

SIGMA CONSULTANTS LTD

CONSTRUCTION OF A NEW ENGINEERED CARPORT

AT 177 OLD TAUPO ROAD, ROTORUA

TO BE USED TO APPLY FOR A CERTIFICATE OF ACCEPTANCE

Prepared For

Bruce Nickalls

Date: July 2026

Project Number: 5700-18

Report prepared by:



Daniel Alemann

M.Arch
Registered Architect

Sigma Consultants Ltd

1281 Hinemoa St

P. O. Box 553

Rotorua, 3040

P +64 7 347 3456

office@sigmaconsult.co.nz

© Copyright 2026 Sigma Consultants Limited (Sigma).

The concepts and information contained in this document are the property of Sigma Consultants Limited. Use or copying of this document in whole or in part without the written permission of Sigma constitutes an infringement of copyright.

Limitation: This report has been prepared on behalf of, and for the exclusive use of Sigma's Client, and is subject to, and issued in accordance with, the provisions of the contract between Sigma and the Client. Sigma accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

Contents

INTRODUCTION	4
BACKGROUND	5
B2 DURABILITY	7
C1-6 FIRE CLAUSES	7
D1 ACCESS ROUTES	7
E3 SURFACE WATER	8
E2 EXTERNAL MOISTURE	8
F7 WARNING SYSTEMS	8
BUILDING CODE COMPLIANCE	9
ASBESTOS DECLARATION	10
CONCLUSION	10

INTRODUCTION

This report was prepared on instruction from the building owner, Bruce Nickalls, and will be used to apply for a Certificate of Acceptance for the building work from the Rotorua Lakes Council.

This Certificate of Acceptance application refers only to the construction of a new 72.6² engineered carport.

The property was visited on 30th April 2026, by Daniel Alemann (Architect) of Sigma Consultants.

The inspection was non-invasive and limited to a visual inspection of the installation and components being in a clear line of sight. The report relates only to the building work identified on the day of the inspection as noted in this report (ie the carport).

This report does not cover any matters in relation to the District Plan.

The engineered design & PS1 by BSK was sighted as part of this assessment

Note: This report has been prepared for the sole use of our client, Bruce Nickalls, for the particular brief and on the terms and conditions agreed with our client. It may not be used or relied on (in whole or part) by anyone else, or for any other purpose or in any other contexts, without our prior written agreement.

LEGAL ENVIRONMENT

Relevant clauses from the Building Act 2004

Section 17 All building work must comply with building code

All building work must comply with the building code to the extent required by this Act, whether or not a building consent is required in respect of that building work.

96 Territorial authority may issue certificate of acceptance in certain circumstances

(1)A territorial authority may, on application, issue a certificate of acceptance for building work already done—

(a)if—

(i)the work was done by the owner or any predecessor in title of the owner; and

(ii)a building consent was required for the work but not obtained; or

(b)if section 42 (which relates to building work that had to be carried out urgently) applies; or

(c)if subsections (3) and (4) of section 91 (which apply if a building consent authority that is not a territorial authority or a regional authority is unable or refuses to issue a code compliance certificate in relation to building work for which it granted a building consent) apply.

(d)[Repealed]

(2)A territorial authority may issue a certificate of acceptance only if it is satisfied, to the best of its knowledge and belief and on reasonable grounds, that, insofar as it could ascertain, the building work complies with the building code.

(3)This section—

(a)does not limit section 40 (which provides that a person must not carry out any building work except in accordance with a building consent); and

(b)accordingly, does not relieve a person from the requirement to obtain a building consent for building work.

BACKGROUND

The property at 177 Old Taupo road consists of a 981m² section.

A detached carport was constructed on the rear of an existing property in early 2026 using timber frame construction over concrete slab without building consent. The construction was later reviewed by BSK Structural engineers, who advised minor changes to the existing structure in order for it to meet building code. BSK Engineers have since reviewed the structure and supplied a confirmation of construction monitoring letter (attached), confirming the structure complies with their design as described by the PS1 issued by BSK (24/03/2026).

