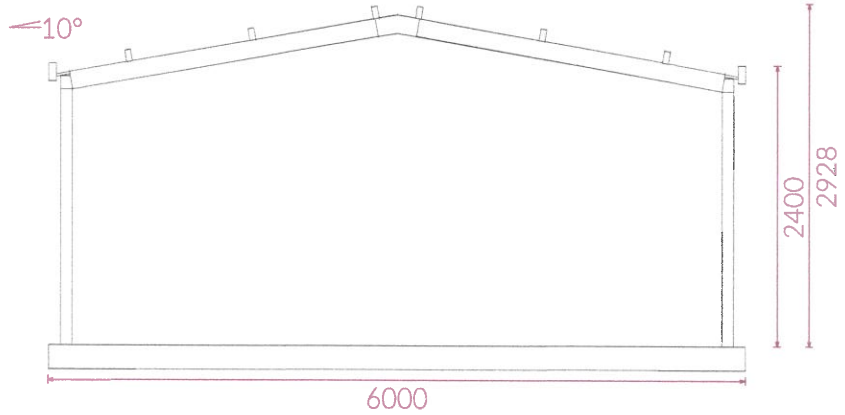


green steel

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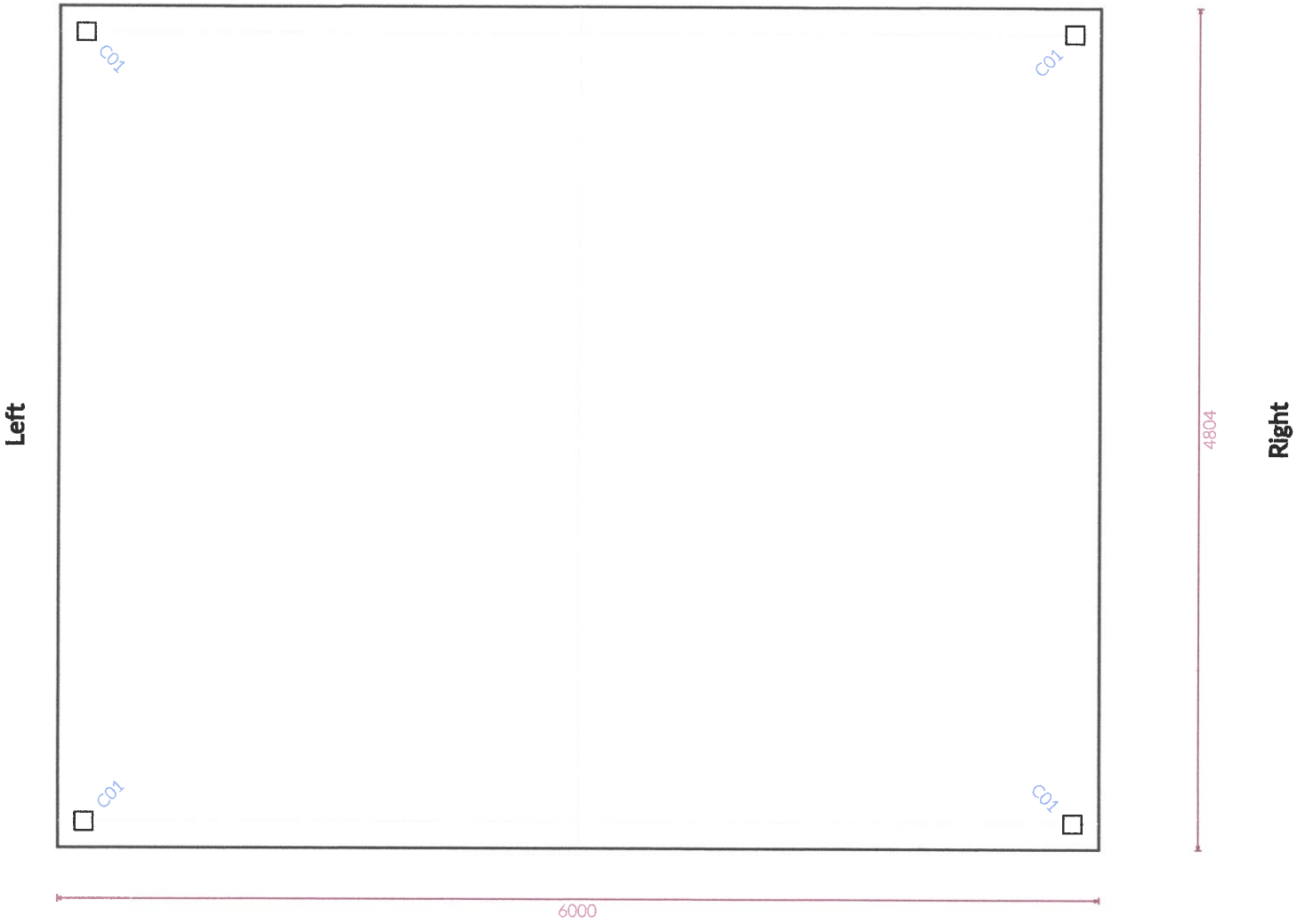
Signature Date 08/10/24

| | | | |
|---|---|---|---|
| **Project** | 6m (w) x 4.8m (l) x 2.4m (h) Gable Garage - Roof Only | **Job#** | 68587_VEAL |
| **Client** | HOWARD VEAL | **Date** | 08 Oct 2024 |
| **Site Address** | 3 DIBDIN STREET WANDAL QLD 4700 | **Page** | 4 of 39 |

# PLAN - SUMMARY (1/3)

This is basic plan for the layout of the building. Refer to the following pages for specific details.




Registered Professional Engineer
Graeme C Moulston
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Signature
Date 08/10/24

| | | | |
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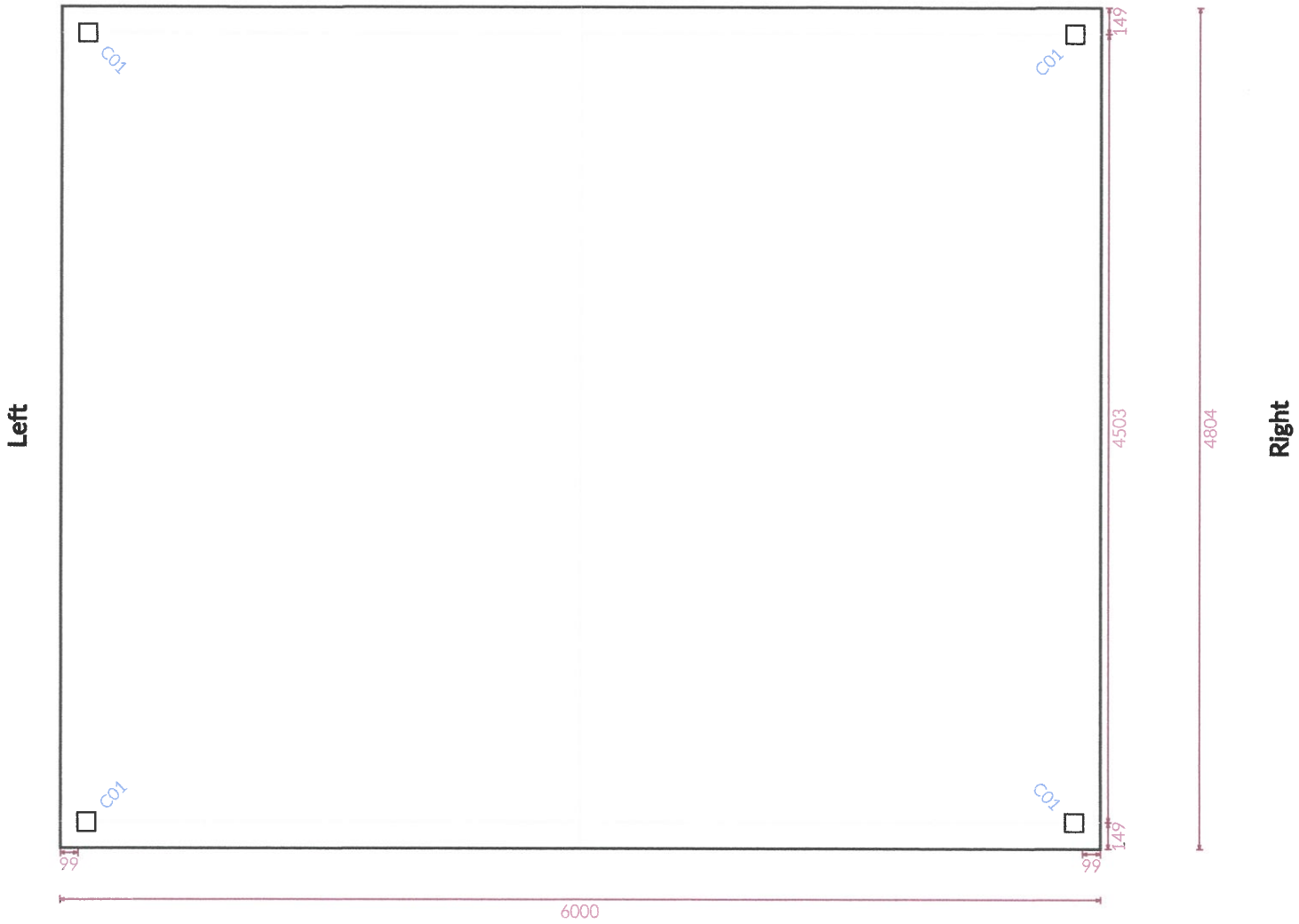
| **Site Address** | 3 DIBDIN STREET WANDAL QLD 4700 | **Page** | 5 of 39 |

# PLAN - COLUMNS (2/3)

This drawing shows placement of columns.




Registered Professional Engineer
Graeme C Moulston
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Signature
Date 08/10/24

| | | | |
|---|---|---|---|
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| **Client** | HOWARD VEAL | **Date** | 08 Oct 2024 |
| **Site Address** | 3 DIBDIN STREET WANDAL QLD 4700 | **Page** | 6 of 39 |

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# Appendix C: Flood Search Report

REFER TO ATTACHMENT

# Flood Report for 3 Dibdin Street Wandal QLD 4700

Printed from GeoCortex on 11/07/2023

Owners: H K Veal

Ratepayer Address: 3 Dibdin St WANDAL QLD 4700

Parcel ID: RP607049/1

Land use: Single Dwelling


Riverine Catchment: Fitzroy River Flood Study

Creek Catchment: Wandal & West Rockhampton Local Catchment Study 2018

Mitigation Area: N/A

Horizontal Datum: MGA 56, GDA 2020 Elevation / WSL: mAHD Velocity: m/sec

Comments

N/A

## Riverine

| | | | |
|---|---|---|---|
| PMF WSL Min: | 14.85 | AEP 2% WSL Min: | 10.30 |
| PMF WSL Max: | 14.86 | AEP 2% WSL Max: | 10.30 |
| PMF Velocity Min: | 0.46 | AEP 2% Velocity Min: | 0.02 |
| PMF Velocity Max: | 0.59 | AEP 2% Velocity Max: | 0.06 |
| AEP 0.05% WSL Min: | 12.08 | AEP 5% WSL Min: | N/A |
| AEP 0.05% WSL Max: | 12.07 | AEP 5% WSL Max: | N/A |
| AEP 0.05% Velocity Min: | 0.09 | AEP 5% Velocity Min: | N/A |
| AEP 0.05% Velocity Max: | 0.11 | AEP 5% Velocity Max: | N/A |
| AEP 0.2% WSL Min: | 11.51 | AEP 10% WSL Min: | N/A |
| AEP 0.2% WSL Max: | 11.51 | AEP 10% WSL Max: | N/A |
| AEP 0.2% Velocity Min: | 0.04 | AEP 10% Velocity Min: | N/A |
| AEP 0.2% Velocity Max: | 0.07 | AEP 10% Velocity Max: | N/A |
| AEP 0.5% WSL Min: | 11.13 | AEP 18% WSL Min: | N/A |
| AEP 0.5% WSL Max: | 11.13 | AEP 18% WSL Max: | N/A |
| AEP 0.5% Velocity Min: | 0.03 | AEP 18% Velocity Max: | N/A |
| AEP 0.5% Velocity Max: | 0.07 | AEP 18% Velocity Max: | N/A |
| AEP 1% WSL Min: | 10.75 | AEP 39% WSL Min: | N/A |
| AEP 1% WSL Max: | 10.75 | AEP 39% WSL Max: | N/A |
| AEP 1% Velocity Min: | 0.03 | AEP 39% Velocity Min: | N/A |
| AEP 1% Velocity Max: | 0.07 | AEP 39% Velocity Max: | N/A |

## Creek \ Local Catchment

| | | | |
|---|---|---|---|
| PMF WSL Min: | 11.19 | AEP 5% WSL Min: | 10.33 |
| PMF WSL Max: | 11.19 | AEP 5% WSL Max: | 10.36 |
| PMF Velocity Min: | 0.15 | AEP 5% Velocity Min: | 0.04 |
| PMF Velocity Max: | 0.87 | AEP 5% Velocity Max: | 0.68 |
| AEP 0.05% WSL Min: | 10.48 | AEP 10% WSL Min: | 10.35 |
| AEP 0.05% WSL Max: | 10.51 | AEP 10% WSL Max: | 10.34 |
| AEP 0.05% Velocity Min: | 0.08 | AEP 10% Velocity Min: | 0.01 |
| AEP 0.05% Velocity Max: | 0.70 | AEP 10% Velocity Max: | 0.68 |
| AEP 0.2% WSL Min: | 10.42 | AEP 18% WSL Min: | 10.28 |
| AEP 0.2% WSL Max: | 10.44 | AEP 18% WSL Max: | 10.34 |
| AEP 0.2% Velocity Min: | 0.07 | AEP 18% Velocity Min: | 0.01 |
| AEP 0.2% Velocity Max: | 0.69 | AEP 18% Velocity Max: | 0.68 |
| AEP 0.5% WSL Min: | 10.38 | AEP 39% WSL Min: | 10.23 |
| AEP 0.5% WSL Max: | 10.40 | AEP 39% WSL Max: | 10.30 |
| AEP 0.5% Velocity Min: | 0.07 | AEP 39% Velocity Min: | 0.01 |
| AEP 0.5% Velocity Max: | 0.69 | AEP 39% Velocity Max: | 0.68 |
| AEP 1% WSL Min: | 10.35 | AEP 63% WSL Min: | 10.19 |
| AEP 1% WSL Max: | 10.40 | AEP 63% WSL Max: | 10.27 |
| AEP 1% Velocity Min: | 0.08 | AEP 63% Velocity Min: | 0.00 |
| AEP 1% Velocity Max: | 0.69 | AEP 63% Velocity Max: | 0.68 |
| AEP 2% WSL Min: | 10.34 | | |
| AEP 2% WSL Max: | 10.37 | | |
| AEP 2% Velocity Min: | 0.02 | | |
| AEP 2% Velocity Max: | 0.68 | | |

## Property Elevation

Ground Elevation (Min): 9.96

Ground Elevation (Max): 10.40

# ENGINEERING DRAWINGS

## Table of Contents



**ROCKHAMPTON REGIONAL COUNCIL**

**APPROVED PLANS**

These plans are approved subject to the current conditions of approval associated with

**Development Permit No.:** D/172-2024

**Dated:** 17 December 2024

green steel

Registered Professional Engineer
Graeme C Moulston
FIE Aust CPEng 5590 RPEQ4431
Signature Date 08/10/24

**Project** 6m (w) x 4.8m (l) x 2.4m (h) Gable Garage - Roof Only
**Client** HOWARD VEAL
**Site Address** 3 DIBDIN STREET WANDAL QLD 4700

**Job#** 68587_VEAL
**Date** 08 Oct 2024
**Page** 1 of 39

## GENERAL NOTES

G01 The design and details shown on these drawings are applicable to this project only and may not be reproduced in whole or in part or used for any other project or purpose without the written permission of Quotec Pty. Ltd with whom the copyright resides.

G02 These drawings shall be read in conjunction with all architectural drawings, other consultants' drawings, specifications and such other written instructions as may be issued during the course of the contract. Any discrepancy shall be referred to the engineer before proceeding with the work.

G03 All materials and workmanship shall be in accordance with the relevant and current saa codes and with authorities except where varied by the project specifications.

G04 All dimensions shown shall be verified by the builder on site. Engineer's drawings shall not be scaled for dimensions.

G05 Unless noted otherwise all levels are in meters and all dimensions are in millimetres.

G06 Construction methods and safety maintenance during construction is the responsibility of the contractor(s). Where any structural element presents difficulties pertaining to construction or safety, the authorized entity must be notified prior to the commencement of work.

G07 The structure must be maintained in a stable condition and no part must be overloaded during construction. Temporary bracing must be designed and provided by the contractor(s) to keep the building works and excavations stable at all times.

G08 Neither snow loading or earthquake loading has been taken into account.

G09 Quotec Pty. Ltd reserves the right to alter specifications and designs as it may see fit without prior notification or penalty.

G10 All dimensions, width, height, lengths and openings are nominal and not absolute. It is the user's responsibility to satisfy themselves of any dimensions.

G11 Where the purlin of a building exceeds 1200 centre, then the roof is to be considered as non-trafficable.

G12 Use Stainless Steel screws and bolts or welds (properly seal from rust) in Marine or Acid Sulphate environments.

## FOUNDATION NOTES

F01 Footing & slab have been designed assuming stable site with an allowable bearing capacity of 100kpa, subgrade CBR15, Class "A", "S" and "M" relatively. Other soil type designed are Typical Drawings based on AS 2870, not site-specific slab drawings details.

F02 The owner is recommended to obtain a soil report if no existing site foundation report (to confirm F01) if soil classification on site has not previously been determined.

F03 Engineer to be contacted if foundation conditions vary from that indicated in F01.

F04 Footings shall be located centrally under walls and columns unless noted otherwise.

F05 All footings to be founded minimum 250mm into natural ground. Do not found footings in uncontrolled fill

## STEELWORK NOTES

S01 All workmanship and material shall be in accordance with AS4100 and AS1554 except where varied by the contract documents.

S02 Bolting categories are identified on the structural drawings in the following manner:

Bolt category comments: 4.6/s commercial bolts of grade 4.6 to as1111 snug tightened 8.8/s high strength structural bolts of grade 8.8 to as1252 snug tightened

S03 Unless noted otherwise all footing bolts shall be m16 category 8.8/s. M12 bolts for C100, C150, C200, and C250 sections, m16 bolts for C300 and C350 sections. No connection shall have less than 2 bolts. All holes shall be 2mm larger than the bolt diameter unless noted otherwise.

S04 All galvanizing of structural steelwork shall be to AS4680. The continuous average zinc coating mass shall be 600g/m2 (550g/m2 minimum) provide seal plates to the ends of all hollow sections, with 'breather' holes if members are to be hot dip galvanized. All metal cladding should comply with AS1397-2001 g550, AZ150 (550 mpa minimum yield stress, 150g/m2 minimum) coating mass.

S05 Steelwork intended to be concrete encased shall be unpainted. Encasing concrete shall be grade N25 unless noted otherwise providing a cover adequate to suit fire rating or exposure conditions. Concrete encasement shall be centrally reinforced with 5mm wire to AS4617 or 6mm structural grade bars to AS4617 at 150mm pitch.

S06 Unless noted otherwise, all steel shall be of the following grade in accordance with the relevant Australian standard.

| Type of steel | GRADE |
|---|---|
| Universal beams and columns, parallel flange Channels, large angles to AS/NZS3679.1 | 300 PLUS |
| Flats, small angles, taper flange beams and columns To AS/NZS3679.1 | 250 |
| Welded sections to as/nzs3679.2 | 300 |
| Hot rolled plates, floor plates and slabs to AS/NZS3678 | 250 |
| Hollow sections to as1163 - circular sections less than 165mm outside diameter - sections other than The above | C250 C350 |
| Cold form to AS4600 | G450 |
| Apex & knee plates | G450 |

## CONCRETE NOTES

C01 All concrete work to be carried out in accordance with AS3600 & AS2870 current addition with amendments, except where varied by the contract documents.

C02 All reinforcements shall be firmly supported on mild steel plastic tipped chairs, plastic chairs or concrete chairs at not greater than 1 metre centres both ways. Bars shall be tied at alternate intersections.

C03 Concrete quality - The characteristic compressive strength and slump of the concrete must not be less than the value stated below.

| Element | F'C MPa (28 Days) | Slump (mm) | Aggregate Size SIZE (mm) |
|---|---|---|---|
| Slabs | 25 Mn | 80 Max | 20 |

Project control testing shall be carried out in accordance with AS3600.

C04 Concrete sizes shown do not include thicknesses of applied finishes.

C05 No holes, chases or embedment of pipes other than those shown on the structural drawings shall be made in concrete members without the prior written approval of the engineer.