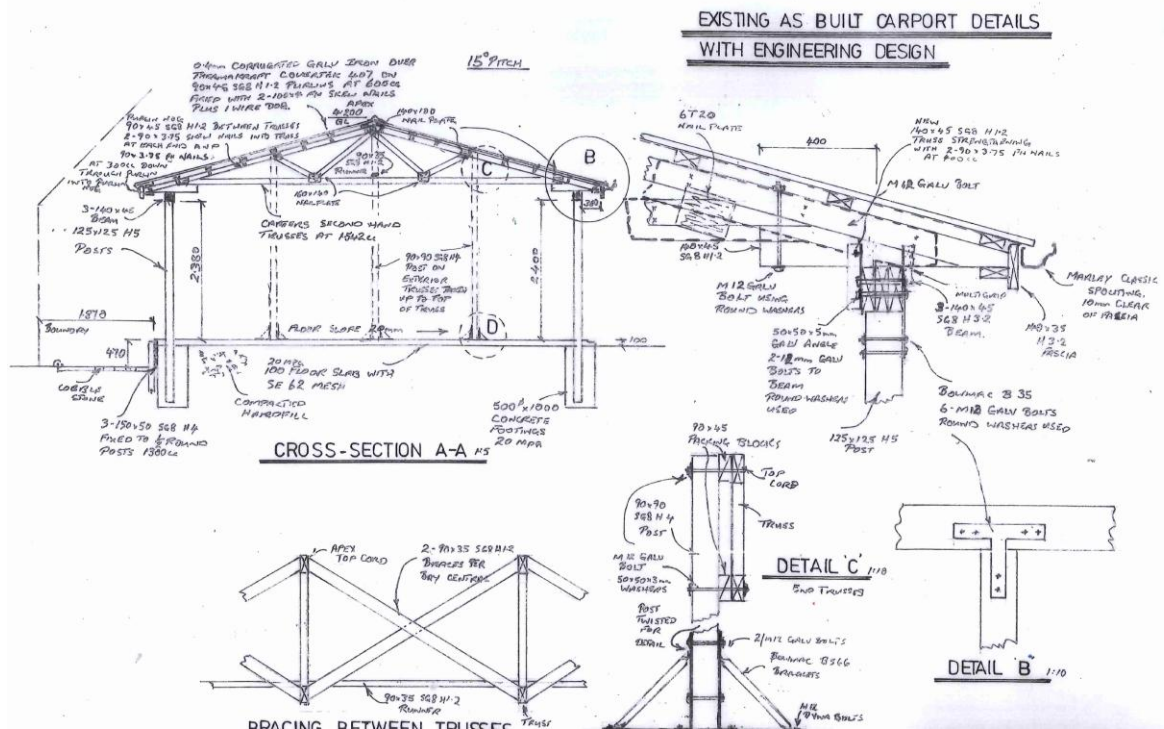


Figure 1 existing as built as per BSK Structural engineers design



Figure 2 photo of as built structure

B1 STRUCTURE

The new structure is specific engineer design as it is beyond the scope of NZS3604:2011. BSK engineers have reviewed the structure and the work is considered to comply with their design, as described by the PS1 issued by BSK (24/03/2026), PS1 and confirmation of construction monitoring are attached.



Figure 3 post connection and post footing

B2 DURABILITY

We are not able to provide a statement showing full compliance with B2 Durability because compliance needs to be shown on a material by material basis using a variety of compliance methods incl maintenance, and not all materials have a clear compliance path. Dates for durability compliance should start from when the work was substantially completed and CCC issued, which has not been done. Each building element has a Durability requirement under NZBC B2/AS1.

Compliance with B2/AS1 cannot be verified.

C1-6 FIRE CLAUSES

The carport is located >1m from the boundary and does not have any fire alarms installed. The existing dwelling (detached) remains compliant as it has previously.

D1 ACCESS ROUTES

The main access route into the building was not altered as part of this work.

E3 SURFACE WASTER

There are no external gutters installed, no downpipes and no stormwater soakage or connection observed.

Compliance with E1/AS1 cannot be verified.

E2 EXTERNAL MOISTURE

The roofing is 0.4mm corrugate on a >8° pitch, laid over Thermakraft Covertex 215 roofing underlay. Flashings appear to align with E2/AS1.

Galvanised corrugate metal has been installed directly onto the CCA treated wall framing which is not permitted as per Table C.1.1.1B of E2/AS1 fourth edition.

While the roofing appears in line with E2/AS1, the wall cladding is not, therefore compliance with E2/AS1 is deemed not achieved.

F7 WARNING SYSTEMS

There is no works associated with any dwelling therefore F7 is deemed not applicable. Smoke alarms of the adjacent dwelling will remain compliant to the same standard as it has previously.

BUILDING CODE COMPLIANCE

This section of the report responds to each section of the NZ Building Code and how the work carried out is deemed to comply or not.

NZBC Section	Title	Deemed Compliance	Comments
B1	Structure	Yes	Compliance verified by BSK
B2	Durability	No	Durability cannot be determined
C1-6	Fire Clauses	Yes	Distance to boundary >1m
D1	Access routes	Not applicable	
D2	Mechanical installations for access	Not applicable	
E1	Surface water	No	Gutter/downpipe not installed
E2	External Moisture	No	Materials in contact not permitted
E3	Internal moisture	Not applicable	
F1	Hazardous agents on site	Not applicable	
F2	Hazardous building materials	Not applicable	
F3	Hazardous substances and processes	Not applicable	
F4	Safety from falling	Not applicable	
F5	Construction and demolition hazards	Not applicable	
F6	Visibility in escape routes	Not applicable	
F7	Warning systems	Not applicable	
F8	Signs	Not applicable	
G1	Personal hygiene	Not applicable	
G2	Laundering	Not applicable	
G3	Food preparation and prevention of contamination	Not applicable	
G4	Ventilation	Not applicable	
G5	Interior environment	Not applicable	
G6	Airborne impact sound	Not applicable	
G7	Natural light	Not applicable	
G8	Artificial light	Not applicable	
G9	Electricity	Not applicable	
G10	Piped services	Not applicable	
G11	Gas as an energy source	Not applicable	
G12	Water supplies	Not applicable	
G13	Foul water	Not applicable	
G14	Industrial liquid waste	Not applicable	
G15	Solid waste	Not applicable	
H1	Energy efficiency	Not applicable	

ASBESTOS DECLARATION

The building is constructed from timber framing and metal roofing / wall cladding which would be unlikely to contain asbestos, it was not considered necessary to do any testing.

CONCLUSION

In terms of the Building Act 2004, subpart 6 – ‘*Special provisions for dangerous, affected, and insanitary buildings*’ the meaning of ‘Dangerous’ building is copied below. Based on my inspection of the building and the definition of ‘Dangerous’ building, the building work is, in the ordinary course of events, unlikely to cause injury or death or damage other property. Because of the level of workmanship and compliance with numerous aspects of the Building Code, then I consider the building work to not be deemed ‘insanitary’ in terms of S123 of the Building Act

S121 Meaning of dangerous building

*(1) A building is **dangerous** for the purposes of this Act if, —(a) in the ordinary course of events (excluding the occurrence of an earthquake), the building is likely to cause—*

(i) injury or death (whether by collapse or otherwise) to any persons in it or to persons on other property; or

(ii) damage to other property; or

(b) in the event of fire, injury or death to any persons in the building or to persons on other property is likely.

(2) For the purpose of determining whether a building is dangerous in terms of subsection (1)(b), a territorial authority—

(a) may seek advice from employees, volunteers, and contractors of Fire and Emergency New Zealand who have been notified to the territorial authority by the board of Fire and Emergency New Zealand as being competent to give advice; and

(b) if the advice is sought, must have due regard to the advice

Section 123 Meaning of insanitary building

*A building is **insanitary** for the purposes of this Act if the building—*

(a) is offensive or likely to be injurious to health because—

(i) of how it is situated or constructed; or

(ii) it is in a state of disrepair; or

(b) has insufficient or defective provisions against moisture penetration so as to cause dampness in the building or in any adjoining building; or

(c) does not have a supply of potable water that is adequate for its intended use; or

(d) does not have sanitary facilities that are adequate for its intended use.

TERMS & CONDITIONS

INSPECTION & REPORT SCOPE & LIMITATION

- 1- This report is based on a visual only non-invasive inspection of the areas of the building which were readily visible at the time of inspection. The inspection did not include any areas of components which were concealed or closed in behind finished surfaces (such as plumbing, drainage, heating, framing, ventilation, insulation or wiring) or which required the moving of anything which impeded access or limited visibility (such as floor covering, furniture, appliances, personal property, debris, vehicles, vegetation or soil).
- 2- No disassembly of equipment intrusive or destructive inspection, moving of furniture, appliances or stored items, or excavation were performed. All components and conditions which because of their location are concealed, deliberately hidden, camouflaged or difficult to inspect are excluded from the report.
- 3- As the purpose of the inspection is to assess the general condition of the building based on the limited visual inspection described in (2), this report may not identify all past, present or future defects. Descriptions in this report of systems or appliances relate to existence only and not adequacy or life expectancy. Any area or component of the building of any item or system not specifically identified in this report as having been inspected was excluded from the scope of the inspection. The inspection and report are not intended to be technically exhaustive, or to imply that every component was inspected, or that every possible defect was discovered. Inspections of the systems at the property are outside of the scope of our report.
- 4- The inspection and report are not a pre - purchase or pre - sale inspection and should not be relied upon as such.
It has been prepared to assess whether the building work executed complies with the required building code clauses.
- 5- Any suggestions or recommendations contained in the report are suggestions only and it shall be the responsibility of the person or persons carrying out the work to ensure the most appropriate remedy is carried out in conjunction with any further discoveries, warranty's or manufacturers recommendation and warranty's, and any necessary local authority consents obtained prior to proceeding with remedial work.
- 6- The report expresses the opinions of the inspector, based upon his or her visual impressions of the conditions that existed at the time of the inspection only.
- 7- Matters which are not within the scope of the inspection include, but are not limited to; the existence of lead paint, asbestos (except where specifically tested and noted), toxic or flammable materials, formaldehyde, pest infestation and other health or environmental hazards; the efficiency measurement of insulation or heating and cooling equipment' any internal or underground drainage or plumbing' any systems which are shut down or otherwise secured' water wells (water quality and quantity)' zoning ordinances' cosmetics or building code conformity' intercoms, security systems, fire detection systems, heat sensors (any general comments about these systems and conditions are informational only and do not represent an inspection or form part of the report).
- 8- The inspection and report should not be construed as a compliance inspection of any building, legal or territorial authority standards, codes or regulations. The report is not intended to be a warranty or guarantee of the present or future weather tightness, adequacy or performance of the structure, its systems, or their component parts. The report does not constitute any express or implied warranty of merchantability of fitness for use regarding the condition of the property and it should not be relied upon as such. Any opinions expressed regarding adequacy, capacity, or expected life of components are general statements based on information about similar components and occasional variations are to be expected between such estimates and actual experience.
- 9- All persons accept that the inspector may not detect some faults because:
 - i. The fault only occurs intermittently.
 - ii. Part of the building has not been used for a while and the fault usually occurs after regular use (or detection of the fault would only occur after regular use).
 - iii. The type of weather that would normally reveal the fault is not prevailing at, or around, the time of the inspection. The fault has been deliberately concealed.
 - iv. Furnishings are obscuring the fault (see clause 6).
 - v. Sigma Consultants have been given incorrect information by the owner, the real estate consultant, or any other person or company.
 - vi. The fault is/was not apparent on a visual inspection.
- 10- This report is not a certificate for code compliance purposes or a certificate of acceptance, nor is it a guarantee that the building will be in the future, fit for any particular purpose other than its current use at the time of inspection.

PRODUCER STATEMENT – PS1 DESIGN

BUILDING CODE CLAUSE(S): B1
ISSUED BY: BSK Consulting Engineers Limited
(Engineering Design Firm)
TO: Bruce Nickalls
(Owner/Developer)
TO BE SUPPLIED TO: Rotorua Lakes Council
(Building Consent Authority)
IN RESPECT OF: Carport Remediation Works
(Description of Building Work)
AT: 177 Old Taupo Road, Utuhina, Rotorua
(Address, Town/City)
LEGAL DESCRIPTION: Lot 11 DP 5265

JOB NUMBER: 26471

N/A ☐

We have been engaged by the owner/developer referred to above to provide (Extent of Engagement):

Structural design for remedial works on partially constructed carport
in respect of the requirements of the Clause(s) of the Building Code specified above for Part only, as specified in the
Schedule, of the proposed building work.

The design carried out by us has been prepared in accordance with:

- ☒ Compliance documents issued by the Ministry of Business, Innovation & Employment (Verification method/acceptable solution) B1/VM1 and/or;
- ☐ Alternative solution as per the attached Schedule.

The proposed building work covered by this producer statement is described on the drawings specified in the Schedule, together with the specification, and other documents set out in the Schedule.

On behalf of the Engineering Design Firm, and subject to:

- Site verification of the following design assumptions: Current construction as shown on drawings/details.
- All proprietary products meeting their performance specification requirements;

I believe on reasonable grounds that:

- the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the Schedule, will comply with the relevant provisions of the Building Code and that;
- the persons who have undertaken the design have the necessary competency to do so.

I recommend the CM 3 level of **construction monitoring**.

I, (Name of Engineering Design Professional) Bradley Noel Christie, am:

- ☒ CPEng number 1019704
and hold the following qualifications BE Civil (Hons), NZDE Civil

The Engineering Design Firm holds a current policy of Professional Indemnity Insurance no less than \$200,000
The Engineering Design Firm is a member of ACE New Zealand.