C06 Construction joints where indicated shall be located to the approval of the engineer.

C07 The finished concrete shall be a dense homogeneous mass, completely filling the formwork thoroughly imbedding the reinforcement and free of air pockets. All concrete including slabs on ground and footings shall be compacted with mechanical vibrators.

C08 Curing of all concrete is to be achieved by keeping surfaces continuously wet for a period of three days, and prevention of loss of moisture for a total of 7 days followed by a gradual drying out. Approved sprayed on curing compounds may be used where no floor finishes are proposed. Polythene sheeting or wet hessian may be used if protected from wind and traffic.

C09 Conduits, pipes etc., shall only be located in the middle one third of slab depth and spaced at not less than 4 diameters.

C10 Reinforcement symbols:

R: Hot-rolled plain round bar to AS 4671 (Grade R250N) / N: Hot-rolled deformed bar to AS 4671 (Grade D500N) / RL, SL, L: Welded wire mesh, plain, deformed and indented to AS 4671 (Grade D500L) / W: Cold-drawn round wire to AS 4671 (Grade R500L).

C11 Reinforcement is represented diagrammatically and not necessarily in true projection.

C12 Welding or heating of reinforcement shall not be permitted unless shown on the structural drawings or approved by the engineer.

C13 Slab fabric shall be lapped 2 transverse wires plus 50mm.

C14 Trench mesh shall be spliced, where necessary, by a minimum lap of 500mm.

C15 The lap length of bar splices shall be not less than 500mm or 25 bar diameters.

C16 Do not plant shrubs or tree higher than 1.5 meters withing 10 meters of foundations. Where existing plants <1.5m (not within property) use effective root barriers and check regularly for root intrusion and maintain for structural integrity.

C17 Do not build or excavate within 10m of foundations without design Engineers written consent.

C18 Seek a qualified Civil Engineer to design overland stormwater flow drainage plans as this is not included in our designs.

C19 Clear concrete cover to reinforcement for durability shall be as follows unless otherwise shown on site specific engineering plans.

| Exposure | Concrete cover |
|---|---|
| Cast against ground | 50mm |
| External exposed surface | 50mm |
| Internal exposed surface | 30mm |

C20 No admixtures shall be used in concrete unless approved in writing. Install 0.2mm vapour barrier over 50mm sand bed under all Class 1 and 10 building slabs. In NSW and SA, use a high-impact resistant 0.2mm damp-proofing membrane in place of the vapour barrier.

**For Site Classification to AS2870**

**CONCRETE:** All concrete work to be carried out in accordance with AS3600 & AS2870. For more than 2.5KPa live load and heavy goods vehicle then special slab design is required. Provide construction joints for every slab pane length is more than 1.5 * width. Concrete strength of minimum 25 MP at 28 days in slab is required. Cover to reinforcements to be minimum of 30mm from top slab & 50mm for footings. All reinforcements shall conform with AS4671- 2019. Care should be taken to ensure that bolts are anchored below without shifting any reinforcement fabric or bars. For slab on ground, all topsail and upper layer containing organic material to be removed and slab place on max. 300 of approved filling medium. Prior to construction, a suitably qualified person is to assess site and soil conditions (i.e. reactive soils, landslide, flood). Refer to Design Engineer.

## PROPRIETARY AND CONFIDENTIAL

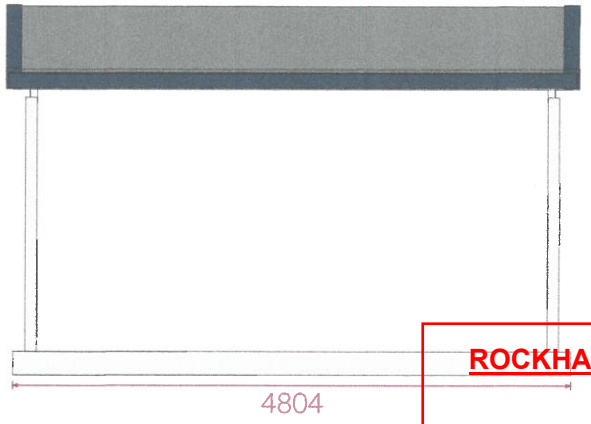




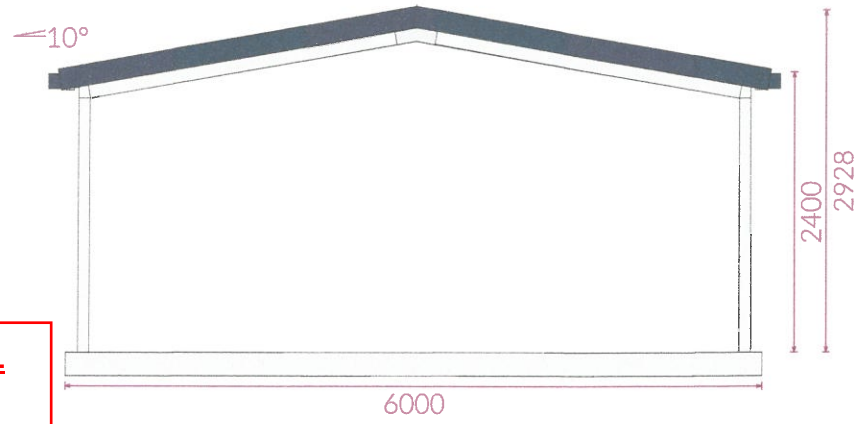
Registered Professional Engineer
Graeme C Moulston
FIE Aust CPEng 5590 RPEQ4431
Signature
Date 08/10/24

| | | | |
|---|---|---|---|
| **Project** | 6m (w) x 4.8m (l) x 2.4m (h) Gable Garage - Roof Only | **Job#** | 68587_VEAL |
| **Client** | HOWARD VEAL | **Date** | 08 Oct 2024 |
| **Site Address** | 3 DIBDIN STREET WANDAL QLD 4700 | **Page** | 2 of 39 |

## LEFT ELEVATION




## FRONT ELEVATION

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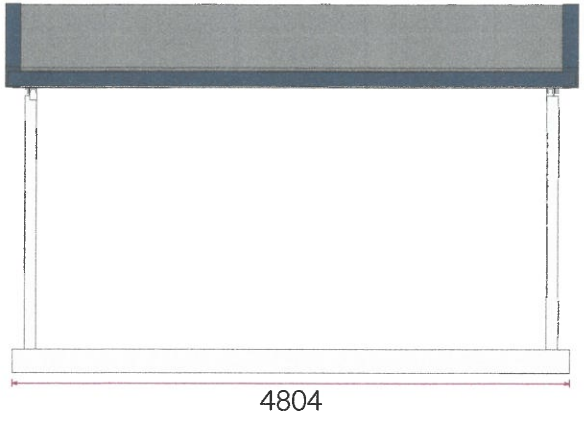
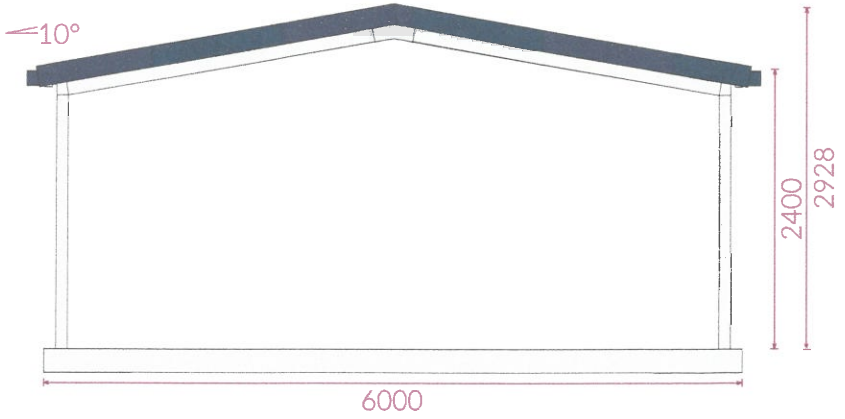
## RIGHT ELEVATION




## BACK ELEVATION

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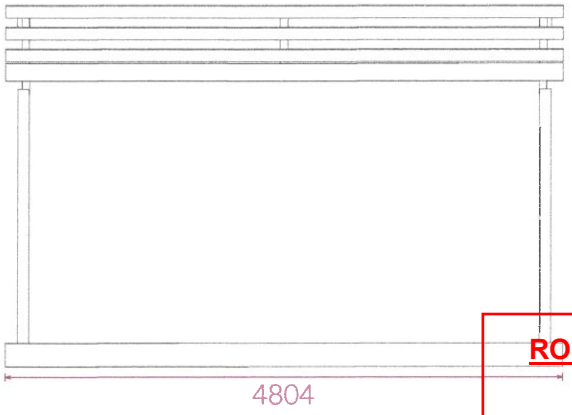
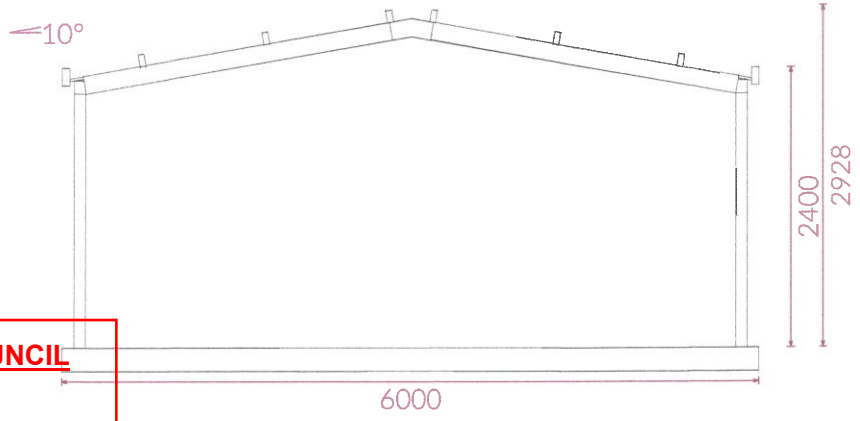
# FRAME LEFT ELEVATION




# FRAME FRONT ELEVATION

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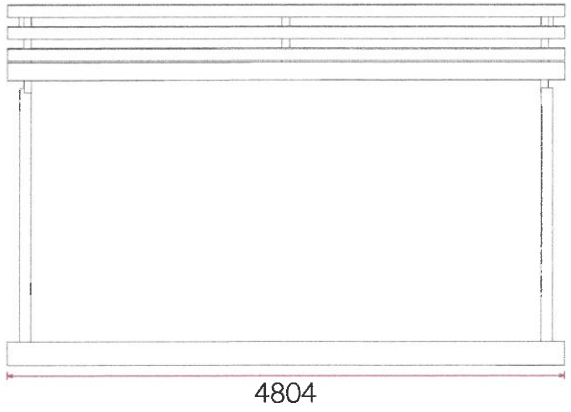
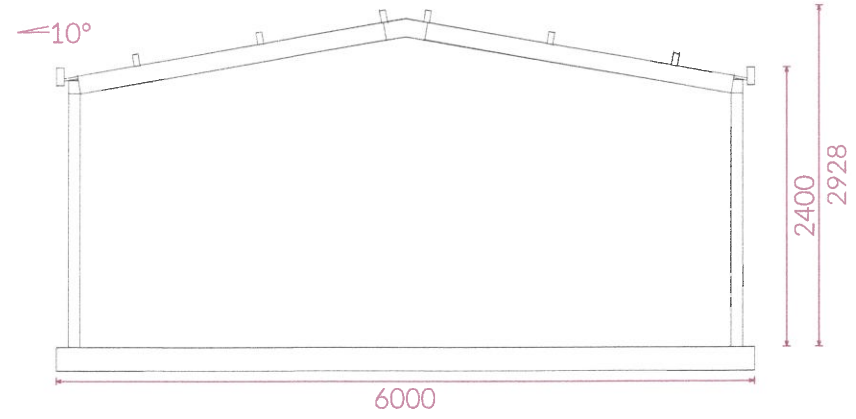
# FRAME RIGHT ELEVATION




# FRAME BACK ELEVATION

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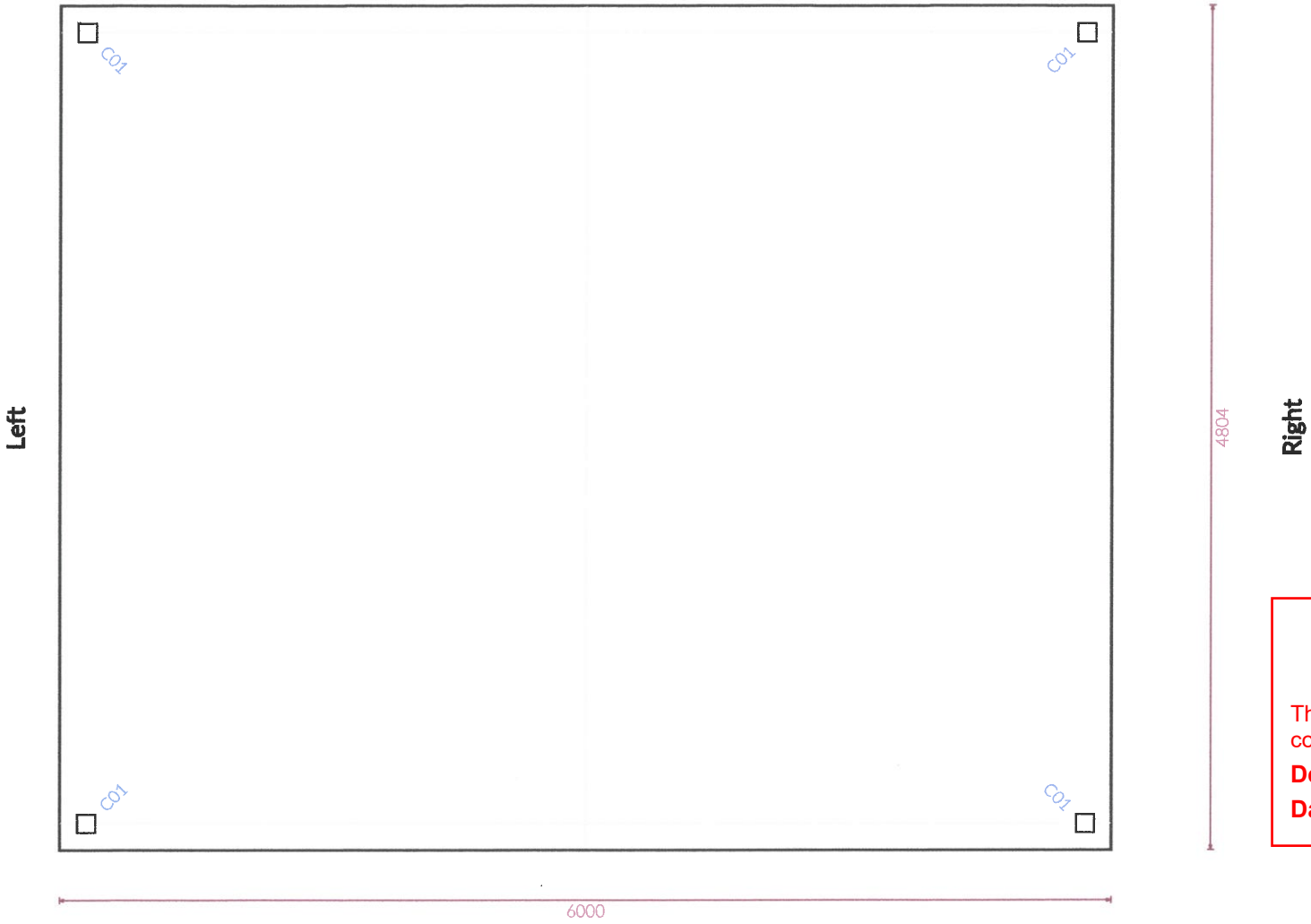
# PLAN - SUMMARY (1/3)

This is basic plan for the layout of the building. Refer to the following pages for specific details.

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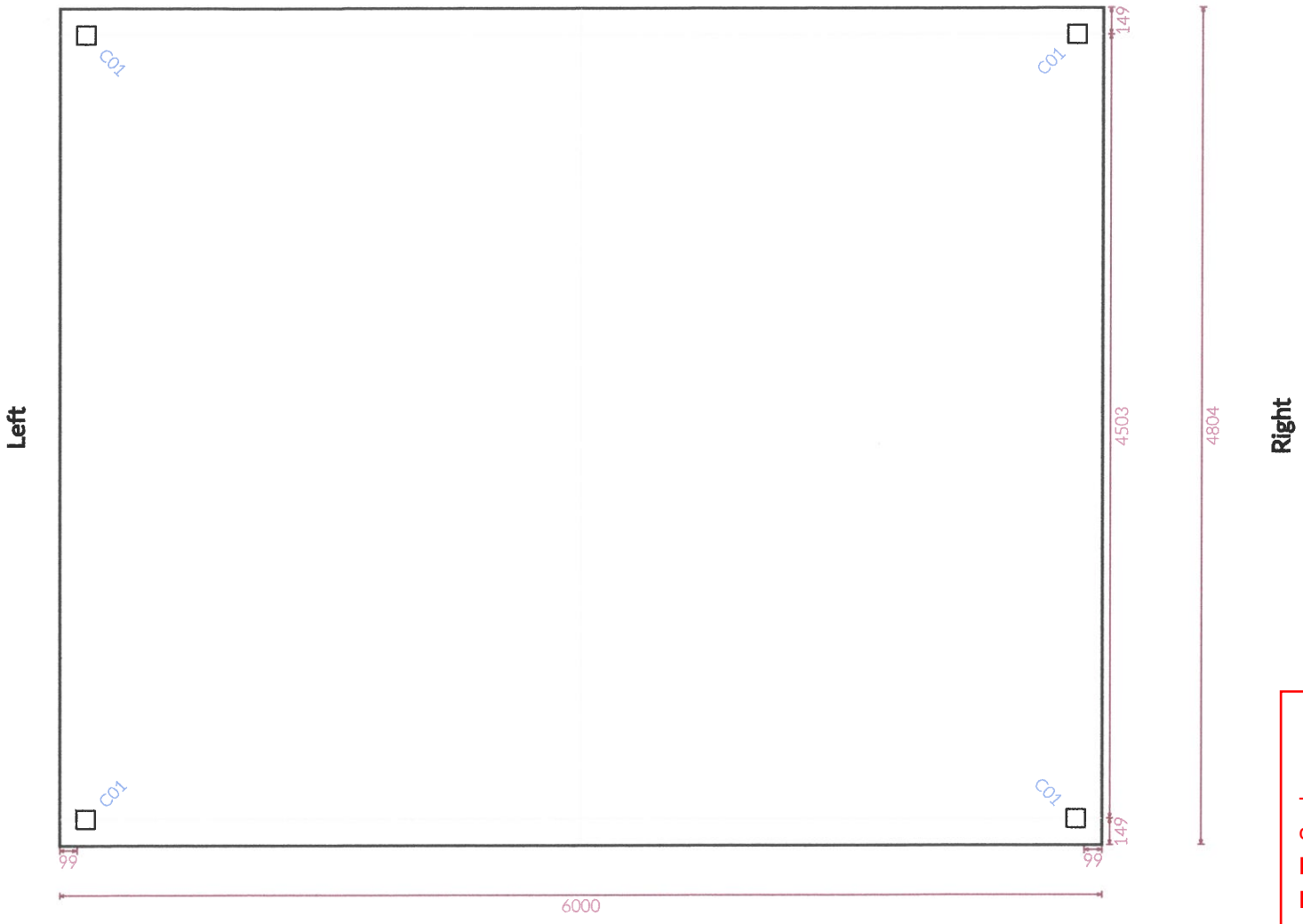
# PLAN - COLUMNS (2/3)

This drawing shows placement of columns.

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# PLAN - INFORMATION (3/3)

## Major Frame

| | | | |
|---|---|---|---|
| C01 | Column SHS100100303 2178mm | Rafter C15015 | 2841mm |

## Miscellaneous Framing

| | |
|---|---|
| Eave Purlin | C Section 152 x 64 x 1.2. |
| Girt | Z Section 102 x 51 x 1.5. Max Spacing 1500.0 |
| Purlin | Z Section 102 x 51 x 1.5. Max Spacing 1200.0 |

## Cladding

| | |
|---|---|
| Walls | Trimdek Cladding 0.47 TCT Colour Surfmist® |
| Roof | Trimdek Cladding 0.47 TCT Colour Basalt® |

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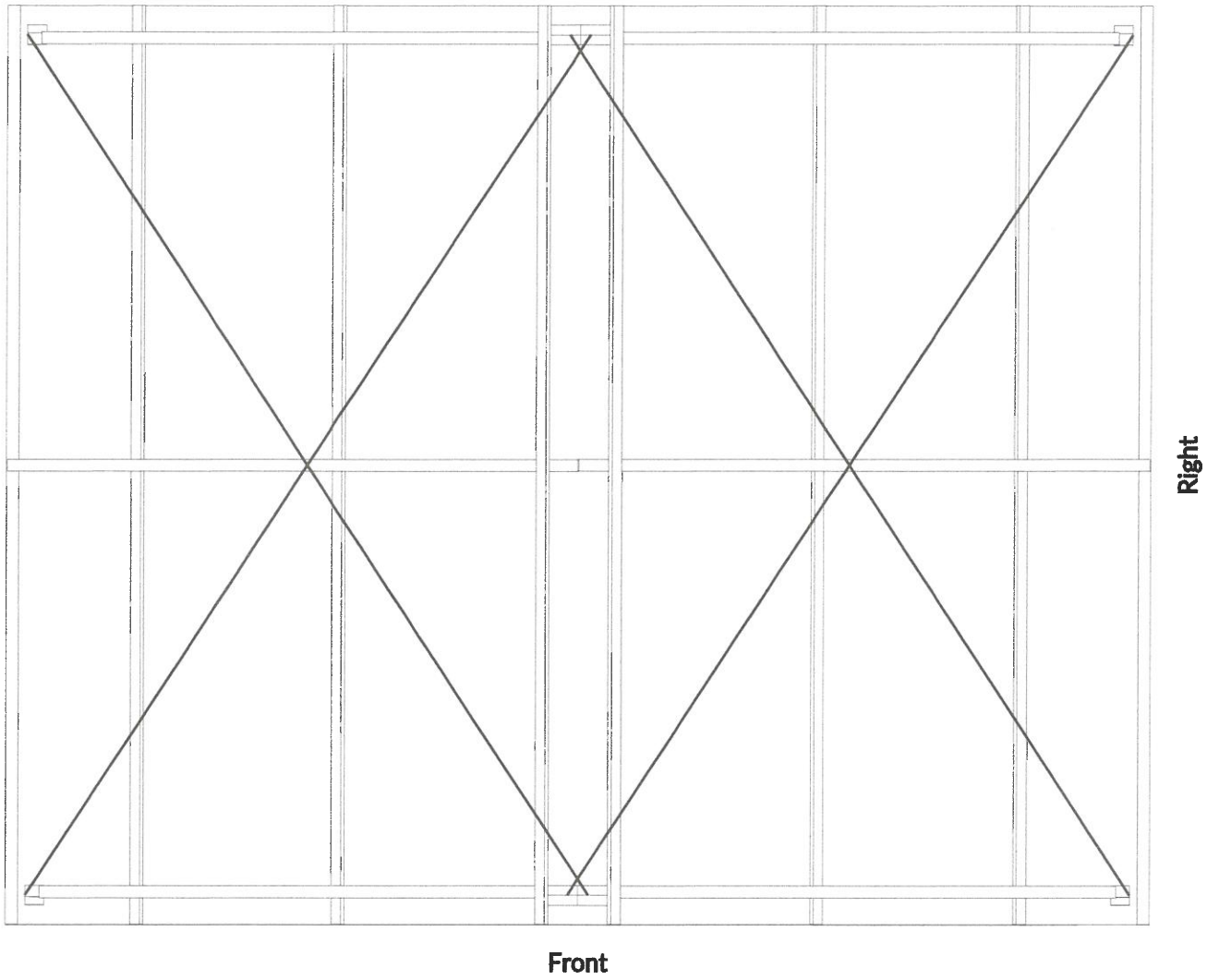
# BRACING

Bracing
Roof
Steel Cable 8mm

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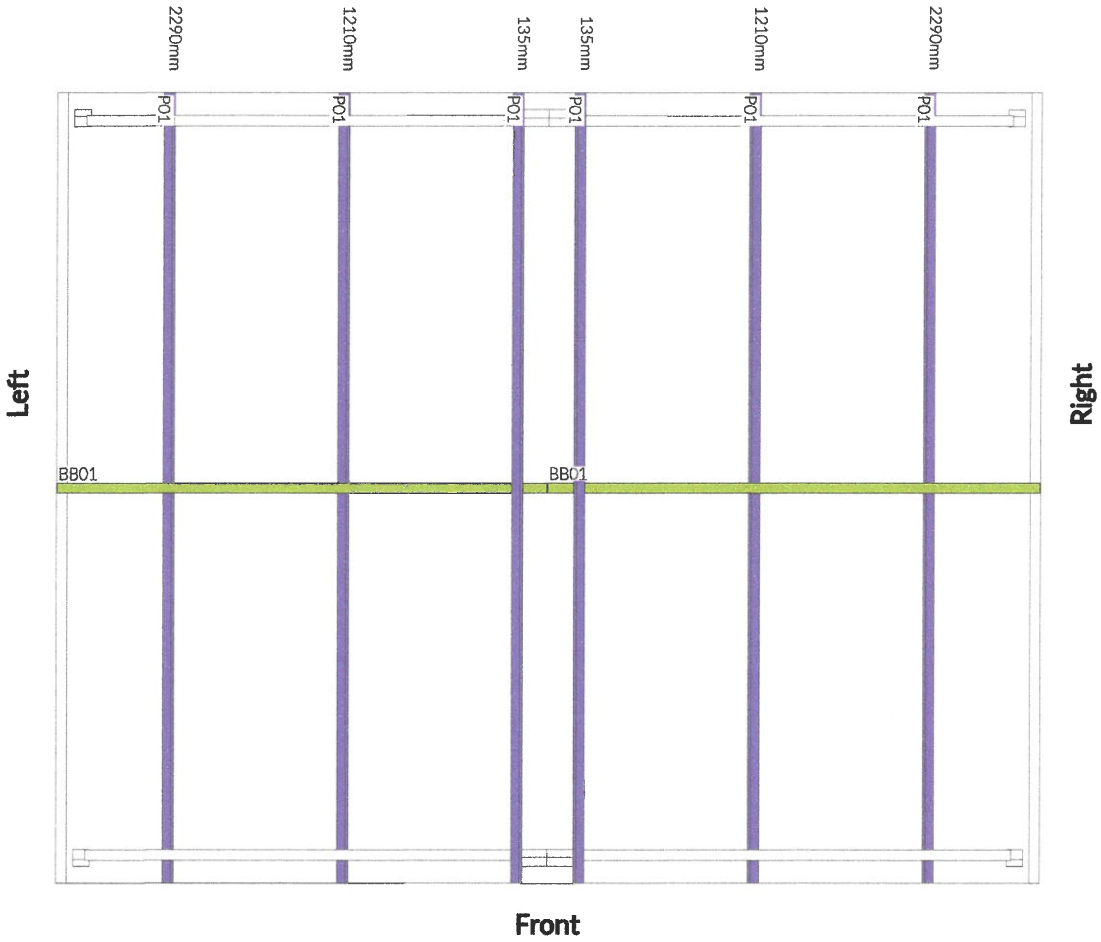
# PURLINS

Purlin dimensions are from the apex of the section to the lower fixing of the purlin.

Frame Items

| | | |
|---|---|---|
| BB01 | 2x | Topspan 22 x 0.42 (6.0 lm) |
| P01 | 6x | Z Section 102 x 51 x 1.5 4805 |

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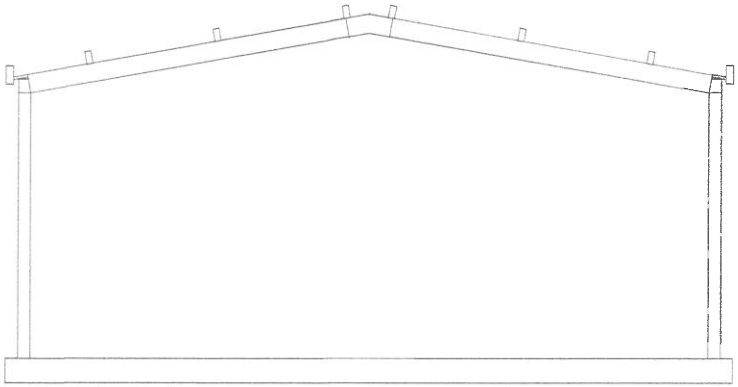
# MAIN FRAME 1 ELEVATION

Viewed from front of building.



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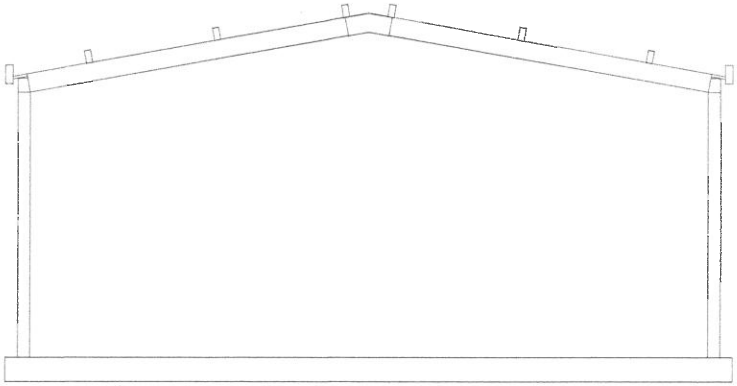
# MAIN FRAME 1 ELEVATION (GIRT POSITIONS)

Viewed from front of building. Girt heights measured in mm from top of slab to centre of girt.



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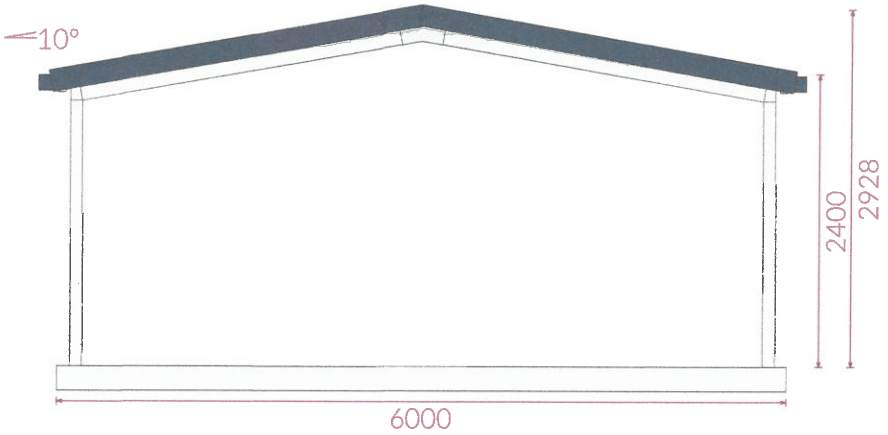
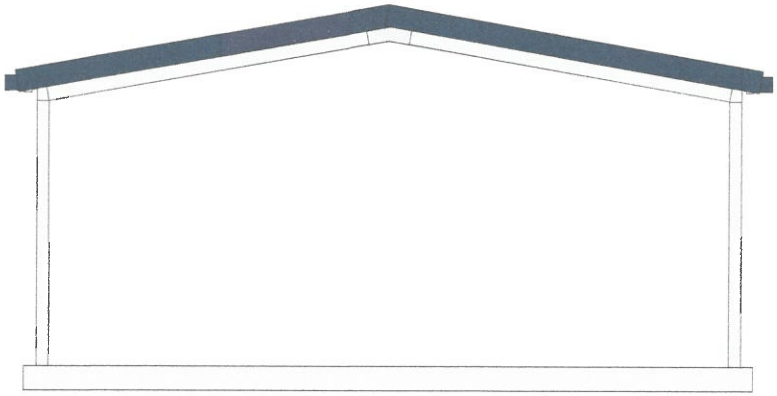
# MAIN FRAME 1 ELEVATION WITH CLADDING

Viewed from front of building.




# MAIN FRAME 1 ELEVATION CLAD SHEETS

Viewed from front of building.



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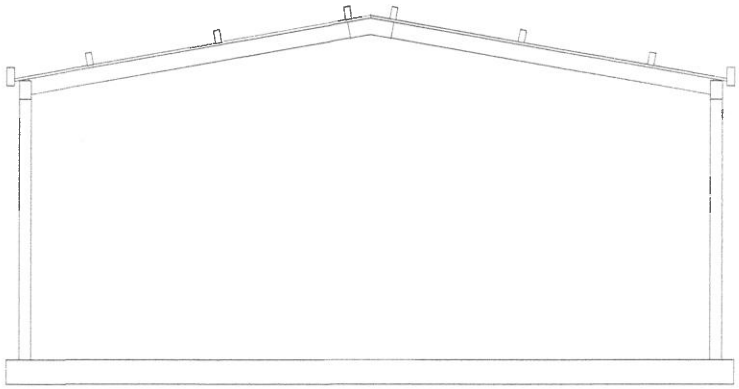
| | | | |
|---|---|---|---|
| **Project** | 6m (w) x 4.8m (l) x 2.4m (h) Gable Garage - Roof Only | **Job#** | 68587_VEAL |
| **Client** | HOWARD VEAL | **Date** | 08 Oct 2024 |
| **Site Address** | 3 DIBDIN STREET WANDAL QLD 4700 | **Page** | 11 of 39 |

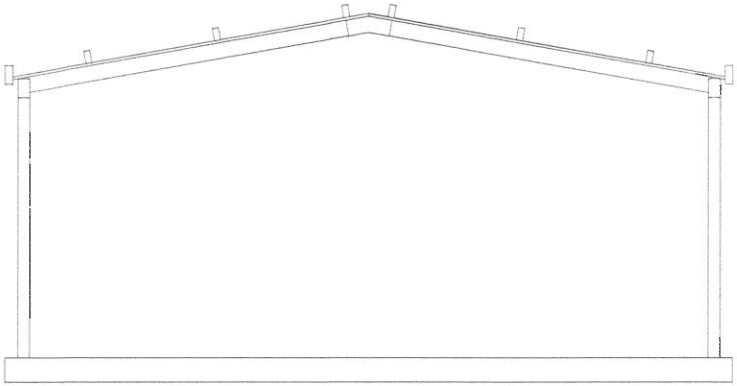
# MAIN FRAME 2 ELEVATION

Viewed from front of building.



# MAIN FRAME 2 ELEVATION (GIRT POSITIONS)

Viewed from front of building. Girt heights measured in mm from top of slab to centre of girt.



**ROCKHAMPTON REGIONAL COUNCIL**

**APPROVED PLANS**

These plans are approved subject to the current conditions of approval associated with

**Development Permit No.:** D/172-2024

**Dated:** 17 December 2024

green steel

Registered Professional Engineer
Graeme C Moulston
FIE Aust CPEng 5590 RPEQ4431
Signature Date 08/10/24

| | | | |
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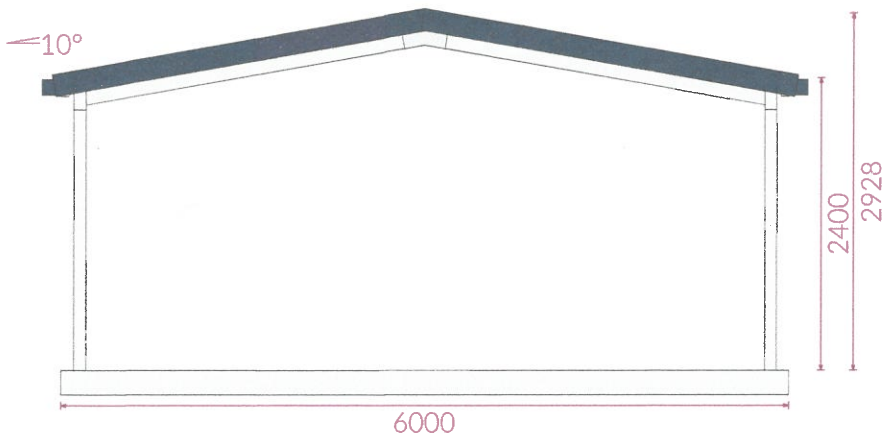
| **Site Address** | 3 DIBDIN STREET WANDAL QLD 4700 | **Page** | 12 of 39 |

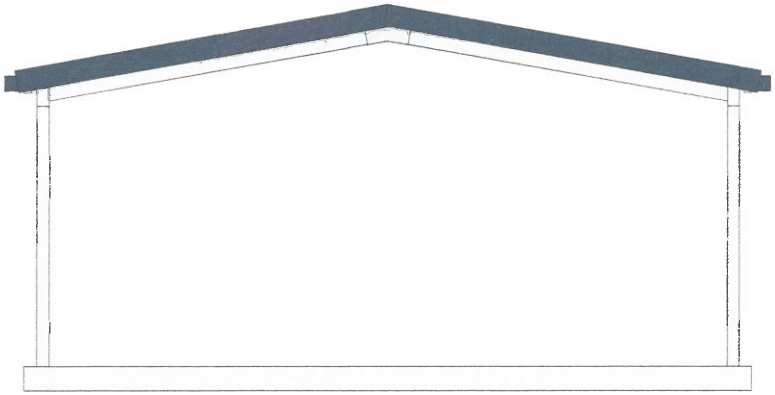
# MAIN FRAME 2 ELEVATION WITH CLADDING

Viewed from front of building.




# MAIN FRAME 2 ELEVATION CLAD SHEETS

Viewed from front of building.



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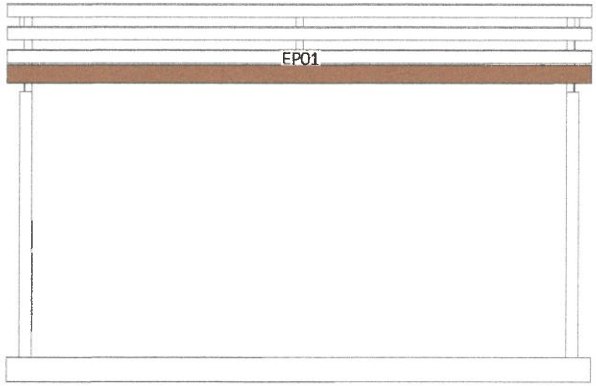
| **Site Address** | 3 DIBDIN STREET WANDAL QLD 4700 | **Page** | 13 of 39 |

# LEFT SIDE MAIN BUILDING FRAME ELEVATION

Viewed from left of building.

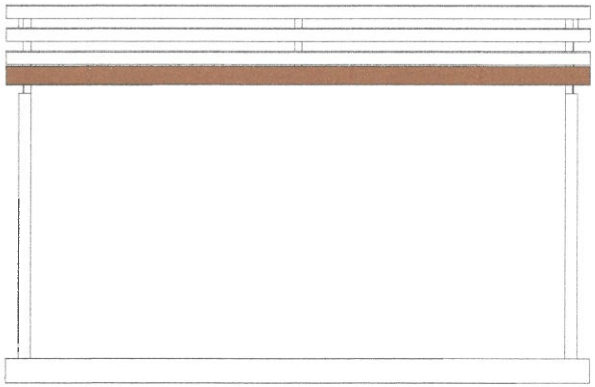



Frame Items

| | | | |
|---|---|---|---|
| EP01 | 1x | C Section 152 x 64 x 1.2 | 4800 |

# LEFT SIDE MAIN BUILDING FRAME ELEVATION (GIRT POSITIONS)

Viewed from left of building. Girt heights measured in mm from top of slab to centre of girt.



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| | | | |
|---|---|---|---|
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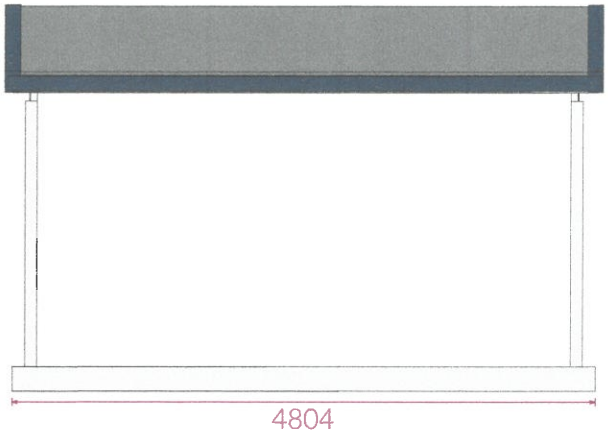
| **Site Address** | 3 DIBDIN STREET WANDAL QLD 4700 | **Page** | 14 of 39 |

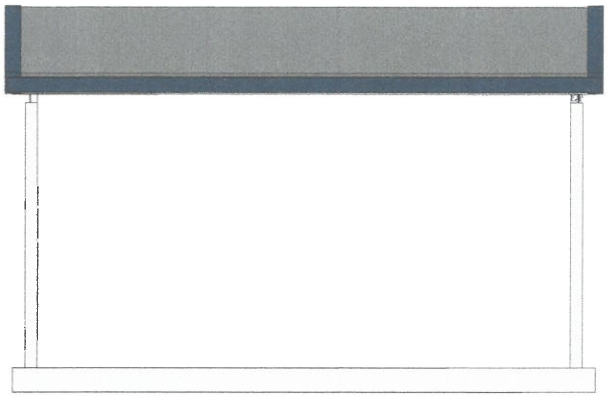
# LEFT SIDE MAIN BUILDING ELEVATION WITH CLADDING

Viewed from left of building.