SIGNED BY (Name of Engineering Design Professional): Bradley Noel Christie
(Signature below):



ON BEHALF OF (Engineering Design Firm): BSK Consulting Engineers Limited

Date: 24/03/26

Note: This statement has been prepared solely for the Building Consent Authority named above and shall not be relied upon by any other person or entity. Any liability in relation to this statement accrues to the Engineering Design Firm only. As a condition of reliance on this statement, the Building Consent Authority accepts that the total maximum amount of liability of any kind arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in tort or otherwise, is limited to the sum of \$200,000.

This form is to accompany **Form 2 of the Building (Forms) Regulations 2004** for the application of a Building Consent.

SCHEDULE to PS1

Please include an itemised list of all referenced documents, drawings, or other supporting materials in relation to this producer statement below:

ASSOCIATED DOCUMENTATION:

- 26471 - B2 Compliance Letter
- 26471 - Calculations
- 26471 - Drawings - Trevor Rowson #2603

ENGINEER TO INSPECT REMEDIAL WORKS UPON COMPLETION IN ACCORDANCE WITH THE BSK DESIGN.

GUIDANCE ON USE OF PRODUCER STATEMENTS

Information on the use of Producer Statements and Construction Monitoring Guidelines can be found on the Engineering New Zealand website

<https://www.engineeringnz.org/engineer-tools/engineering-documents/producer-statements/>

Producer statements were first introduced with the Building Act 1991. The producer statements were developed by a combined task committee consisting of members of the New Zealand Institute of Architects (NZIA), Institution of Professional Engineers New Zealand (now Engineering New Zealand), Association of Consulting and Engineering New Zealand (ACE NZ) in consultation with the Building Officials Institute of New Zealand (BOINZ). The original suite of producer statements has been revised at the date of this form to ensure standard use within the industry.

The producer statement system is intended to provide Building Consent Authorities (BCAs) with part of the reasonable grounds necessary for the issue of a Building Consent or a Code Compliance Certificate, without necessarily having to duplicate review of design or construction monitoring undertaken by others.

PS1 DESIGN Intended for use by a suitably qualified independent engineering design professional in circumstances where the BCA accepts a producer statement for establishing reasonable grounds to issue a Building Consent;

PS2 DESIGN REVIEW Intended for use by a suitably qualified independent engineering design review professional where the BCA accepts an independent design professional's review as the basis for establishing reasonable grounds to issue a Building Consent;

PS3 CONSTRUCTION Forms commonly used as a certificate of completion of building work are Schedule 6 of NZS 3910:2013 or Schedules E1/E2 of NZIA's SCC 2011²

PS4 CONSTRUCTION REVIEW Intended for use by a suitably qualified independent engineering construction monitoring professional who either undertakes or supervises construction monitoring of the building works where the BCA requests a producer statement prior to issuing a Code Compliance Certificate.

This must be accompanied by a statement of completion of building work (Schedule 6).

The following guidelines are provided by ACE New Zealand and Engineering New Zealand to interpret the Producer Statement.

Competence of Engineering Professional

This statement is made by an engineering firm that has undertaken a contract of services for the services named, and is signed by a person authorised by that firm to verify the processes within the firm and competence of its personnel.

The person signing the Producer Statement on behalf of the engineering firm will have a professional qualification and proven current competence through registration on a national competence-based register such as a Chartered Professional Engineer (CPEng).

Membership of a professional body, such as Engineering New Zealand provides additional assurance of the designer's standing within the profession. If the engineering firm is a member of ACE New Zealand, this provides additional assurance about the standing of the firm.

Persons or firms meeting these criteria satisfy the term "suitably qualified independent engineering professional".

Professional Indemnity Insurance

As part of membership requirements, ACE New Zealand requires all member firms to hold Professional Indemnity Insurance to a minimum level.

The PI Insurance minimum stated on the front of this form reflects standard practice for the relationship between the BCA and the engineering firm.

Professional Services during Construction Phase

There are several levels of service that an engineering firm may provide during the construction phase of a project (CM1-CM5 for engineers³). The building Consent Authority is encouraged to require that the service to be provided by the engineering firm is appropriate for the project concerned.

Requirement to provide Producer Statement PS4

Building Consent Authorities should ensure that the applicant is aware of any requirement for producer statements for the construction phase of building work at the time the building consent is issued as no design professional should be expected to provide a producer statement unless such a requirement forms part of the Design Firm's engagement.

Refer Also:

- ¹ Conditions of Contract for Building & Civil Engineering Construction NZS 3910: 2013
- ² NZIA Standard Conditions of Contract SCC 2011
- ³ Guideline on the Briefing & Engagement for Consulting Engineering Services (ACE New Zealand/Engineering New Zealand 2004)
- ⁴ PN01 Guidelines on Producer Statements

www.acenz.org.nz

www.engineeringnz.org



25 March 2026

Rotorua Lakes Council
Private Bag 3029
Rotorua Mail Centre
ROTORUA 3046

Attention: Building Consents Department

Dear Sir

RE: PROPOSED CARPORT AT 177 OLD TAUPŌ ROAD, ROTORUA

BSK REF: 26471

The purpose of this letter is to discuss structural performance with regards to Clause B2 of the Building Code – Structural Durability

We are not able to provide a design Producer Statement – PS1 for clause B2 as there is no effective verification method for B2 contained within the Building Code.

However, we can confirm the following for the structural elements shown in our documentation.

Concrete

Concrete covers have been selected in accordance with NZS3101, Part 1, Section 3

Timber

Timber treatment has been selected in accordance with Table 1A of B2/AS1

We trust this provides the information required. Please contact the undersigned if you wish to discuss this matter further.