# LEFT SIDE MAIN BUILDING ELEVATION CLAD SHEETS

Viewed from left of building.



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| | | | |
|---|---|---|---|
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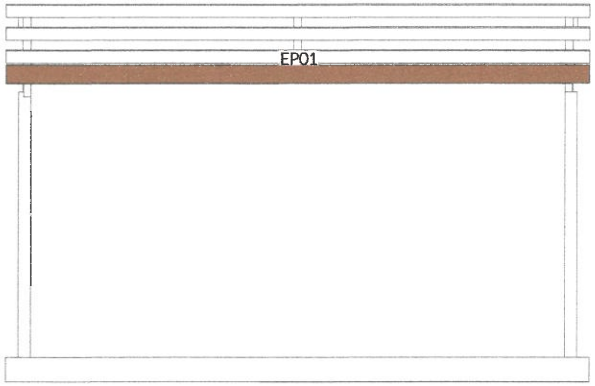
| **Site Address** | 3 DIBDIN STREET WANDAL QLD 4700 | **Page** | 15 of 39 |

# RIGHT SIDE MAIN BUILDING FRAME ELEVATION

Viewed from right of building.

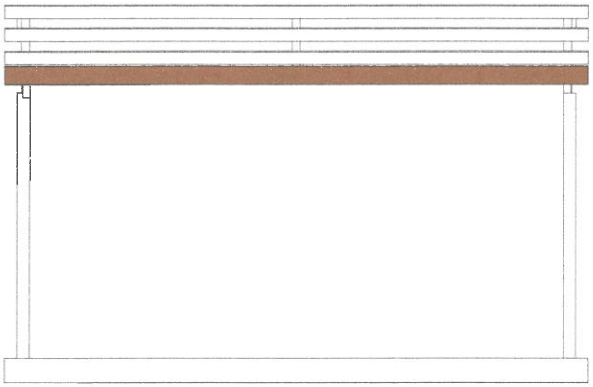



Frame Items

| | | | |
|---|---|---|---|
| EP01 | 1x | C Section 152 x 64 x 1.2 | 4800 |

# RIGHT SIDE MAIN BUILDING FRAME ELEVATION (GIRT POSITIONS)

Viewed from right of building. Girt heights measured in mm from top of slab to centre of girt.



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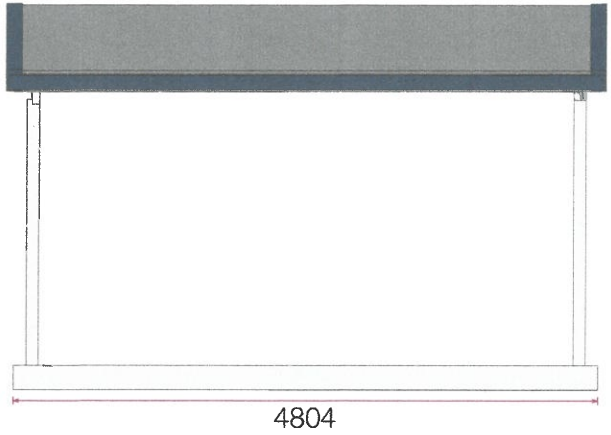
| | | | |
|---|---|---|---|
| **Project** | 6m (w) x 4.8m (l) x 2.4m (h) Gable Garage - Roof Only | **Job#** | 68587_VEAL |
| **Client** | HOWARD VEAL | **Date** | 08 Oct 2024 |
| **Site Address** | 3 DIBDIN STREET WANDAL QLD 4700 | **Page** | 16 of 39 |

# RIGHT SIDE MAIN BUILDING ELEVATION WITH CLADDING

Viewed from right of building.

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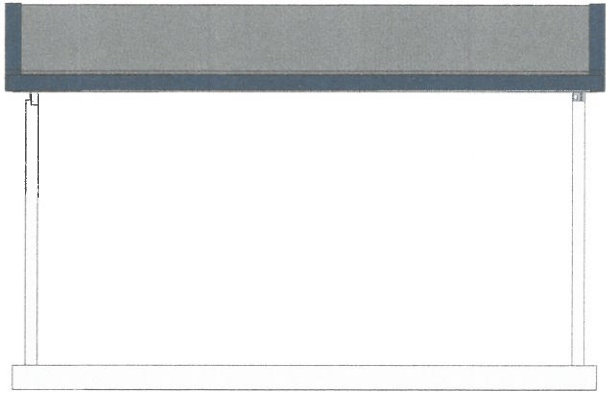
# RIGHT SIDE MAIN BUILDING ELEVATION CLAD SHEETS

Viewed from right of building.



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| **Site Address** | 3 DIBDIN STREET WANDAL QLD 4700 | **Page** | 17 of 39 |

# CONCRETE SLAB (1/4) - DIMENSIONS/STEPDOWN

This drawing shows the dimensions of the slabs and any stepdowns required.

**ROCKHAMPTON REGIONAL COUNCIL**

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**Development Permit No.:** D/172-2024

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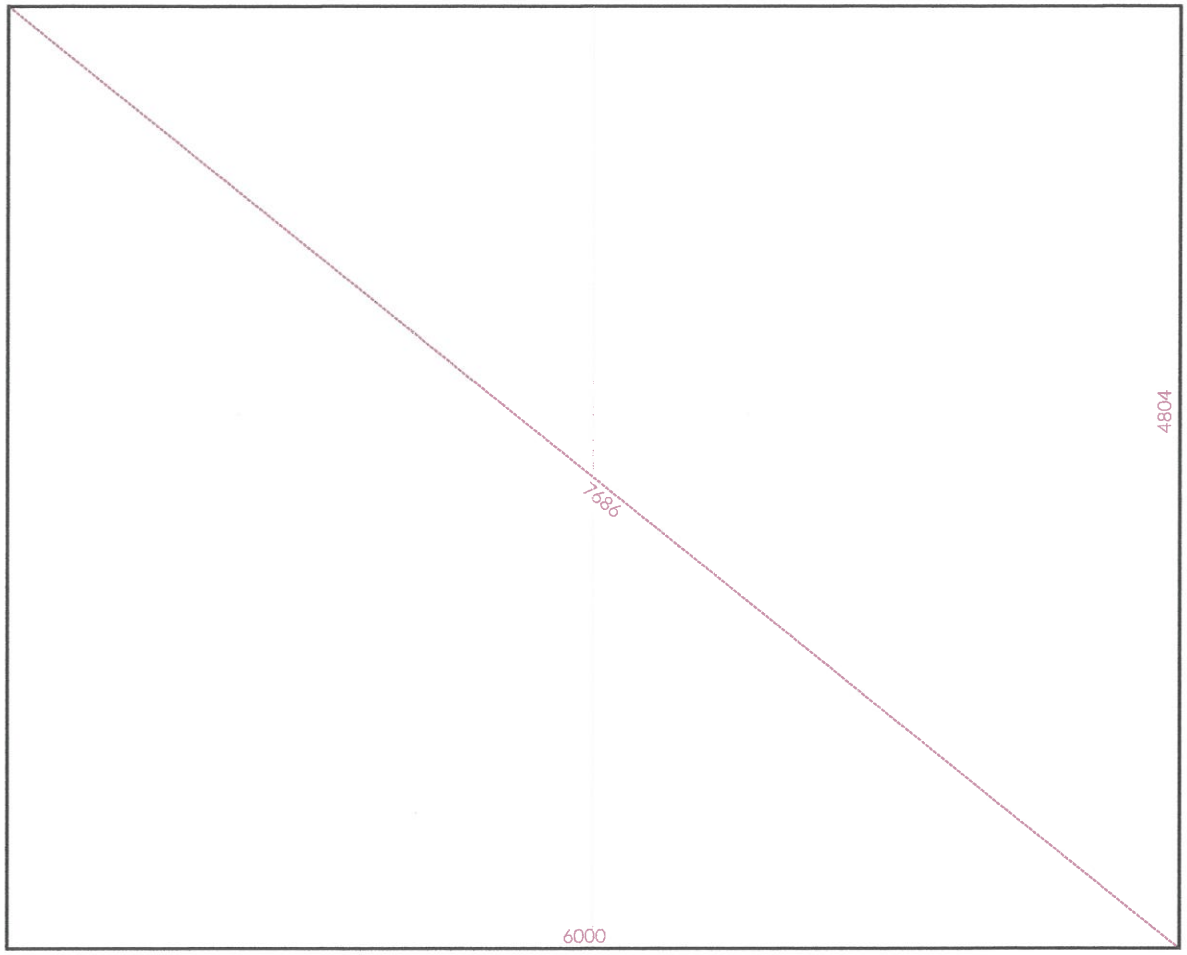


Registered Professional Engineer
Graeme C Moulston
FIE Aust CPEng 5590 RPEQ4431
Signature
Date 08/10/24

| | | | |
|---|---|---|---|
| **Project** | 6m (w) x 4.8m (l) x 2.4m (h) Gable Garage - Roof Only | **Job#** | 68587_VEAL |
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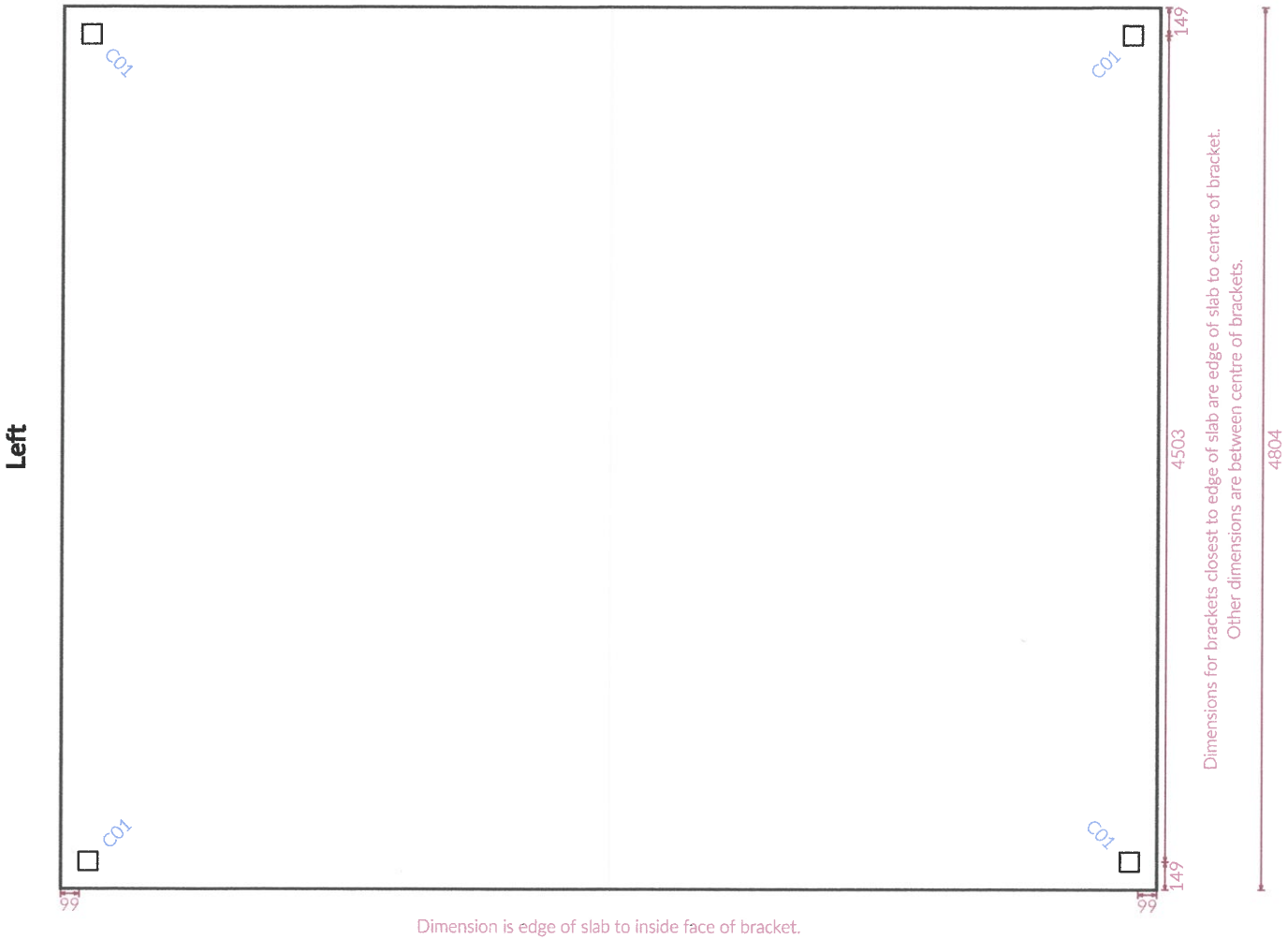
| **Site Address** | 3 DIBDIN STREET WANDAL QLD 4700 | **Page** | 18 of 39 |

# CONCRETE SLAB (2/4) - IN SLAB BRACKETS

These are the positions for the inslab brackets. Correct placement is crucial!

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| | | | |
|---|---|---|---|
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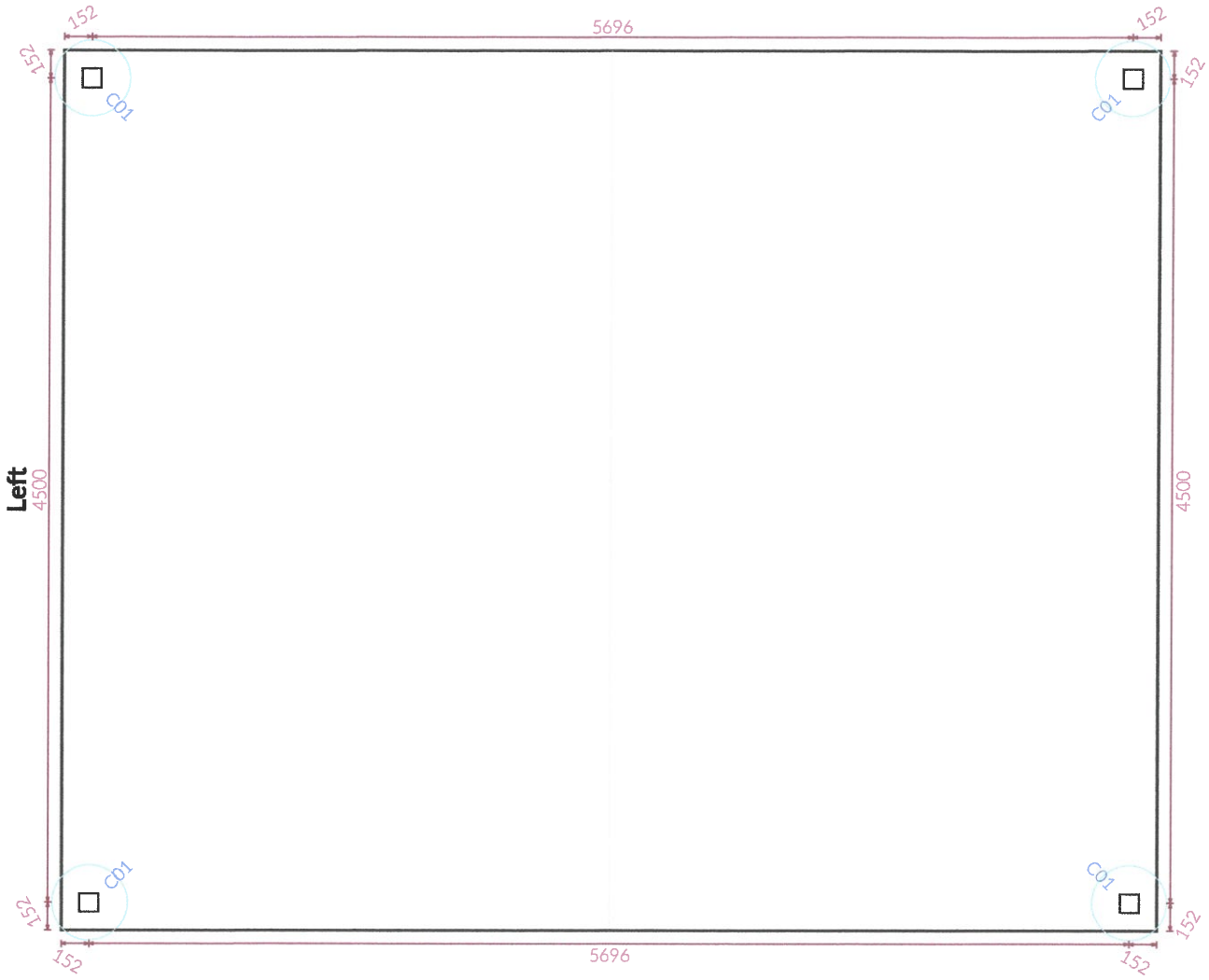
| **Site Address** | 3 DIBDIN STREET WANDAL QLD 4700 | **Page** | 19 of 39 |

# CONCRETE SLAB (3/4) - FOOTINGS

Column and mullion footings may differ in size. Refer to following pages for footing details.

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**Front**

Registered Professional Engineer
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Signature Date 08/10/24

| | | | |
|---|---|---|---|
| **Project** | 6m (w) x 4.8m (l) x 2.4m (h) Gable Garage - Roof Only | **Job#** | 68587_VEAL |
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| **Site Address** | 3 DIBDIN STREET WANDAL QLD 4700 | **Page** | 20 of 39 |

# CONCRETE SLAB (4/4) - INFORMATION

Major Frame

| | | | |
|---|---|---|---|
| C01 | Column SHS100100303 2178mm | Rafter C15015 | 2841mm |

Notes

1. Concrete strength to be 25mPa at 28 days.
2. Footing shown as per standard NCC 2022 requirements, not site specific details.
3. Sub-structure requires safe bearing pressure at foundation level of 100kPa.
4. Any other soil class VOIDS design – refer back to engineer.
5. Should rock be encountered during footing excavation you shall contact the design engineer for clarification that the design is suitable for the site conditions.
6. If 'Pier Only' design has been selected as a preferred option, use same pier detail design to the End Wall Mullion as per Portal Columns.
7. Flood Design Parameters.
   - "INUNDATION" FLOOD - The building requires at least two (2) opposing door openings with a max flood height of 1.5 metres at a max flood velocity of 0.5 m/s.
   - "FLOW" FLOOD - The building requires a minimum of four (4) door openings, minimum of one (1) on each side of the structure, with absolute flood height of 0.5 metres at a maximum flood velocity of 1.0 m/s.

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**Project** 6m (w) x 4.8m (l) x 2.4m (h) Gable Garage - Roof Only
**Client** HOWARD VEAL
**Site Address** 3 DIBDIN STREET WANDAL QLD 4700

**Job#** 68587_VEAL
**Date** 08 Oct 2024

# STANDARD SLAB - SITE CLASS A,S

**- DOMESTIC LARGE 12-24m SPAN, 1.5kPa**
**- INDUSTRIAL ≤24m SPAN 5kPa & 10 kPa**

## FOUNDATION NOTES

F01 Information shown in this drawing is only for guidance and only applicable to clad frame construction and the site classifications listed in the table below. For site specific slab design refer to an engineer.

### SITE CLASSIFICATION TO AS2870

| Class | Notes |
|---|---|
| A | 1.5 kPa (Domestic), 5 kPa & 10 kPa (Industrial) options shown |
| S | |
| M | |
| H1 | |
| H2 | |
| E | |
| P | |

F02 Footing & slab have been designed assuming stable site with an allowable bearing capacity of 100 kPa, subgrade CBR15, Classes "A" and "S".

F03 If the site soil classification is unknown, the owner is recommended to obtain a soil test report from a geotechnical engineer to confirm F02 .

F04 For Class 1A buildings, the standard slab designs shown will not meet NCC 2022 requirements. The owner is strongly advised to obtain a soil report and contact an engineer for a site specific slab design. Additional design fees may apply.

F05 Footings shall be located centrally under walls and columns unless noted otherwise.

F06 All footings to be founded minimum 250mm into natural ground. Do not found footings in uncontrolled fill.

### EDGE & INTERNAL BEAM DESIGN

| Site Class | Beam Depth [mm] | Reinforcement | | Max. Beam Spacing |
|---|---|---|---|---|
| | | Bottom Mesh | Top Bar | |
| A | 300 | 3-L8TM | - | - |
| S | 300 | 3-L8TM | - | - |

### SLAB REINFORCEMENT

Slab reinforcement for all listed site classes shall be:

| Slab Length | Reinforcement |
|---|---|
| < 18m | SL72 |
| 18m to 25m | SL82 |
| > 25m & < 30m | SL92 |

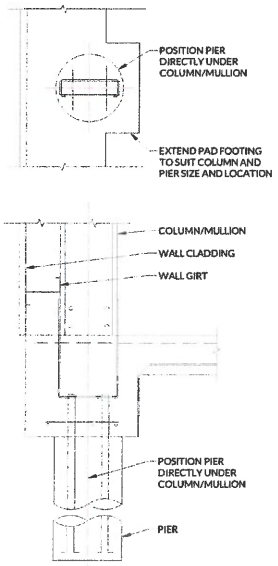
### SLAB THICKNESS

| Live Load | Slab Thickness |
|---|---|
| 1.5 kPa | 100 mm |
| 5 kPa | 125 mm |
| 10 kPa | 150 mm |

### PAD FOOTING SIZES**

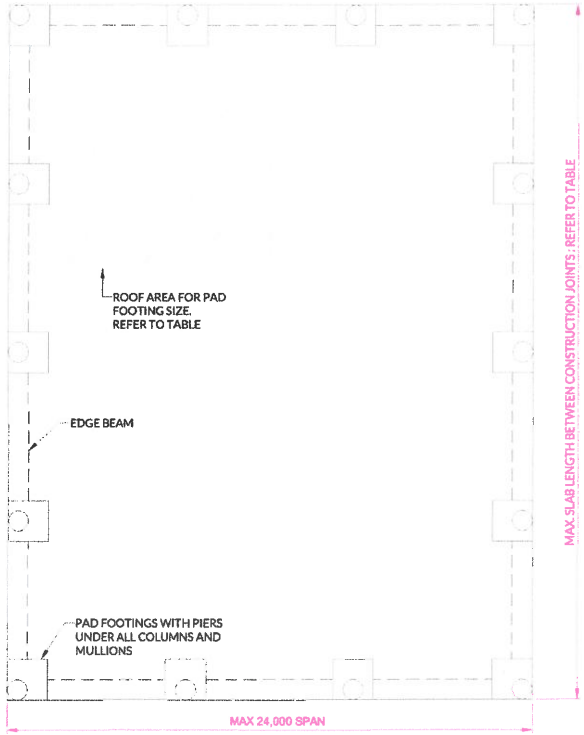
| Pad Roof Area* | 1.5 kPa - 100 THK<br>5 kPa - 125 THK | 10 kPa - 150 THK |
|---|---|---|
| < 40 m² | 400x400x300 mm | 400x400x300 mm |
| 40-60 m² | 400x400x300 mm | 500x500x300 mm |
| 60-80 m² | 500x500x300 mm | 500x500x300 mm |
| 80-100 m² | - | 600x600x300 mm |

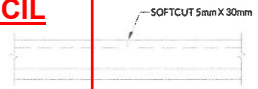
Notes:
* 'Pad Roof Area' is the area of the roof that the pad footing is holding down at that column or mullion.
PAD ROOF AREA = 0.5 x SPAN x BAY SPACING
** Minimum sizes listed. Extend pad footing to suit size and position of column/mullion in particular with in-slab footing option.




## PIER LOCATIONS

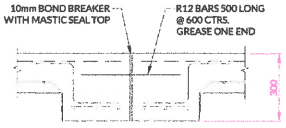
- PIERS TO BE POSITIONED DIRECTLY UNDER COLUMNS AND MULLIONS ACCOUNTING FOR C-SECTION AND WALL GIRT SIZE.
- EXTEND PAD FOOTING TO SUIT SIZE AND POSITION OF COLUMN/MULLION.
- REFER TO COLUMN AND MULLION LOCATIONS ON BUILDING PLAN DRAWING.



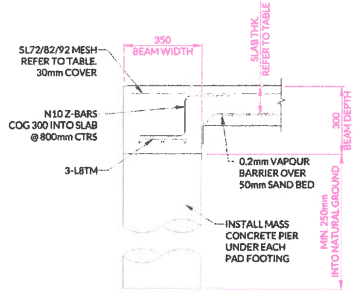

## CONSTRUCTION JOINT

CUT CONSTRUCTION JOINTS AT MAX. 6000mm SPACING



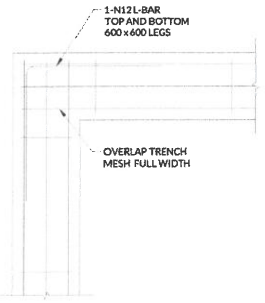

## ISOLATION JOINT

| SITE CLASS | | | | | | |
|---|---|---|---|---|---|---|
| A | S | M | H1 | H2 | E | P |




## EDGE BEAM DETAIL

| SITE CLASS | | | | | | |
|---|---|---|---|---|---|---|
| A | S | M | H1 | H2 | E | P |




## BEAM CORNER DETAIL

**ROCKHAMPTON REGIONAL COUNCIL**

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| **Site Address** | 3 DIBDIN STREET WANDAL QLD 4700 | **Page** | 22 of 39 |

# STANDARD SLAB - SITE CLASS M,H1,H2

**- DOMESTIC LARGE 12-24m SPAN, 1.5kPa**
**- INDUSTRIAL ≤24m SPAN 5kPa & 10 kPa**

**FOUNDATION NOTES**

F01 Information shown in this drawing is only for guidance and only applicable to clad frame construction and the site classifications listed in the table below. For site specific slab design refer to an engineer.

| SITE CLASSIFICATION TO AS2870 | |
|---|---|
| Class | Notes |
| A | |
| S | |
| M | 1.5 kPa (Domestic), 5 kPa & 10 kPa (Industrial) options shown |
| H1 | |
| H2 | |
| E | |
| P | |

F02 If the site soil classification is unknown, the owner is recommended to obtain a soil test report from a geotechnical engineer.

F03 For Class 1A buildings, the standard slab designs shown will not meet NCC 2022 requirements. The owner is strongly advised to obtain a soil report and contact an engineer for a site specific slab design. Additional design fees may apply.

F04 All footings to be founded minimum 250mm into natural ground. Do not found footings in uncontrolled fill.

F05 Natural ground is assumed to be stable soil with an allowable bearing capacity of at least 100 kPa.

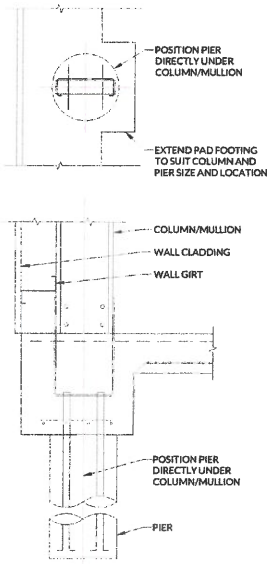
| EDGE & INTERNAL BEAM DESIGN | | | | |
|---|---|---|---|---|
| Site Class | Beam Depth [mm] | Reinforcement | | Max. Beam Spacing |
| | | Bottom Mesh | Top Bar | |
| M | 300 | 3-L8TM | - | 6m |
| M-D | 400 | 3-L11TM | - | 5m |
| H1 | 400 | 3-L11TM | - | 5m |
| H1-D | 400 | 3-L11TM | 1N12 | 4m |
| H2 | 550 | 3-L11TM | 2N12 | 4m |
| H2-D | 550 | 2x3-L11TM | 2N16 | 4m |

| SLAB REINFORCEMENT | |
|---|---|
| Slab reinforcement for all listed site classes shall be: | |
| Slab Length | Reinforcement |
| < 18m | SL72 |
| 18m to 25m | SL82 |
| > 25m & < 30m | SL92 |

| SLAB THICKNESS | |
|---|---|
| Live Load | Slab Thickness |
| 1.5 kPa | 100 mm |
| 5 kPa | 125 mm |
| 10 kPa | 150 mm |

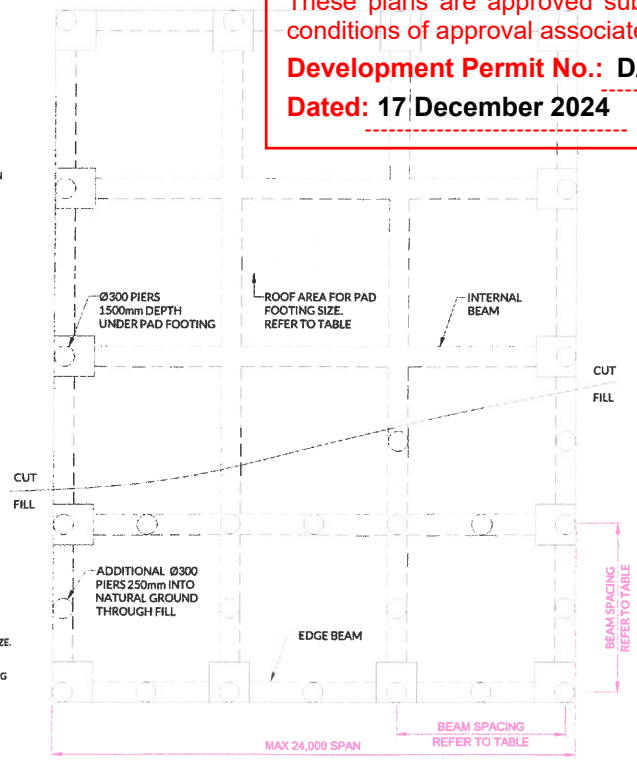
| PAD FOOTING SIZES** | | |
|---|---|---|
| Pad Roof Area* | 1.5 kPa - 100 THK<br>5 kPa - 125 THK | 10 kPa - 150 THK |
| < 40 m² | 400x400x300 mm | 400x400x300 mm |
| 40-60 m² | 400x400x300 mm | 500x500x300 mm |
| 60-80 m² | 500x500x300 mm | 500x500x300 mm |
| 80-100 m² | - | 600x600x300 mm |

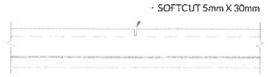
Notes:
* 'Pad Roof Area' is the area of the roof that the pad footing is holding down at that column or mullion.
PAD ROOF AREA = 0.5 x SPAN x BAY SPACING
** Minimum sizes listed. Extend pad footing to suit size and position of column/mullion in particular with in-slab footing option.




## PIER LOCATIONS

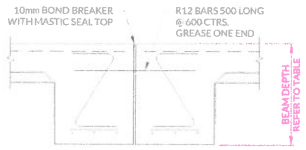
- PIERS TO BE POSITIONED DIRECTLY UNDER COLUMNS AND MULLIONS ACCOUNTING FOR C-SECTION AND WALL GIRT SIZE.
- EXTEND PAD FOOTING TO SUIT SIZE AND POSITION OF COLUMN/MULLION.
- REFER TO COLUMN AND MULLION LOCATIONS ON BUILDING PLAN DRAWING.



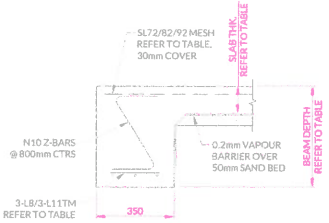

CONSTRUCTION JOINT

CUT CONSTRUCTION JOINTS AT MAX. 6000mm SPACING



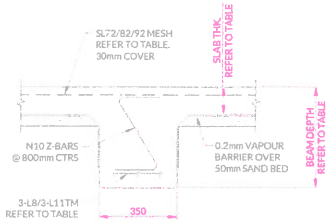

ISOLATION JOINT

SITE CLASS
A S M H1 H2 E P



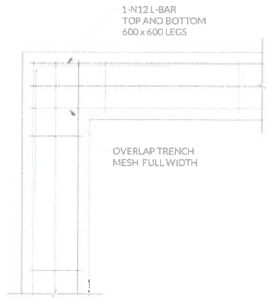

EDGE BEAM DETAIL

SITE CLASS
A S M H1 H2 E P

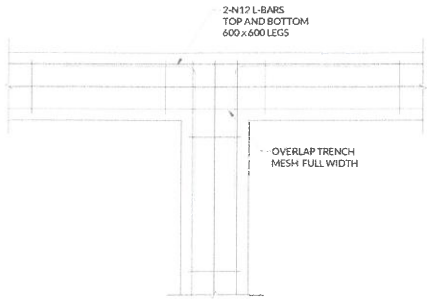



INTERNAL BEAM DETAIL

SITE CLASS
A S M H1 H2 E P




BEAM CORNER DETAIL




BEAM T-INTERSECTION DETAIL

**ROCKHAMPTON REGIONAL COUNCIL**

**APPROVED PLANS**

These plans are approved subject to the current conditions of approval associated with

**Development Permit No.:** D/172-2024

**Dated:** 17 December 2024

green steel

Registered Professional Engineer
Graeme C Moulston
FIE Aust CPEng 5590 RPEQ4431
Signature Date 08/10/24

| | | | |
|---|---|---|---|
| **Project** | 6m (w) x 4.8m (l) x 2.4m (h) Gable Garage - Roof Only | **Job#** | 68587_VEAL |
| **Client** | HOWARD VEAL | **Date** | 08 Oct 2024 |
| **Site Address** | 3 DIBBIN STREET WANDAL QLD 4700 | **Page** | 23 of 39 |

# STANDARD SLAB - INDUSTRIAL - SITE CLASS E,P

**ROCKHAMPTON REGIONAL COUNCIL**

**APPROVED PLANS**

These plans are approved subject to the current conditions of approval associated with

**Development Permit No.:** D/172-2024

**Dated:** 17 December 2024

## - INDUSTRIAL ≤24m SPAN 5kPa & 10 kPa

### FOUNDATION NOTES

F01 Information shown in this drawing is only for guidance and only applicable to clad frame construction and the site classifications listed in the table below. For site specific slab design refer to an engineer.

**SITE CLASSIFICATION TO AS2870**

| Class | Notes |
|---|---|
| A | |
| S | |
| M | |
| H1 | |
| H2 | |
| E | 5 kPa & 10 kPa options shown. Extremely reactive and problematic soil requires site specific slab design, contact an engineer. |
| P | |

F02 If the site soil classification is unknown, the owner is recommended to obtain a soil test report.

F03 For Class 1A buildings, the standard slab designs shown will not meet NCC 2022 requirements. The owner is strongly advised to obtain a soil report and contact an engineer for a site specific slab design. Additional design fees may apply.

F04 All mass concrete piers to be founded minimum 250mm into natural ground. Do not found footings in uncontrolled fill.

F05 Natural ground is assumed to be stable soil with an allowable bearing capacity of at least 100 kPa.

**EDGE & INTERNAL BEAM DESIGN**

| Site Class | Beam Depth [mm] | Reinforcement Bottom Mesh | Reinforcement Top Mesh | Max. Beam Spacing | Max. Pier Spacing |
|---|---|---|---|---|---|
| E | 450 | 4-L11TM | 4-L11TM | 4m | 2.5m |
| E-D | 450 | 4-L11TM | 4-L11TM | 4m | 2.5m |
| P | 450 | 4-L11TM | 4-L11TM | 4m | 2.5m |

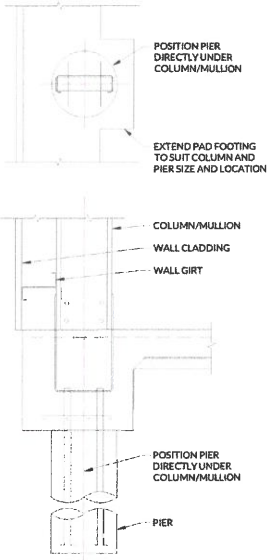
**SLAB THICKNESS & REINFORCEMENT**

| Live Load | Slab Thickness | Slab Mesh |
|---|---|---|
| 5 kPa | 125 mm | SL82 |
| 10 kPa | 150 mm | SL92 |

**PAD FOOTING SIZES**

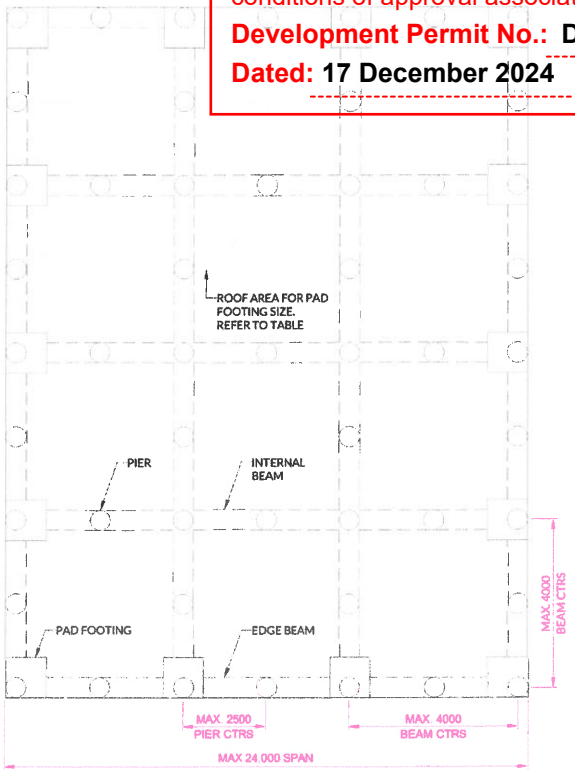
| Pad Roof Area* | Industrial Slab 5 kPa - 125 THK | Industrial Slab 10 kPa - 150 THK |
|---|---|---|
| < 40 m² | 400x400x300 mm | 400x400x300 mm |
| 40-60 m² | 400x400x300 mm | 500x500x300 mm |
| 60-80 m² | 500x500x300 mm | 500x500x300 mm |
| 80-100 m² | - | 600x600x300 mm |

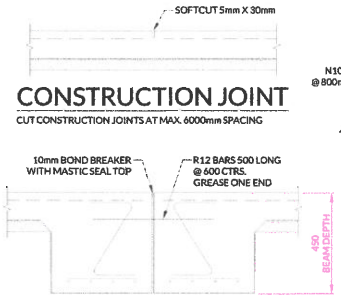
Notes:
* 'Pad Roof Area' is the area of the roof that the pad footing is holding down at that column or mullion.
PAD ROOF AREA = 0.5 x SPAN x BAY SPACING
** Minimum sizes listed. Extend pad footing to suit size and position of column/mullion in particular with in-slab footing option.




## PIER LOCATIONS

- PIERS TO BE POSITIONED DIRECTLY UNDER COLUMNS AND MULLIONS ACCOUNTING FOR C-SECTION AND WALL GIRT SIZE.
- EXTEND PAD FOOTING TO SUIT SIZE AND POSITION OF COLUMN/MULLION.
- REFER TO COLUMN AND MULLION LOCATIONS ON BUILDING PLAN DRAWING.



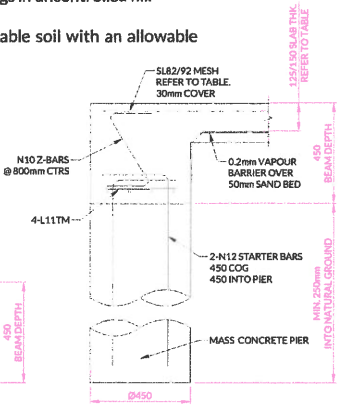




## CONSTRUCTION JOINT

CUT CONSTRUCTION JOINTS AT MAX. 6000mm SPACING

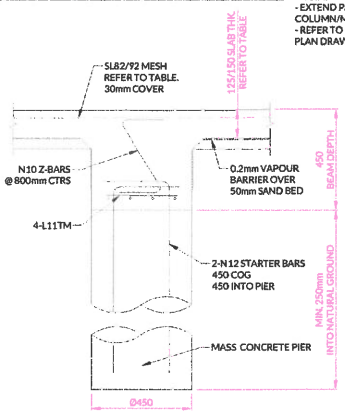
## ISOLATION JOINT

SITE CLASS: A S M H1 H2 E P



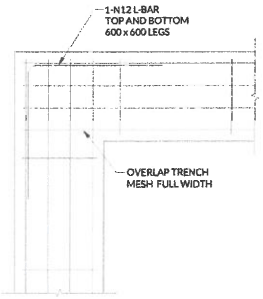

## EDGE BEAM DETAIL

SITE CLASS: A S M H1 H2 E P

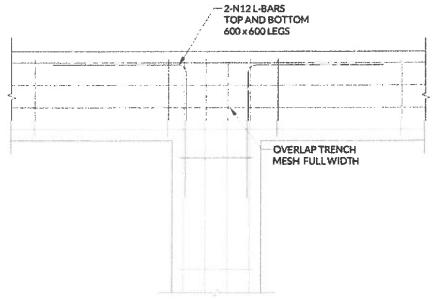



## INTERNAL BEAM DETAIL

SITE CLASS: A S M H1 H2 E P




## BEAM CORNER DETAIL




## BEAM T-INTERSECTION DETAIL

green steel

Registered Professional Engineer
Graeme C Moulston
FIE Aust CPEng 5590 RPEQ4431
Signature Date 08/10/24

| | | | |
|---|---|---|---|
| **Project** | 6m (w) x 4.8m (l) x 2.4m (h) Gable Garage - Roof Only | **Job#** | 68587_VEAL |
| **Client** | HOWARD VEAL | **Date** | 08 Oct 2024 |
| **Site Address** | 3 DIBBIN STREET WANDAL QLD 4700 | **Page** | 24 of 39 |

# STANDARD SLAB - PIER ONLY

## FOUNDATION NOTES

F01 Information shown in this drawing is only for guidance and only applicable to clad frame construction and the site classifications listed in the table below. For site specific slab design refer to an engineer.

| SITE CLASSIFICATION TO AS2870 | |
|---|---|
| Class | Notes |
| A | |
| S | Class 7, 8, 9b, 10a buildings only. |
| M | |
| H1 | |
| H2 | |
| E | |
| P | |

F02 Subsoil is assumed to be stiff clay with minimum undrained cohesion of 100 kPa.