Yours faithfully,

Brad Christie
BE Civil (Hons), CMEngNZ, CPEng, NZDE Civil
BSK CONSULTING ENGINEERS LTD



STRUCTURAL CALCULATIONS

PROJECT: Structural Review of Carport
ADDRESS: 177 Old Taupo Road, Rotorua

Our Ref: 26471
Date: 2/03/2026



177 Old Tapanui Road

Job Ref 26471

Date

Consulting Engineers

WIND LOADS

Sheet of

SITE WIND PRESSURE:

- CHECK WIND

$$\begin{aligned}
 q_{sit, B} &= 0.62 \text{ kPa}, & V_{sit, B} &= 32.2 \text{ m/s} & < 37 \text{ m/s} \\
 q_{serv, B} &= 0.47 \text{ kPa}, & V_{serv, B} &= 27.4 \text{ m/s} & \text{Medium wind zone}
 \end{aligned}$$

SHAPE FACTOR:

- NZS1170.2:2021

$$\begin{aligned}
 C_{shp} &= C_{pin} k_a k_r & \text{Eq B.3(1)} \\
 C_{pin} &= -1.2 & \text{Table B.5} - \alpha < 15^\circ, C_{pin}, \text{ blocked} \\
 k_a &= 1.0 \\
 k_r &= \text{Table B.1} & \text{Purlins elsewhere} \\
 &= 1.0 \\
 C_{shp} &= -1.2
 \end{aligned}$$

DESIGN WIND PRESSURE:

$$P_{des, whs} = -0.75 \text{ kPa}$$

$$P_{des, sls} = -0.57 \text{ kPa}$$

LIVE LOAD:

$$Q = 0.25 \text{ kPa}, 1.1 \text{ kN} \quad - 1170.1:2002 - \text{Table 3.2}$$

GRAVITY LOAD:

$$\begin{aligned}
 \text{TRUSSES} &= 0.15 \text{ kPa} \\
 \text{PURLINS} &= 0.03 \text{ kPa} \\
 \text{ROOFING} &= 0.02 \text{ kPa} \\
 G_{mins} &= 0.23 \text{ kPa} & \text{FOR UPLIFT CASE'S (ROOF)} \\
 \text{BRACES/FITTINGS} &= 0.03 \text{ kPa} \\
 \text{SDL} &= 0.05 \text{ kPa} \\
 G_{maxs} &= 0.31 \text{ kPa} & \text{FOR DOWNWARD CASE'S (ROOF)} \\
 \text{POSTS} &= \frac{5 \text{ kN}}{\text{m}^2} \times 0.125 \text{ m}^2 \times 2.5 \text{ m} \\
 &= 0.195 \text{ kN ea} \\
 &= 1.6 \text{ kN TOTAL (8 x)}
 \end{aligned}$$

PURLINS:

Roof = 90x45 SGB H1.2 on FLAT @ 600 c/s

SPAN = 1550 mm - OUTSIDE SCOPE OF NZS3604

DEMAND:

$$\begin{aligned} 1.2 G &= 0.11 \text{ kPa} \times 0.6 \text{ m} \times 1.2 \\ &= 0.08 \text{ kN/m} \end{aligned}$$

$$\begin{aligned} 1.5 Q &= 0.375 \text{ kPa} \times 0.6 \text{ m} = 0.23 \text{ kN/m} \\ \text{OR } 1.5 &\times 1.1 \text{ kN} = 1.7 \text{ kN} \end{aligned}$$

$$\begin{aligned} M^* &= \overset{1.2G}{0.024} \text{ kNm} + \overset{1.5Q \text{ UDL}}{0.07} \text{ kNm} \quad \text{OR} \quad \overset{1.5Q \text{ pt}}{0.66} \text{ kNm} \\ &= 0.69 \text{ kNm} \end{aligned}$$

$$V^* = 1.8 \text{ kN}$$

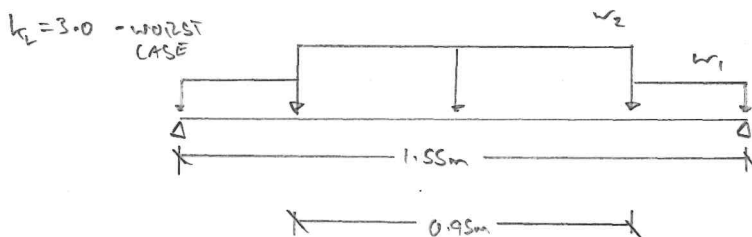
WIND: (k_z)

$$\begin{aligned} a &= 0.2 \times 7.5 \text{ m} \\ &= 1.5 \text{ m} \end{aligned}$$

$$\frac{a}{0.6 \text{ m}} = 2.5 \quad - \quad k_z = 1.5 \quad - \quad \text{over whole purlin}$$

$$0.25 a^2 = 0.57 \text{ m}^2$$

$$\frac{0.25 a^2}{0.6} = 0.95 \text{ m} \quad - \quad k_z = 3.0 \quad - \quad \text{over } 0.95 \text{ m of span.}$$



$$w_e = \left[\frac{0.75 \text{ kPa} \times 3.0 \times 0.95}{1.55} + \frac{0.75 \text{ kPa} \times 0.6}{1.55} \right] \times 0.6 \text{ m}$$

$$= 1.01 \frac{\text{kN}}{\text{m}} \quad (\text{UWS})$$

$$= 0.77 \frac{\text{kN}}{\text{m}} \quad (\text{SLS})$$

$$\begin{aligned} 0.9 G - W_n &= 0.9 \times (0.11 \text{ kPa} \times 0.6 \text{ m}) - 1.01 \frac{\text{kN}}{\text{m}} \\ &= -0.96 \frac{\text{kN}}{\text{m}} \end{aligned}$$

$$M^* = 0.29 \text{ kNm}$$

$$V^* = 0.75 \text{ kN} \quad - \quad 1.2 G + 1.5 Q \quad \text{GOVERNS STRENGTH}$$



Consulting Engineers

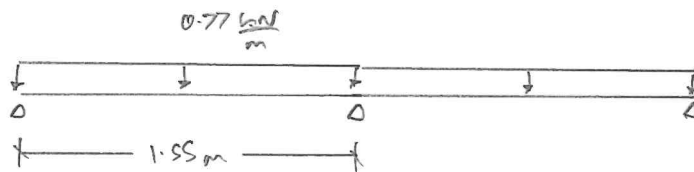
177 Old Tempo Road

Job Ref 26471

Date

Sheet of

SLS:



$$\Delta = \frac{w L^4}{185 EI}$$

$$= 4.4 \text{ mm}$$

$$L/\Delta = 351, \text{ ok}$$

$$E = 8.0 \text{ GPa}$$

$$I = \frac{90 \times 45^3}{12}$$

NOTE $\Rightarrow$ a pt load not checked, as this is not deemed a typical service level loading.