F03 If the site soil classification is unknown, the owner is recommended to obtain a soil test report from a geotechnical engineer.

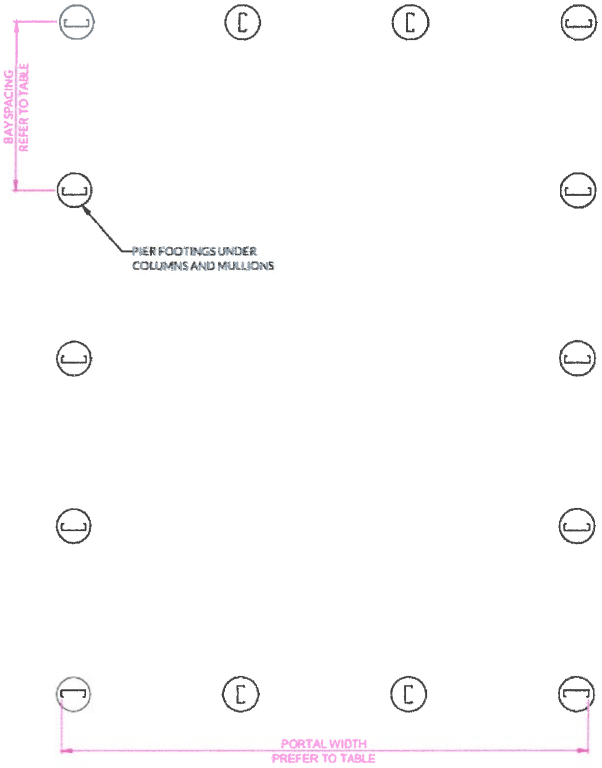
F04 For Class 1A buildings, the standard slab designs shown will not meet NCC 2022 requirements. The owner is strongly advised to obtain a soil report and contact an engineer for a site specific slab design. Additional design fees may apply.

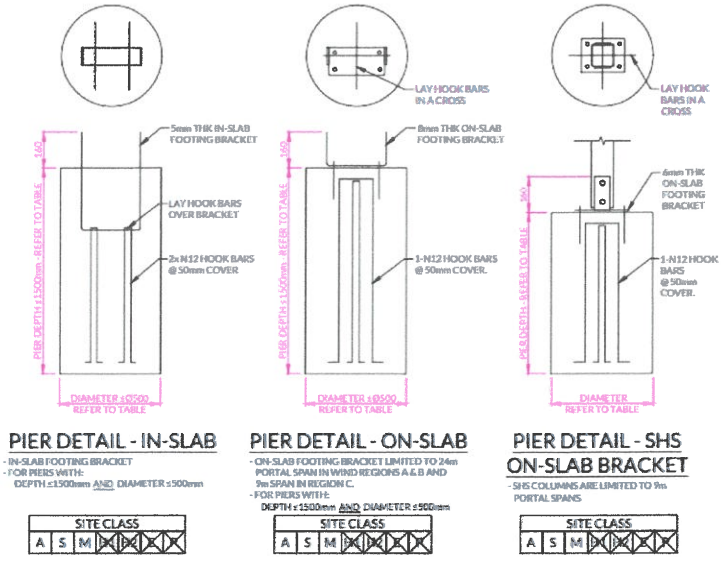
F05 All footings to be founded minimum 250mm into natural ground. Do not found footings in uncontrolled fill.

F06 Regional wind speeds to AS1170.2-2021 listed in table below:

| Region | Wind Speed |
|---|---|
| A | up to 45 m/s |
| B | up to 57 m/s |
| C | up to 75 m/s |

F06 Any open sided type shed use the pier details for cyclonic regions (C).




**PIER DETAIL - IN-SLAB**
- IN-SLAB FOOTING BRACKET
- FOR PIERS WITH: DEPTH ±1500mm AND DIAMETER ±500mm

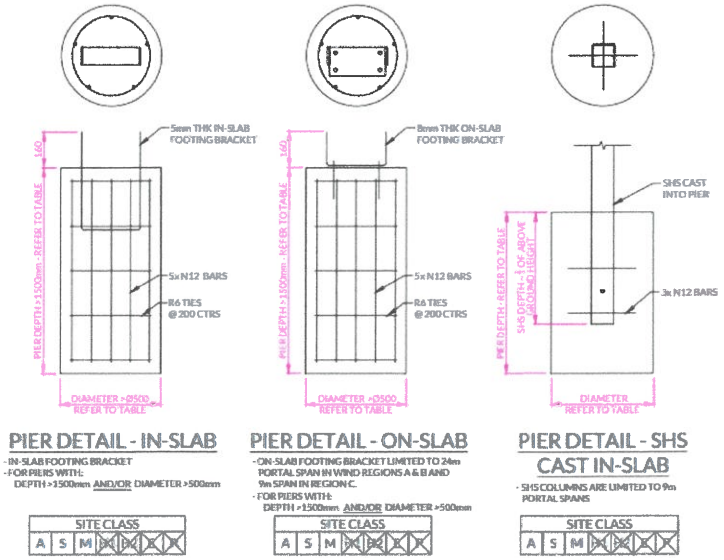
SITE CLASS: A S M H1 H2 E P

**PIER DETAIL - ON-SLAB**
- ON-SLAB FOOTING BRACKET LIMITED TO 24m PORTAL SPAN IN WIND REGIONS A & B AND 9m SPAN IN REGION C.
- FOR PIERS WITH: DEPTH ±1500mm AND DIAMETER ±500mm

SITE CLASS: A S M H1 H2 E P

**PIER DETAIL - SHS ON-SLAB BRACKET**
- SHS COLUMNS ARE LIMITED TO 9m PORTAL SPANS

SITE CLASS: A S M H1 H2 E P




**PIER DETAIL - IN-SLAB**
- IN-SLAB FOOTING BRACKET
- FOR PIERS WITH: DEPTH >1500mm AND/OR DIAMETER >500mm

SITE CLASS: A S M H1 H2 E P

**PIER DETAIL - ON-SLAB**
- ON-SLAB FOOTING BRACKET LIMITED TO 24m PORTAL SPAN IN WIND REGIONS A & B AND 9m SPAN IN REGION C.
- FOR PIERS WITH: DEPTH >1500mm AND/OR DIAMETER >500mm

SITE CLASS: A S M H1 H2 E P

**PIER DETAIL - SHS CAST IN-SLAB**
- SHS COLUMNS ARE LIMITED TO 9m PORTAL SPANS

SITE CLASS: A S M H1 H2 E P

**ROCKHAMPTON REGIONAL COUNCIL**

**APPROVED PLANS**

These plans are approved subject to the current conditions of approval associated with

**Development Permit No.:** D/172-2024

**Dated:** 17 December 2024


Registered Professional Engineer
Graeme C Moulston
FIE Aust CPEng 5590 RPEQ4431
Signature Date 08/10/24


| | | | |
|---|---|---|---|
| **Project** | 6m (w) x 4.8m (l) x 2.4m (h) Gable Garage - Roof Only | **Job#** | 68587_VEAL |
| **Client** | HOWARD VEAL | **Date** | 08 Oct 2024 |
| **Site Address** | 3 DIBDIN STREET WANDAL QLD 4700 | **Page** | 25 of 39 |

# STANDARD SLAB - PIER ONLY

## PIER DIMENSIONS - A, S, M SOIL CLASSES ONLY - WIND REGION A

| Portal Width | 0 - 3.5m Bay Spacing | | | | 3.5m - 4.5m Bay Spacing | | | | 4.5m - 6.0m Bay Spacing | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Option 1 - Narrow and deep | | Option 2 - Wide and shallow | | Option 1 - Narrow and deep | | Option 2 - Wide and shallow | | Option 1 - Narrow and deep | | Option 2 - Wide and shallow | |
| | Diameter [mm] | Depth [mm] | Diameter [mm] | Depth [mm] | Diameter [mm] | Depth [mm] | Diameter [mm] | Depth [mm] | Diameter [mm] | Depth [mm] | Diameter [mm] | Depth [mm] |
| 0 - 5m | Ø400 | 600 | Ø600 | 550 | Ø400 | 600 | Ø600 | 550 | Ø400 | 1050 | - | - |
| 5 - 6m | Ø400 | 600 | Ø600 | 550 | Ø400 | 800 | Ø600 | 550 | Ø400 | 1100 | - | - |
| 6 - 7.5m | Ø400 | 650 | Ø600 | 550 | Ø400 | 900 | Ø600 | 550 | Ø400 | 1400 | Ø600 | 750 |
| 7.5 - 9m | Ø400 | 1100 | Ø600 | 600 | Ø400 | 1200 | Ø600 | 650 | Ø400 | 1700 | Ø600 | 850 |
| 9 - 12m | Ø400 | 1400 | Ø600 | 800 | Ø400 | 1500 | Ø600 | 800 | Ø400 | 1800 | Ø600 | 950 |
| 12 - 15m | Ø450 | 1700 | Ø750 | 800 | Ø450 | 1700 | Ø750 | 800 | Ø450 | 1700 | Ø750 | 750 |
| 15 - 18m | Ø600 | 1250 | Ø750 | 1150 | Ø600 | 1250 | Ø750 | 1150 | Ø600 | 1600 | Ø750 | 1100 |
| 18 - 20m | Ø600 | 1500 | Ø750 | 1250 | Ø600 | 1600 | Ø750 | 1250 | Ø600 | 1900 | Ø750 | 1400 |
| 20 - 22m | Ø600 | 1800 | Ø900 | 950 | Ø600 | 1800 | Ø900 | 950 | Ø750 | 1600 | Ø900 | 1100 |
| 22 - 24m | Ø750 | 1600 | Ø900 | 1200 | Ø750 | 1600 | Ø900 | 1200 | Ø750 | 1800 | Ø900 | 1350 |

## PIER DIMENSIONS - A, S, M SOIL CLASSES ONLY - WIND REGION B

| Portal Width | 0 - 3.5m Bay Spacing | | | | 3.5m - 4.5m Bay Spacing | | | | 4.5m - 6.0m Bay Spacing | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Option 1 - Narrow and deep | | Option 2 - Wide and shallow | | Option 1 - Narrow and deep | | Option 2 - Wide and shallow | | Option 1 - Narrow and deep | | Option 2 - Wide and shallow | |
| | Diameter [mm] | Depth [mm] | Diameter [mm] | Depth [mm] | Diameter [mm] | Depth [mm] | Diameter [mm] | Depth [mm] | Diameter [mm] | Depth [mm] | Diameter [mm] | Depth [mm] |
| 0 - 5m | Ø400 | 650 | Ø600 | 550 | Ø400 | 700 | Ø600 | 550 | Ø400 | 1050 | - | - |
| 5 - 6m | Ø400 | 700 | Ø600 | 550 | Ø400 | 1000 | Ø600 | 550 | Ø400 | 1100 | Ø600 | 800 |
| 6 - 7.5m | Ø400 | 800 | Ø600 | 550 | Ø400 | 1000 | Ø600 | 550 | Ø400 | 1400 | Ø600 | 850 |
| 7.5 - 9m | Ø400 | 1300 | Ø600 | 700 | Ø400 | 1500 | Ø600 | 800 | Ø400 | 1700 | Ø600 | 900 |
| 9 - 12m | Ø400 | 1500 | Ø600 | 850 | Ø400 | 1700 | Ø600 | 900 | Ø400 | 1800 | Ø600 | 1100 |
| 12 - 15m | Ø450 | 2200 | Ø750 | 1000 | Ø450 | 2200 | Ø750 | 1150 | Ø450 | 1700 | Ø750 | 1050 |
| 15 - 18m | Ø600 | 1500 | Ø750 | 1250 | Ø600 | 1600 | Ø750 | 1250 | Ø450 | 2000 | Ø750 | 1300 |
| 18 - 20m | Ø600 | 1750 | Ø750 | 1400 | Ø600 | 1800 | Ø750 | 1400 | Ø600 | 1900 | Ø750 | 1600 |
| 20 - 22m | Ø600 | 1900 | Ø900 | 1000 | Ø600 | 1900 | Ø900 | 1000 | Ø600 | 1800 | Ø900 | 1350 |
| 22 - 24m | Ø750 | 1800 | Ø900 | 1350 | Ø750 | 1800 | Ø900 | 1350 | Ø750 | 2100 | Ø900 | 1700 |

## PIER DIMENSIONS - A, S, M SOIL CLASSES ONLY - WIND REGION C

| Portal Width | 0 - 3.5m Bay Spacing | | | | 3.5m - 4.5m Bay Spacing | | | | 4.5m - 6.0m Bay Spacing | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Option 1 - Narrow and deep | | Option 2 - Wide and shallow | | Option 1 - Narrow and deep | | Option 2 - Wide and shallow | | Option 1 - Narrow and deep | | Option 2 - Wide and shallow | |
| | Diameter [mm] | Depth [mm] | Diameter [mm] | Depth [mm] | Diameter [mm] | Depth [mm] | Diameter [mm] | Depth [mm] | Diameter [mm] | Depth [mm] | Diameter [mm] | Depth [mm] |
| 0 - 5m | Ø400 | 900 | Ø600 | 550 | Ø400 | 950 | Ø600 | 550 | Ø400 | 1400 | Ø600 | 700 |
| 5 - 6m | Ø400 | 950 | Ø600 | 550 | Ø400 | 1400 | Ø600 | 700 | Ø400 | 1700 | Ø600 | 850 |
| 6 - 7.5m | Ø400 | 1400 | Ø600 | 700 | Ø400 | 1600 | Ø600 | 800 | Ø400 | 1900 | Ø600 | 950 |
| 7.5 - 9m | Ø400 | 1600 | Ø600 | 850 | Ø400 | 1900 | Ø600 | 950 | Ø400 | 2000 | Ø600 | 1000 |
| 9 - 12m | Ø400 | 2100 | Ø600 | 1050 | Ø450 | 2000 | Ø600 | 1200 | Ø400 | 2200 | Ø600 | 1400 |
| 12 - 15m | Ø600 | 1700 | Ø750 | 1250 | Ø600 | 1800 | Ø750 | 1250 | Ø600 | 1800 | Ø750 | 1200 |
| 15 - 18m | Ø600 | 1950 | Ø750 | 1350 | Ø600 | 2000 | Ø750 | 1350 | Ø750 | 1750 | Ø900 | 1050 |
| 18 - 20m | Ø600 | 2400 | Ø750 | 1700 | Ø750 | 1650 | Ø900 | 1200 | Ø750 | 1900 | Ø900 | 1100 |
| 20 - 22m | Ø750 | 1800 | Ø900 | 1350 | Ø750 | 1900 | Ø900 | 1350 | Ø750 | 2300 | Ø900 | 1500 |
| 22 - 24m | Ø750 | 2000 | Ø900 | 1500 | Ø750 | 2100 | Ø900 | 1500 | Ø750 | 2500 | Ø900 | 1700 |

Registered Professional Engineer
Graeme C Moulston
FIE Aust CPEng 5590 RPEQ4431
Signature
Date 08/10/24

# STANDARD SLAB - FOOTING NEAR INFRASTRUCTURE

**NOTES**

01 Designs comply with AS/NZS 2870-2011 ONLY IF the requirements, as per QDC MP1.4 (Building near relevant infrastructure) are met.

02 It is the builder's responsibility to ensure that these requirements are followed (refer back to Engineer if otherwise).

03 Compaction by vibration not permitted.

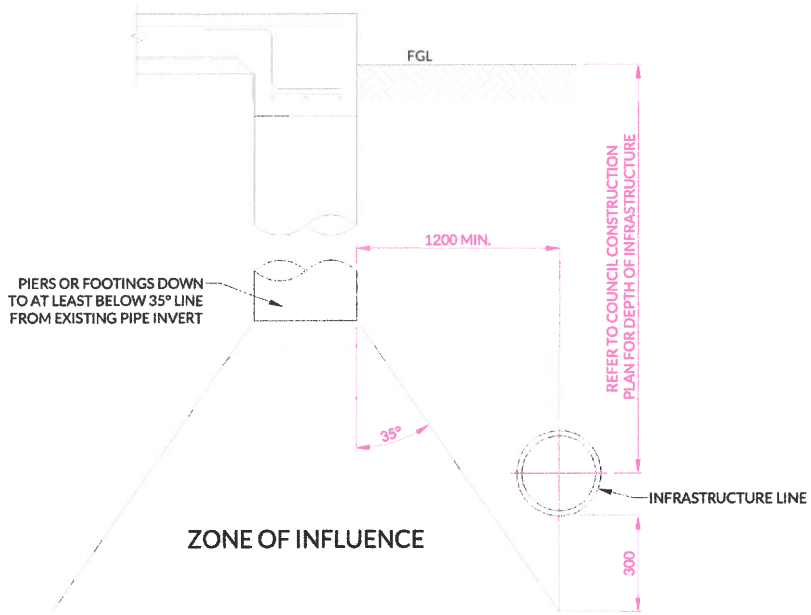
**ROCKHAMPTON REGIONAL COUNCIL**

**APPROVED PLANS**

These plans are approved subject to the current conditions of approval associated with

**Development Permit No.:** D/172-2024

**Dated:** 17 December 2024




## FOOTING NEAR INFRASTRUCTURE

In compliance with QDC MP1.4 Building over/near relevant infrastructure.
- Acceptable Solution: A1(2)(b)(ii) & Figure 5.

green steel

Registered Professional Engineer
Graeme C Moulston
FIE Aust CPEng 5590 RPEQ4431
Signature Date 08/10/24

| | | | |
|---|---|---|---|
| **Project** | 6m (w) x 4.8m (l) x 2.4m (h) Gable Garage - Roof Only | **Job#** | 68587_VEAL |
| **Client** | HOWARD VEAL | **Date** | 08 Oct 2024 |
| **Site Address** | 3 DIBDIN STREET WANDAL QLD 4700 | **Page** | 27 of 39 |

# Foundation Maintenance and Footing Performance:
## A Homeowner's Guide

CSIRO
BTF 18
replaces
Information
Sheet 10/91

Buildings can and often do move. This movement can be up, down, lateral or rotational. The fundamental cause of movement in buildings can usually be related to one or more problems in the foundation soil. It is important for the homeowner to identify the soil type in order to ascertain the measures that should be put in place in order to ensure that problems in the foundation soil can be prevented, thus protecting against building movement.

This Building Technology File is designed to identify causes of soil-related building movement, and to suggest methods of prevention of resultant cracking in buildings.

### Soil Types

The types of soils usually present under the topsoil in land zoned for residential buildings can be split into two approximate groups – granular and clay. Quite often, foundation soil is a mixture of both types. The general problems associated with soils having granular content are usually caused by erosion. Clay soils are subject to saturation and swell/shrink problems.

Classifications for a given area can generally be obtained by application to the local authority, but these are sometimes unreliable and if there is doubt, a geotechnical report should be commissioned. As most buildings suffering movement problems are founded on clay soils, there is an emphasis on classification of soils according to the amount of swell and shrinkage they experience with variations of water content. The table below is Table 2.1 from AS 2870, the Residential Slab and Footing Code.

### Causes of Movement

**Settlement due to construction**
There are two types of settlement that occur as a result of construction:

- Immediate settlement occurs when a building is first placed on its foundation soil, as a result of compaction of the soil under the weight of the structure. The cohesive quality of clay soil mitigates against this, but granular (particularly sandy) soil is susceptible.
- Consolidation settlement is a feature of clay soil and may take place because of the expulsion of moisture from the soil or because of the soil's lack of resistance to local compressive or shear stresses. This will usually take place during the first few months after construction, but has been known to take many years in exceptional cases.

These problems are the province of the builder and should be taken into consideration as part of the preparation of the site for construction. Building Technology File 19 (BTF 19) deals with these problems.

**Erosion**
All soils are prone to erosion, but sandy soil is particularly susceptible to being washed away. Even clay with a sand component of say 10% or more can suffer from erosion.

**Saturation**
This is particularly a problem in clay soils. Saturation creates a bog-like suspension of the soil that causes it to lose virtually all of its bearing capacity. To a lesser degree, sand is affected by saturation because saturated sand may undergo a reduction in volume – particularly imported sand fill for bedding and blinding layers. However, this usually occurs as immediate settlement and should normally be the province of the builder.

**Seasonal swelling and shrinkage of soil**
All clays react to the presence of water by slowly absorbing it, making the soil increase in volume (see table below). The degree of increase varies considerably between different clays, as does the degree of decrease during the subsequent drying out caused by fair weather periods. Because of the low absorption and expulsion rate, this phenomenon will not usually be noticeable unless there are prolonged rainy or dry periods, usually of weeks or months, depending on the land and soil characteristics.

The swelling of soil creates an upward force on the footings of the building, and shrinkage creates subsidence that takes away the support needed by the footing to retain equilibrium.

**Shear failure**
This phenomenon occurs when the foundation soil does not have sufficient strength to support the weight of the footing. There are two major post-construction causes:

- Significant load increase.
- Reduction of lateral support of the soil under the footing due to erosion or excavation.
- In clay soil, shear failure can be caused by saturation of the soil adjacent to or under the footing.

**GENERAL DEFINITIONS OF SITE CLASSES**

| Class | Foundation |
|---|---|
| A | Most sand and rock sites with little or no ground movement from moisture changes |
| S | Slightly reactive clay sites with only slight ground movement from moisture changes |
| M | Moderately reactive clay or silt sites, which can experience moderate ground movement from moisture changes |
| H | Highly reactive clay sites, which can experience high ground movement from moisture changes |
| E | Extremely reactive sites, which can experience extreme ground movement from moisture changes |
| A to P | Filled sites |
| P | Sites which include soft soils, such as soft clay or silt or loose sands; landslip; mine subsidence; collapsing soils; soils subject to erosion; reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise |

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**Tree root growth**
Trees and shrubs that are allowed to grow in the vicinity of footings can cause foundation soil movement in two ways:

- Roots that grow under footings may increase in cross-sectional size, exerting upward pressure on footings.
- Roots in the vicinity of footings will absorb much of the moisture in the foundation soil, causing shrinkage or subsidence.

## Unevenness of Movement

The types of ground movement described above usually occur unevenly throughout the building's foundation soil. Settlement due to construction tends to be uneven because of:

- Differing compaction of foundation soil prior to construction.
- Differing moisture content of foundation soil prior to construction.

Movement due to non-construction causes is usually more uneven still. Erosion can undermine a footing that traverses the flow or can create the conditions for shear failure by eroding soil adjacent to a footing that runs in the same direction as the flow.

Saturation of clay foundation soil may occur where subfloor walls create a dam that makes water pond. It can also occur wherever there is a source of water near footings in clay soil. This leads to a severe reduction in the strength of the soil which may create local shear failure.

Seasonal swelling and shrinkage of clay soil affects the perimeter of the building first, then gradually spreads to the interior. The swelling process will usually begin at the uphill extreme of the building, or on the weather side where the land is flat. Swelling gradually reaches the interior soil as absorption continues. Shrinkage usually begins where the sun's heat is greatest.

## Effects of Uneven Soil Movement on Structures

**Erosion and saturation**
Erosion removes the support from under footings, tending to create subsidence of the part of the structure under which it occurs. Brickwork walls will resist the stress created by this removal of support by bridging the gap or cantilevering until the bricks or the mortar bedding fail. Older masonry has little resistance. Evidence of failure varies according to circumstances and symptoms may include:

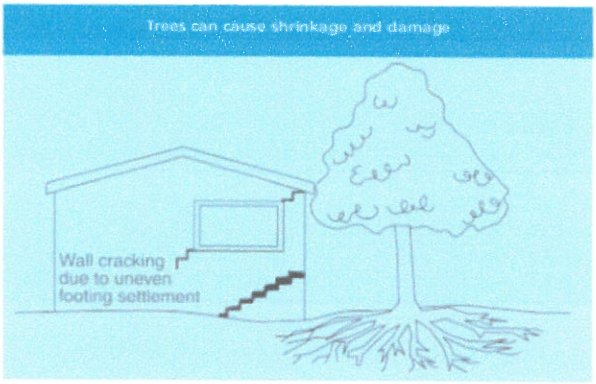
- Step cracking in the mortar beds in the body of the wall or above/below openings such as doors or windows.
- Vertical cracking in the bricks (usually but not necessarily in line with the vertical beds or perpends).

Isolated piers affected by erosion or saturation of foundations will eventually lose contact with the bearers they support and may tilt or fall over. The floors that have lost this support will become bouncy, sometimes rattling ornaments etc.

**Seasonal swelling/shrinkage in clay**
Swelling foundation soil due to rainy periods first lifts the most exposed extremities of the footing system, then the remainder of the perimeter footings while gradually permeating inside the building footprint to lift internal footings. This swelling first tends to create a dish effect, because the external footings are pushed higher than the internal ones.

The first noticeable symptom may be that the floor appears slightly dished. This is often accompanied by some doors binding on the floor or the door head, together with some cracking of cornice mitres. In buildings with timber flooring supported by bearers and joists, the floor can be bouncy. Externally there may be visible dishing of the hip or ridge lines.

As the moisture absorption process completes its journey to the innermost areas of the building, the internal footings will rise. If the spread of moisture is roughly even, it may be that the symptoms will temporarily disappear, but it is more likely that swelling will be uneven, creating a difference rather than a disappearance in symptoms. In buildings with timber flooring supported by bearers and joists, the isolated piers will rise more easily than the strip footings or piers under walls, creating noticeable doming of flooring.




As the weather pattern changes and the soil begins to dry out, the external footings will be first affected, beginning with the locations where the sun's effect is strongest. This has the effect of lowering the external footings. The doming is accentuated and cracking reduces or disappears where it occurred because of dishing, but other cracks open up. The roof lines may become convex.

Doming and dishing are also affected by weather in other ways. In areas where warm, wet summers and cooler dry winters prevail, water migration tends to be toward the interior and doming will be accentuated, whereas where summers are dry and winters are cold and wet, migration tends to be toward the exterior and the underlying propensity is toward dishing.

**Movement caused by tree roots**
In general, growing roots will exert an upward pressure on footings, whereas soil subject to drying because of tree or shrub roots will tend to remove support from under footings by inducing shrinkage.

**Complications caused by the structure itself**
Most forces that the soil causes to be exerted on structures are vertical – i.e. either up or down. However, because these forces are seldom spread evenly around the footings, and because the building resists uneven movement because of its rigidity, forces are exerted from one part of the building to another. The net result of all these forces is usually rotational. This resultant force often complicates the diagnosis because the visible symptoms do not simply reflect the original cause. A common symptom is binding of doors on the vertical member of the frame.

**Effects on full masonry structures**
Brickwork will resist cracking where it can. It will attempt to span areas that lose support because of subsided foundations or raised points. It is therefore usual to see cracking at weak points, such as openings for windows or doors.

In the event of construction settlement, cracking will usually remain unchanged after the process of settlement has ceased.

With local shear or erosion, cracking will usually continue to develop until the original cause has been remedied, or until the subsidence has completely neutralised the affected portion of footing and the structure has stabilised on other footings that remain effective.

In the case of swell/shrink effects, the brickwork will in some cases return to its original position after completion of a cycle, however it is more likely that the rotational effect will not be exactly reversed, and it is also usual that brickwork will settle in its new position and will resist the forces trying to return it to its original position. This means that in a case where swelling takes place after construction and cracking occurs, the cracking is likely to at least partly remain after the shrink segment of the cycle is complete. Thus, each time the cycle is repeated, the likelihood is that the cracking will become wider until the sections of brickwork become virtually independent.

With repeated cycles, once the cracking is established, if there is no other complication, it is normal for the incidence of cracking to stabilise, as the building has the articulation it needs to cope with the problem. This is by no means always the case, however, and monitoring of cracks in walls and floors should always be treated seriously.

Upheaval caused by growth of tree roots under footings is not a simple vertical shear stress. There is a tendency for the root to also exert lateral forces that attempt to separate sections of brickwork after initial cracking has occurred.

The normal structural arrangement is that the inner leaf of brickwork in the external walls and at least some of the internal walls (depending on the roof type) comprise the load-bearing structure on which any upper floors, ceilings and the roof are supported. In these cases, it is internally visible cracking that should be the main focus of attention, however there are a few examples of dwellings whose external leaf of masonry plays some supporting role, so this should be checked if there is any doubt. In any case, externally visible cracking is important as a guide to stresses on the structure generally, and it should also be remembered that the external walls must be capable of supporting themselves.

**Effects on framed structures**
Timber or steel framed buildings are less likely to exhibit cracking due to swell/shrink than masonry buildings because of their flexibility. Also, the doming/dishing effects tend to be lower because of the lighter weight of walls. The main risks to framed buildings are encountered because of the isolated pier footings used under walls. Where erosion or saturation cause a footing to fall away, this can double the span which a wall must bridge. This additional stress can create cracking in wall linings, particularly where there is a weak point in the structure caused by a door or window opening. It is, however, unlikely that framed structures will be so stressed as to suffer serious damage without first exhibiting some or all of the above symptoms for a considerable period. The same warning period should apply in the case of upheaval. It should be noted, however, that where framed buildings are supported by strip footings there is only one leaf of brickwork and therefore the externally visible walls are the supporting structure for the building. In this case, the subfloor masonry walls can be expected to behave as full brickwork walls.

**Effects on brick veneer structures**
Because the load-bearing structure of a brick veneer building is the frame that makes up the interior leaf of the external walls plus perhaps the internal walls, depending on the type of roof, the building can be expected to behave as a framed structure, except that the external masonry will behave in a similar way to the external leaf of a full masonry structure.

## Water Service and Drainage

Where a water service pipe, a sewer or stormwater drainage pipe is in the vicinity of a building, a water leak can cause erosion, swelling or saturation of susceptible soil. Even a minuscule leak can be enough to saturate a clay foundation. A leaking tap near a building can have the same effect. In addition, trenches containing pipes can become watercourses even though backfilled, particularly where broken rubble is used as fill. Water that runs along these trenches can be responsible for serious erosion, interstrata seepage into subfloor areas and saturation.

Pipe leakage and trench water flows also encourage tree and shrub roots to the source of water, complicating and exacerbating the problem.
Poor roof plumbing can result in large volumes of rainwater being concentrated in a small area of soil:

- Incorrect falls in roof guttering may result in overflows, as may gutters blocked with leaves etc.
- Corroded guttering or downpipes can spill water to ground.
- Downpipes not positively connected to a proper stormwater collection system will direct a concentration of water to soil that is directly adjacent to footings, sometimes causing large-scale problems such as erosion, saturation and migration of water under the building.

## Seriousness of Cracking

In general, most cracking found in masonry walls is a cosmetic nuisance only and can be kept in repair or even ignored. The table below is a reproduction of Table C1 of AS 2870.

AS 2870 also publishes figures relating to cracking in concrete floors, however because wall cracking will usually reach the critical point significantly earlier than cracking in slabs, this table is not reproduced here.

## Prevention/Cure

**Plumbing**
Where building movement is caused by water service, roof plumbing, sewer or stormwater failure, the remedy is to repair the problem. It is prudent, however, to consider also rerouting pipes away from the building where possible, and relocating taps to positions where any leakage will not direct water to the building vicinity. Even where gully traps are present, there is sometimes sufficient spill to create erosion or saturation, particularly in modern installations using smaller diameter PVC fixtures. Indeed, some gully traps are not situated directly under the taps that are installed to charge them, with the result that water from the tap may enter the backfilled trench that houses the sewer piping. If the trench has been poorly backfilled, the water will either pond or flow along the bottom of the trench. As these trenches usually run alongside the footings and can be at a similar depth, it is not hard to see how any water that is thus directed into a trench can easily affect the foundation's ability to support footings or even gain entry to the subfloor area.

**Ground drainage**
In all soils there is the capacity for water to travel on the surface and below it. Surface water flows can be established by inspection during and after heavy or prolonged rain. If necessary, a grated drain system connected to the stormwater collection system is usually an easy solution.

It is, however, sometimes necessary when attempting to prevent water migration that testing be carried out to establish watertable height and subsoil water flows. This subject is referred to in BTF 19 and may properly be regarded as an area for an expert consultant.

**Protection of the building perimeter**
It is essential to remember that the soil that affects footings extends well beyond the actual building line. Watering of garden plants, shrubs and trees causes some of the most serious water problems.

For this reason, particularly where problems exist or are likely to occur, it is recommended that an apron of paving be installed around as much of the building perimeter as necessary. This paving

**CLASSIFICATION OF DAMAGE WITH REFERENCE TO WALLS**

| Description of typical damage and required repair | Approximate crack width limit (see Note 3) | Damage category |
|---|---|---|
| Hairline cracks | <0.1 mm | 0 |
| Fine cracks which do not need repair | <1 mm | 1 |
| Cracks noticeable but easily filled. Doors and windows stick slightly | <5 mm | 2 |
| Cracks can be repaired and possibly a small amount of wall will need to be replaced. Doors and windows stick. Service pipes can fracture. Weathertightness often impaired | 5–15 mm (or a number of cracks 3 mm or more in one group) | 3 |
| Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Window and door frames distort. Walls lean or bulge noticeably, some loss of bearing in beams. Service pipes disrupted | 15–25 mm but also depend on number of cracks | 4 |

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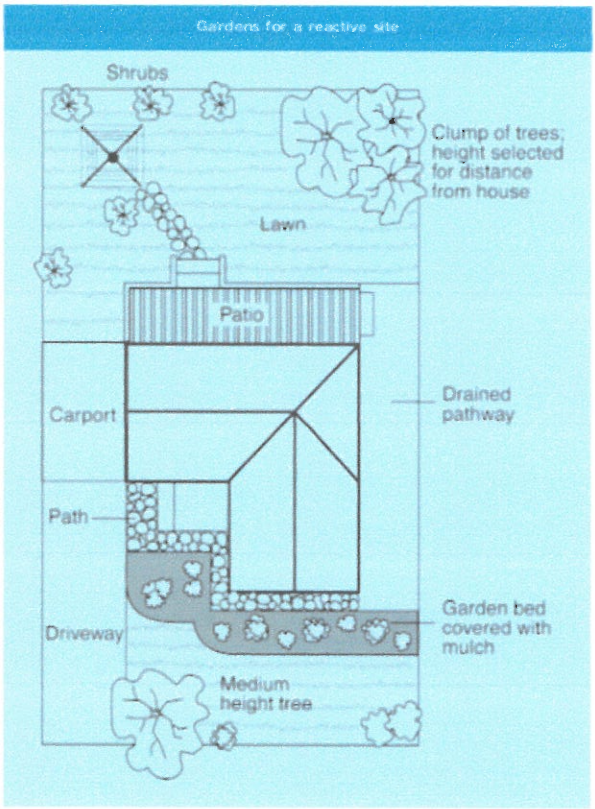


should extend outwards a minimum of 900 mm (more in highly reactive soil) and should have a minimum fall away from the building of 1:60. The finished paving should be no less than 100 mm below brick vent bases.

It is prudent to relocate drainage pipes away from this paving, if possible, to avoid complications from future leakage. If this is not practical, earthenware pipes should be replaced by PVC and backfilling should be of the same soil type as the surrounding soil and compacted to the same density.

Except in areas where freezing of water is an issue, it is wise to remove taps in the building area and relocate them well away from the building - preferably not uphill from it (see BTF 19).

It may be desirable to install a grated drain at the outside edge of the paving on the uphill side of the building. If subsoil drainage is needed this can be installed under the surface drain.

**Condensation**
In buildings with a subfloor void such as where bearers and joists support flooring, insufficient ventilation creates ideal conditions for condensation, particularly where there is little clearance between the floor and the ground. Condensation adds to the moisture already present in the subfloor and significantly slows the process of drying out. Installation of an adequate subfloor ventilation system, either natural or mechanical, is desirable.

**Warning** Although this Building Technology File deals with cracking in buildings, it should be said that subfloor moisture can result in the development of other problems, notably:

- Water that is transmitted into masonry, metal or timber building elements causes damage and/or decay to those elements.
- High subfloor humidity and moisture content create an ideal environment for various pests, including termites and spiders.
- Where high moisture levels are transmitted to the flooring and walls, an increase in the dust mite count can ensue within the living areas. Dust mites, as well as dampness in general, can be a health hazard to inhabitants, particularly those who are abnormally susceptible to respiratory ailments.

**The garden**
The ideal vegetation layout is to have lawn or plants that require only light watering immediately adjacent to the drainage or paving edge, then more demanding plants, shrubs and trees spread out in that order.

Overwatering due to misuse of automatic watering systems is a common cause of saturation and water migration under footings. If it is necessary to use these systems, it is important to remove garden beds to a completely safe distance from buildings.

**Existing trees**
Where a tree is causing a problem of soil drying or there is the existence or threat of upheaval of footings, if the offending roots are subsidiary and their removal will not significantly damage the tree, they should be severed and a concrete or metal barrier placed vertically in the soil to prevent future root growth in the direction of the building. If it is not possible to remove the relevant roots without damage to the tree, an application to remove the tree should be made to the local authority. A prudent plan is to transplant likely offenders before they become a problem.

**Information on trees, plants and shrubs**
State departments overseeing agriculture can give information regarding root patterns, volume of water needed and safe distance from buildings of most species. Botanic gardens are also sources of information. For information on plant roots and drains, see Building Technology File 17.

**Excavation**
Excavation around footings must be properly engineered. Soil supporting footings can only be safely excavated at an angle that allows the soil under the footing to remain stable. This angle is called the angle of repose (or friction) and varies significantly between soil types and conditions. Removal of soil within the angle of repose will cause subsidence.

## Remediation

Where erosion has occurred that has washed away soil adjacent to footings, soil of the same classification should be introduced and compacted to the same density. Where footings have been undermined, augmentation or other specialist work may be required. Remediation of footings and foundations is generally the realm of a specialist consultant.

Where isolated footings rise and fall because of swell/shrink effect, the homeowner may be tempted to alleviate floor bounce by filling the gap that has appeared between the bearer and the pier with blocking. The danger here is that when the next swell segment of the cycle occurs, the extra blocking will push the floor up into an accentuated dome and may also cause local shear failure in the soil. If it is necessary to use blocking, it should be by a pair of fine wedges and monitoring should be carried out fortnightly.

**This BTF was prepared by John Lewer FAIB, MIAMA, Partner, Construction Diagnosis.**



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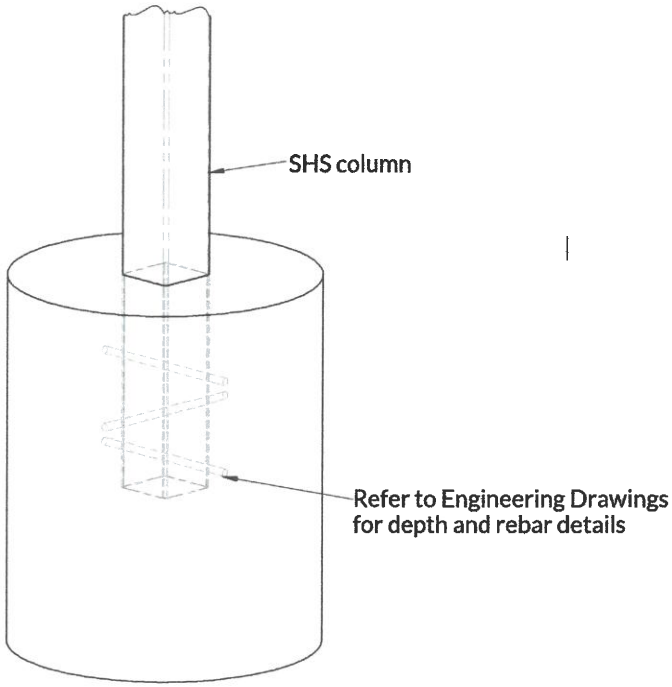
# Dimensions/ Slab - SHS (In Slab)

SHS portal columns are concreted into the slab.




**75mm - 100mm SHS COLUMN CAST IN SLAB**

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| | | | |
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| **Client** | HOWARD VEAL | **Date** | 08 Oct 2024 |
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# Brackets - Knee Plates (SHS)

Knee Plates for C-Section rafters to SHS posts are handed (left and right). Rafter sizes range from C100 to C350 and all square posts are all 100 x 3mm SHS. Knee Plates are bolted to the rafter through both the web and flange, and to three sides of the square post. Reach down inside the square post to install the nuts.