STRENGTH CHECK:

$$\phi M_n = \phi k f_b Z$$

$$= 0.34 \text{ kNm}$$

$$\phi V_n = \phi k f_c A_s$$

$$= 8.0 \text{ kN}$$

$$\phi = 0.8$$

$$k_1 = 1.0$$

$$k_{e1} = 1.0$$

$$k_b = 1.0$$

$$k_a = 1.0$$

$$k_{12} = 1.0 - \rho = 0.76$$

$$f_b = 14 \text{ MPa}$$

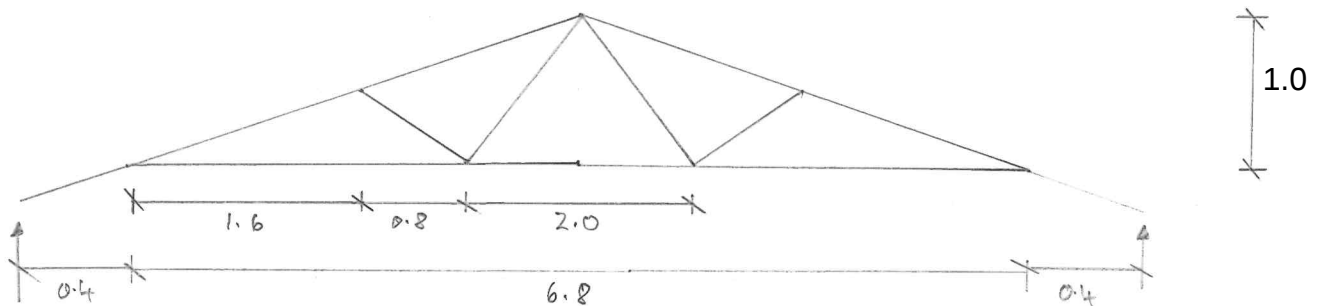
$$Z = 90 \times 45^2 / 6$$

$$= 30375 \text{ mm}^3$$

$$f_c = 3.7 \text{ MPa}$$

$$A_s = 2/3 bd$$

GEOMETRY



TOP/BOTTOM CHORDS - 90 x 4S
STRUTS - 70 x 4S

LOADS

$$G_{up} = 0.08 \text{ kPa}$$

$$G_d = 0.16 \text{ kPa}$$

$$T.W = 1.55 \text{ m}$$

$$= 0.13$$

$$= 0.25$$

$$Q = 0.25 \text{ kPa}$$

$$= 0.39$$

$$W_u = -0.75 \text{ kPa}$$

$$W_s = -0.57 \text{ kPa}$$

$$= 1.17$$

$$= 0.89$$

} $\frac{\text{kN}}{\text{m}}$

LOAD COMBINATIONS

$$1.2 G_d + 1.5 Q = 0.89 \text{ kN/m}$$

$$0.9 G_{up} - W_u = -1.1 \text{ kN/m}$$

- ULS Governing Case

$$0.9 G_{up} - W_s = -0.77 \text{ kN/m}$$

- SLS Governing Case.

$$G_d + Q = 0.64 \text{ kN/m}$$

DEMANDS

$$M^x = 0.44 \text{ kNm}$$

$$V^x = 1.0 \text{ kN}$$

$$\text{TOP CHORD} - L = 1.9 \text{ m}$$

$$"$$

$$N^x = 9.4 \text{ kN} \text{ (C)}$$

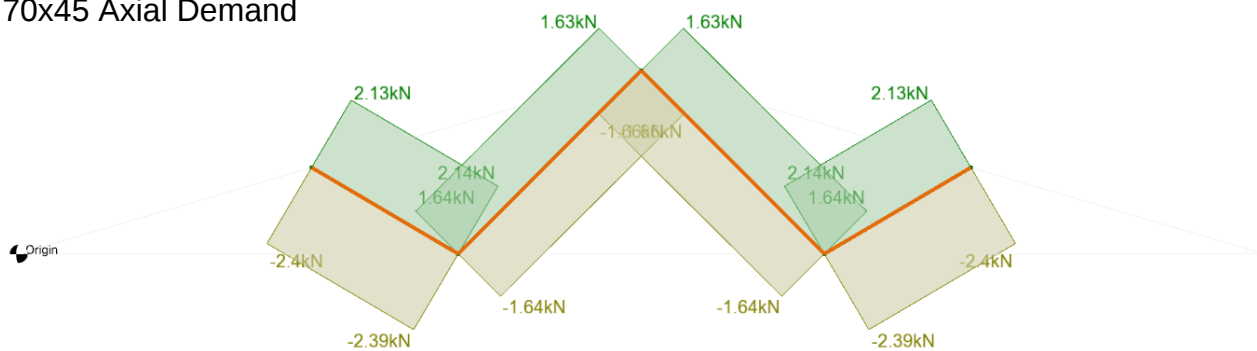
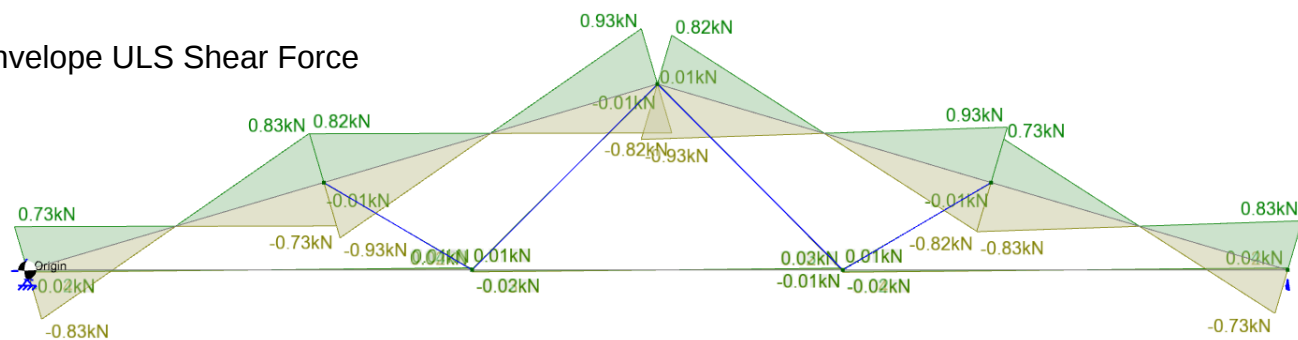
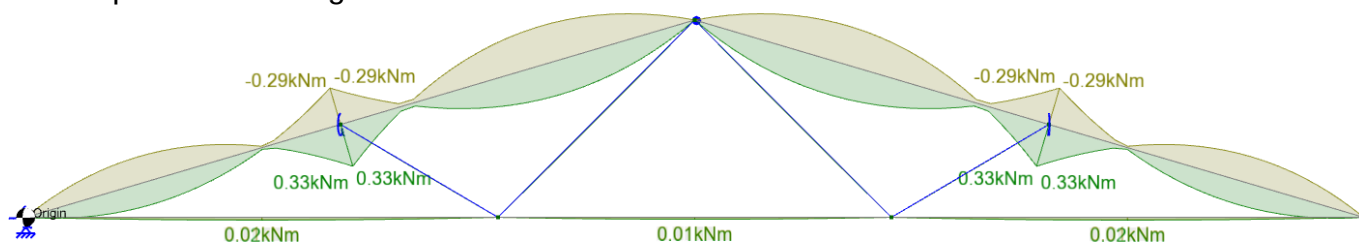
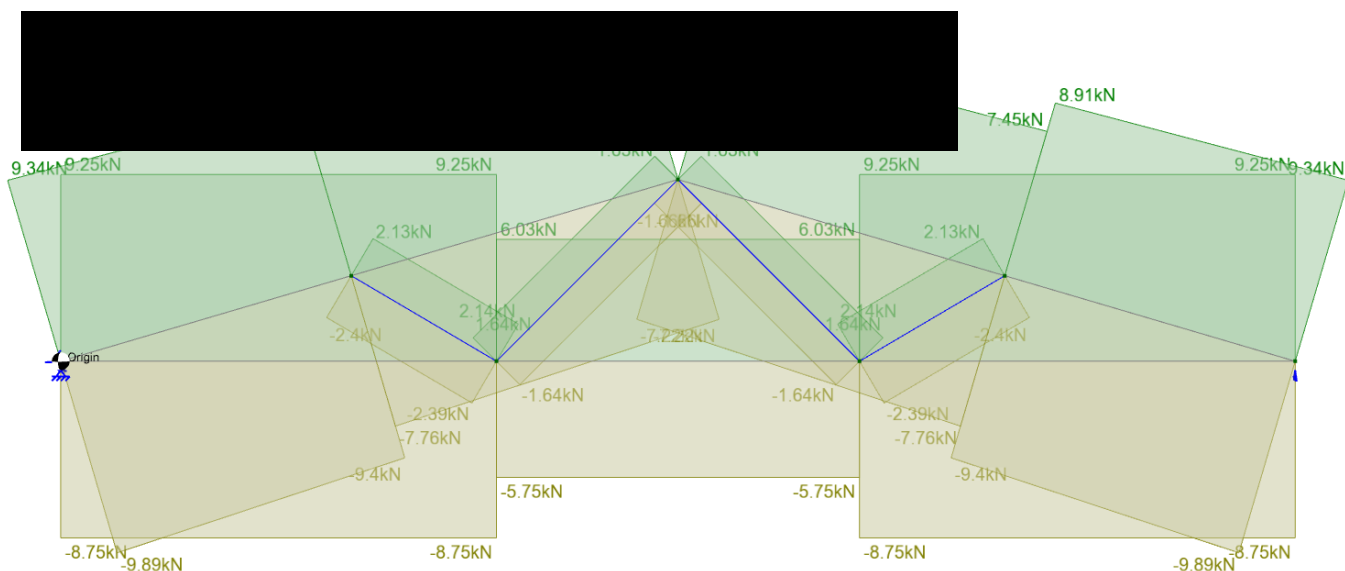
$$9.4 \text{ kN} \text{ (T)}$$