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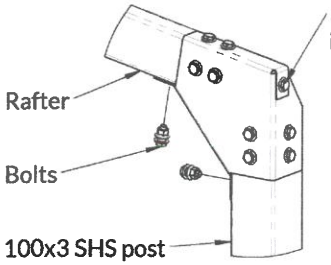
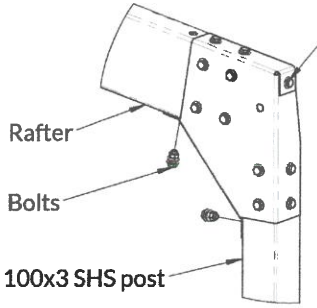


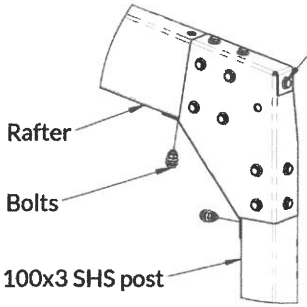

## C100 AWNING RAFTER

- Fixed with 11x M12 shoulder bolts for C100



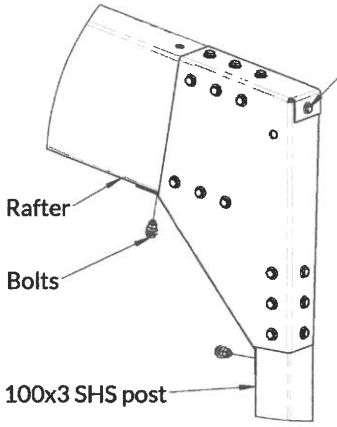

## C300 AWNING RAFTER

- Fixed with 13x M16 Gr8.8 bolts + 26x washers for C300




## C150-C250 AWNING RAFTER

- Fixed with 13x M12 shoulder bolts for C150, C200, C250




## C350 AWNING RAFTER

- Fixed with 18x M16 Gr8.8 bolts + 36x washers for C350

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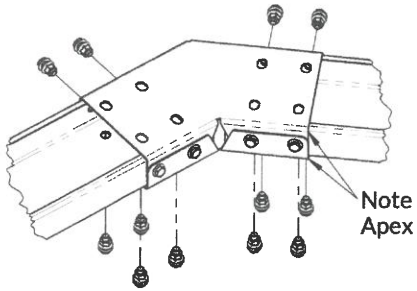
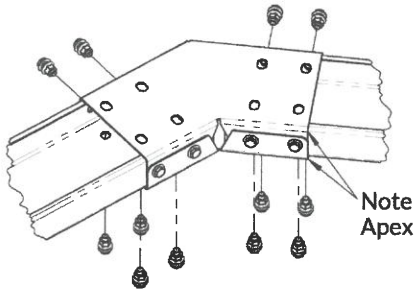
# Brackets - Apex Plates (Bolted)

## SINGLE PORTAL

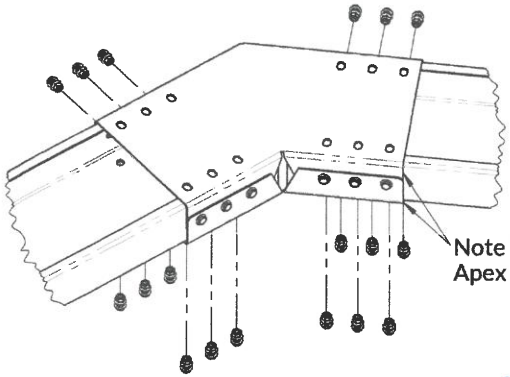
2x bolted Apex Plates are placed on both sides of the rafters and overlap each other. Bolts connect to the rafters through the web and flange.




**C150-C250**
- Fixed with 16x M12 shoulder bolts




**C300**
- Fixed with 16x M16 Gr8.8 bolts + 32x washers




**C350-C400**
- Fixed with 24x M16 Gr8.8 bolts + 48x washers

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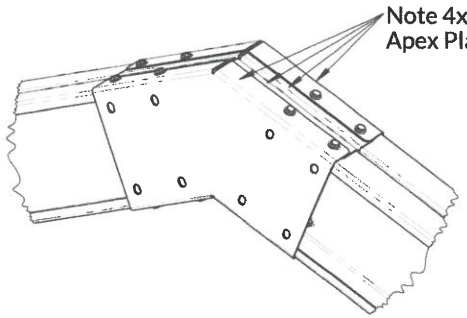
## BTB (BACK TO BACK) PORTALS

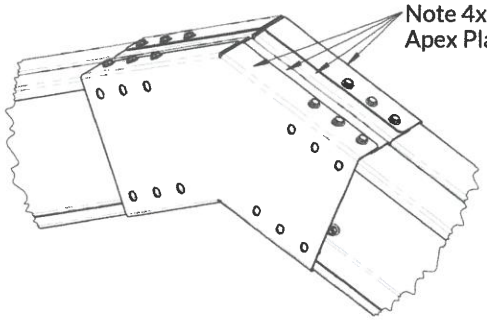
4x bolted Apex Plates are placed in pairs on both sides of each rafter and overlap each other. Bolts connect to the rafters through the web and flange.




### C300

Back-to-back portals have a total of 4x Apex Plates: 2x sandwiched between the rafters and 2x on the outsides.

- Fixed with 24x M16 Gr8.8 bolts + 48x washers




### C350-C400

Back-to-back portals have a total of 4x Apex Plates: 2x sandwiched between the rafters and 2x on the outsides.

- Fixed with 36x M16 Gr8.8 bolts + 72x washers

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# Brackets - Eave Purlin Plates

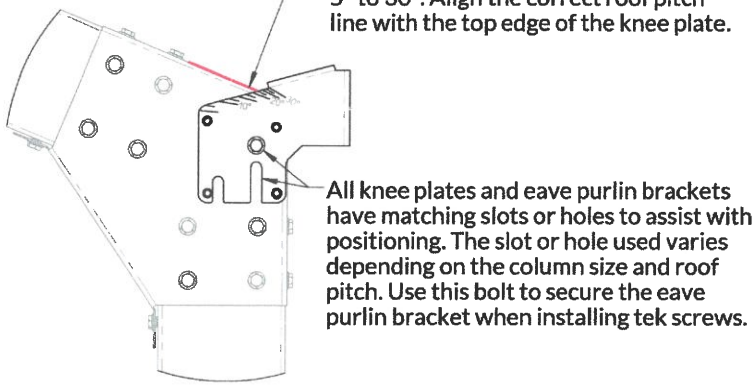
Eave brackets are placed at the top of the column to join the eave purlin to the column.

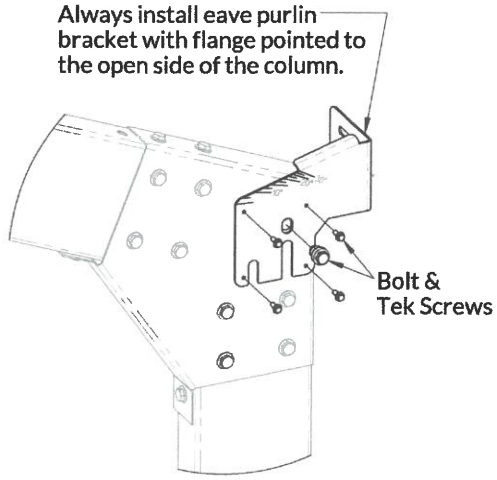


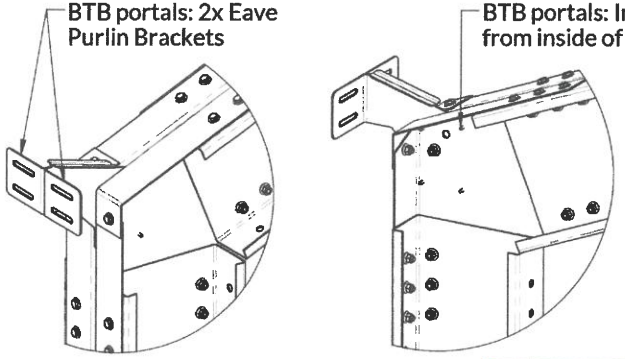
## FOR ALL WALL GIRTS: TH61/64, Z100, Z150, Z200

Eave Purlin Brackets are positioned on the side of the knee plate. Eave Purlin Brakets are handed left and right.

- Fixed with 1x M12 shoulder bolt and 4x #14-10x25 Tek Screws

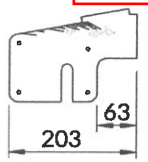


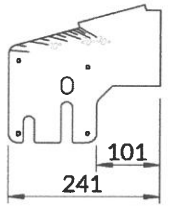




## BACK-TO-BACK (BTB) PORTALS

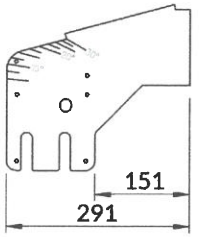
Back-to-back portals have 2x Eave Purlin Brackets (1x left and 1x right) sandwiched in between the Knee Plates. Position and Tek screw one Eave Purlin Bracket to one Knee Plate. Remove the Tek screws and assemble the 2x BTB Knee Plates with 2x Eave Purlin Brackets. Use the screw holes in the first Knee Plate as a template to secure both Eave Purlin Brackets to both Knee Plates.



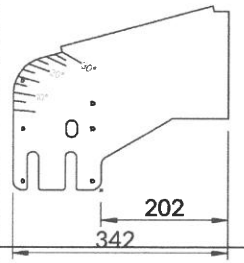

EAVE BRACKET for
- TH61/64 wall girt
- C100 eave purlin




EAVE BRACKET for
- Z100 wall girt
- C150 eave purlin




EAVE BRACKET for
- Z150 wall girt
- C150 eave purlin




EAVE BRACKET for
- Z200 wall girt
- C200 eave purlin

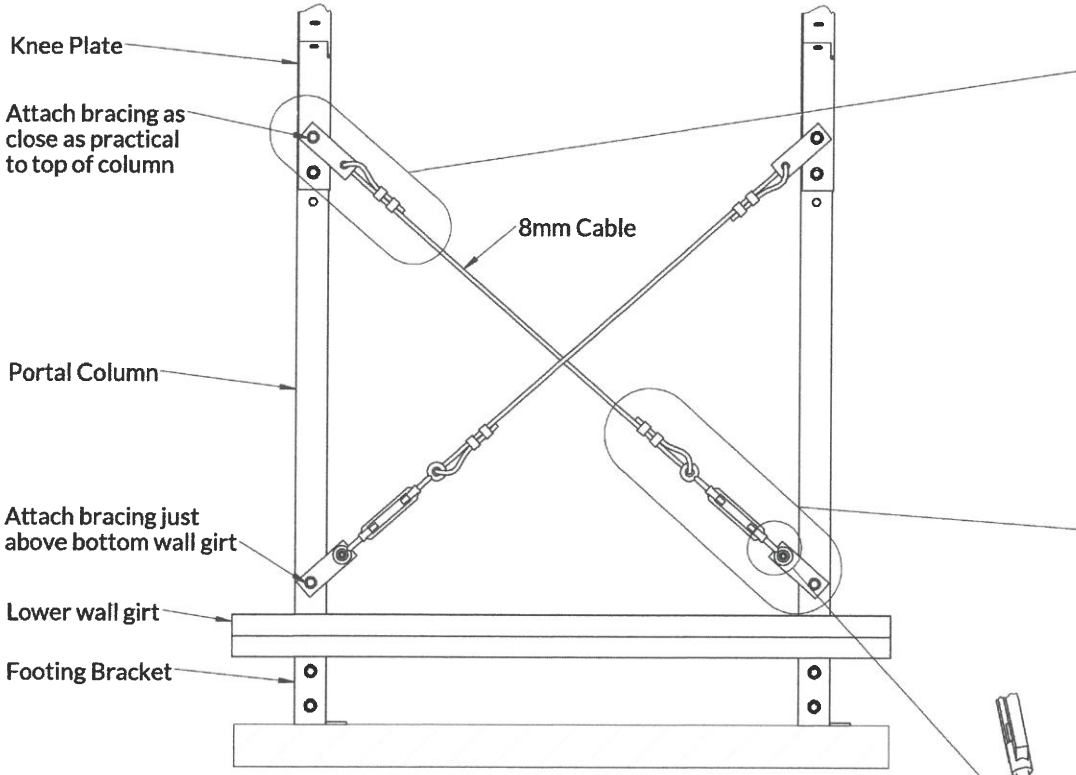

Registered Professional Engineer
Graeme C Moulston
FIE Aust CPEng 5590 RPEQ4431
Signature
Date 08/10/24


| | |
|---|---|
| **Project** | 6m (w) x 4.8m (l) x 2.4m (h) Gable Garage - Roof Only |
| **Client** | HOWARD VEAL |
| **Site Address** | 3 DIBDIN STREET WANDAL QLD 4700 |

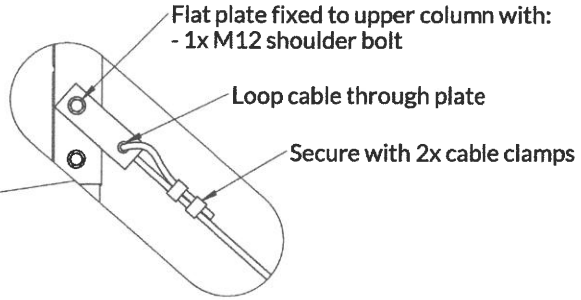
**Job#** 68587_VEAL
**Date** 08 Oct 2024

# Bracing - Cross Bracing (Cable)

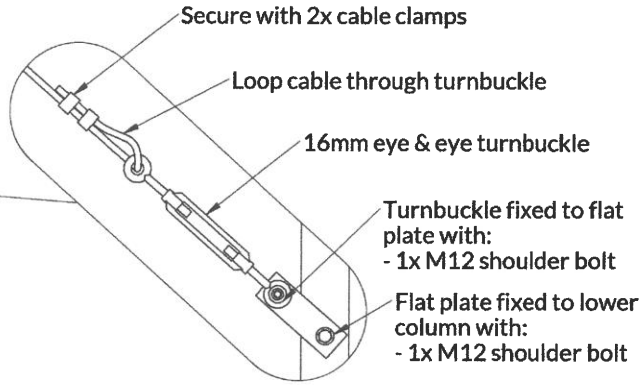
## 8mm CABLE BRACING



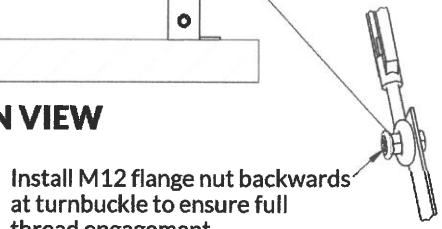

SIDE ELEVATION VIEW




8mm CABLE BRACING UPPER CONNECTION




8mm CABLE BRACING LOWER CONNECTION




**ROCKHAMPTON REGIONAL COUNCIL**

**APPROVED PLANS**

These plans are approved subject to the current conditions of approval associated with

**Development Permit No.:** D/172-2024

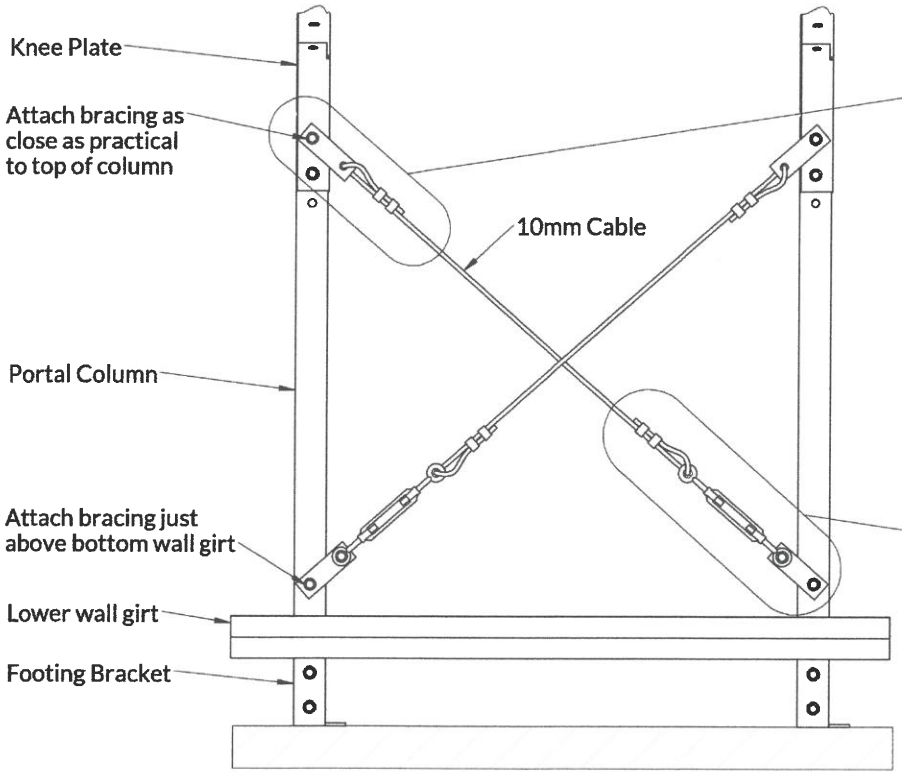
**Dated:** 17 December 2024

green steel

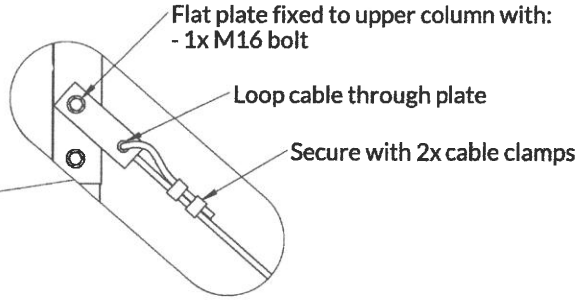
Registered Professional Engineer
Graeme C Moulston
FIE Aust CPEng 5590 RPEQ4431
Signature Date 08/10/24

| | | | |
|---|---|---|---|
| **Project** | 6m (w) x 4.8m (l) x 2.4m (h) Gable Garage - Roof Only | **Job#** | 68587_VEAL |
| **Client** | HOWARD VEAL | **Date** | 08 Oct 2024 |
| **Site Address** | 3 DIBDIN STREET WANDAL QLD 4700 | **Page** | 37 of 39 |

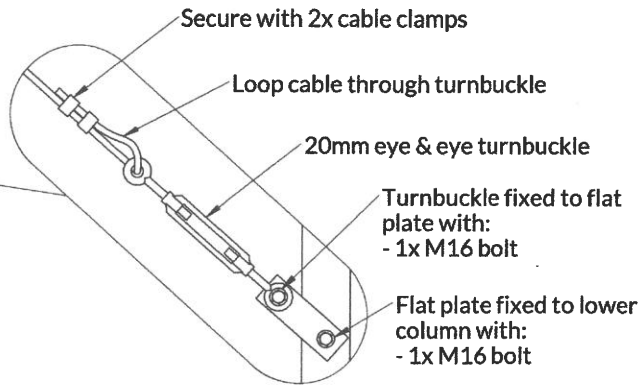
# 10mm CABLE BRACING




**SIDE ELEVATION VIEW**




**10mm CABLE BRACING UPPER CONNECTION**




**10mm CABLE BRACING LOWER CONNECTION**

**ROCKHAMPTON REGIONAL COUNCIL**

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Signature Date 08/10/24

| | | | |
|---|---|---|---|
| **Project** | 6m (w) x 4.8m (l) x 2.4m (h) Gable Garage - Roof Only | **Job#** | 68587_VEAL |
| **Client** | HOWARD VEAL | **Date** | 08 Oct 2024 |
| **Site Address** | 3 DIBDIN STREET WANDAL QLD 4700 | **Page** | 38 of 39 |

# Site Details

| | |
|---|---|
| **Site Address** | 3 DIBDIN STREET WANDAL QLD 4700 |
| **Lot/RP** | 1/RP607049 Rockhampton Regional |
| **Latitude** | -23.366813,150.493996 |
| **Elevation** | 10.00m |
| **Region** | C |
| **Ultimate VR** | 60m |
| **Summary** | AS/NZS 1170 ARI:500YEARS<br>Height:2.66m Critical Direction:SOUTH EAST<br>Md:0.9 Mc:1.05 TC:3.0 Mz,cat:0.83 Ms:0.9322<br>Mh:1.0 Mlee:1.0 Mel:1.0 Mt:1.0 |
| **Wind Speed** | 43.87m/s |


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