$$\text{BOTTOM CHORD} - L = 2.4 \text{ m}$$

$$N^y = 2.2 \text{ kN} \text{ (C)}$$

$$2.4 \text{ kN} \text{ (T)}$$

$$\text{STRUTS} - L = 1.4 \text{ m}$$





Consulting Engineers

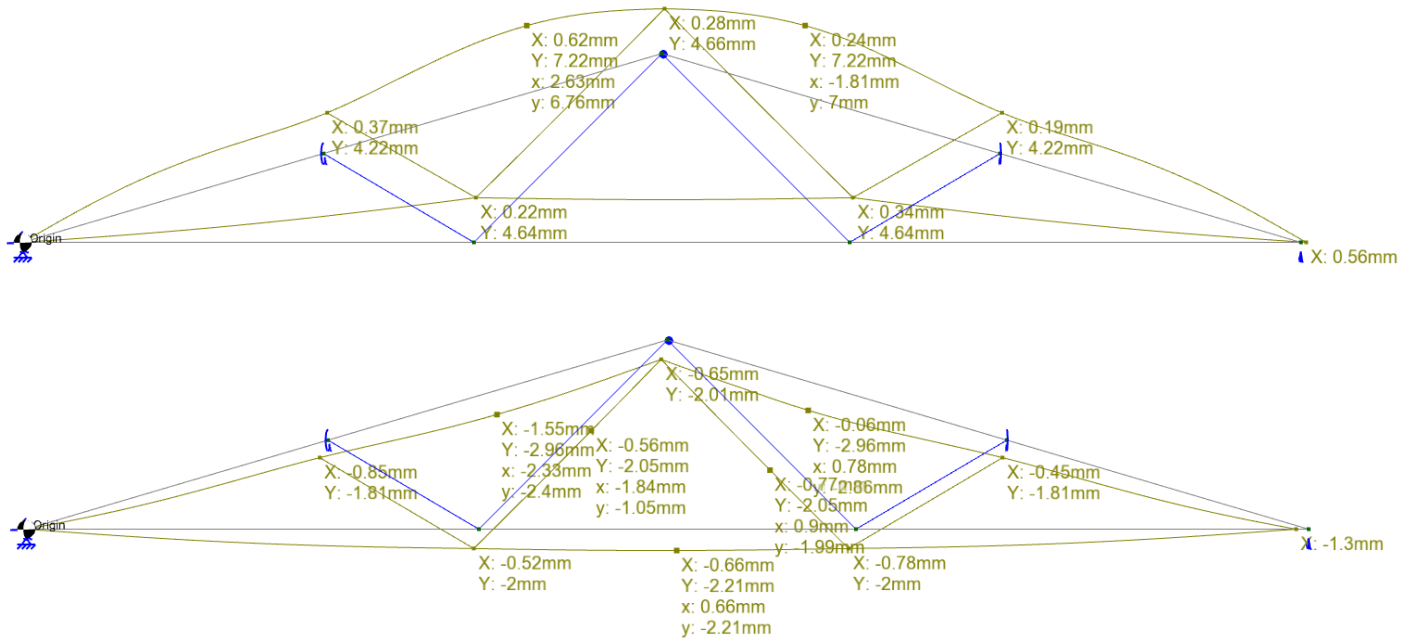
177 Old Taro Rd

Job Ref 26471

Date

Sheet of

Envelope SLS Deflection



Global Deflection:

6.0 m / 5 mm = 1200, OK

Local Deflection:

3.5m / 7 mm = 500, OK

TRUSS MEMBER CAPACITY90x45

$$\begin{aligned}\phi M_n &= \phi k f_b Z \\ &= 0.46 \text{ kNm}, \text{ ok} \\ \phi V_n &= \phi k f_s A_s \\ &= 2.2 \text{ kN}, \text{ ok} \\ \phi N_c &= \phi k f_c A_c \\ &= 7.3 \text{ kN}, \text{ NOT ok}\end{aligned}$$

70x45

$$\begin{aligned}\phi N_c &= \phi k f_c A_c \\ &= 26 \text{ kN}, \text{ ok}\end{aligned}$$

$$\begin{aligned}\phi &= 0.8 \\ \text{No. 1 FRAMING!} \\ f_b &= 10 \text{ MPa} \\ f_s &= 3.8 \text{ MPa} \\ f_c &= 15.0 \text{ MPa} \\ k_1 &= 1.0 \\ k_u &= 1.0 \\ k_q &= 1.0 \\ k_{12} &= 0.95 \quad (13) \\ Z &= bd^2/6 \\ A_s &= 2/3 \times bd \\ f_c &= 15 \text{ MPa} \\ A_c &= bd \\ k_b &= 1.0 \\ k_{12} &= 0.15 \quad (c) \\ S &= 2.4 \text{ m} / 0.045 \text{ m} \\ &= 53 \\ k_{12} &= 0.7 \\ A_c &= 70 \times 45\end{aligned}$$

Truss chord fixings:

V* = 1.1 kN/m - see loads, worst case is uplift combination.

1 nail @ 300 cr's

 $\phi Q_n = \phi k n Q$ $\phi = 0.8$ $k = 0.85 \times 0.8$ (green) $n = 1/0.3$ $q_k = 0.863 \text{ kN j4 } 3.15 \text{ mm dia}$ $\phi Q_k = 1.5 \text{ kN/m}$



Consulting Engineers

177 Old Tapanui Road

Job Ref 26471

Date

Sheet of

TRUSS END CANTILEVER:

$$L = 0.45m$$

$$F^x = 3.5 kN$$

$$M^x = 1.6 kNm$$

$$V^x = 3.5 kN$$

140x45:

$$\begin{aligned}\phi M_n &= \phi k f_b Z \\ &= 1.31 kNm, \text{ NOT OK.}\end{aligned}$$

$$\begin{aligned}\phi V_n &= \phi k f_s A_s \\ &= 9.9 kN, \text{ OK}\end{aligned}$$

⇒ 1 x 140x45 / SIDE:

$$\phi M_n = 2.62 kNm, \text{ OK.}$$

⇒ STITCH 140x45 S48 TO EITHER SIDE TO TRANSFER LOADS TO BEAMS.

OR:

Ex 90x45 TOP CHORD:

$$\begin{aligned}\phi M_n &= \phi k f_b Z \\ &= 0.39 kNm\end{aligned}$$

+ 1 x 140x45

$$= 1.7 kNm, \text{ OK}$$

CONNECT TO BEAM WITH MPM66 PRYDA MULTIGRIP = 4.6 kN (132 mm LENGTH), ONE SIDE.

$$\begin{aligned}\phi &= 0.9 \\ k_r &= 0.8 \\ k_{lc} &= 1.0 \\ k_b &= 1.0 \\ k_e &= 1.0 \\ k_{j2} &= 1.0 \\ f_b &= 116 \text{ MPa} \\ Z &= 45 \times 140^2 / 6 \\ f_s &= 3.7 \text{ MPa} \\ A_s &= \frac{2}{3} bd \\ P_b &= 0.76 \\ s &= 10\end{aligned}$$



Consulting Engineers

177 Old Tempo Road

Job Ref 26471

Date

BEAMS

Sheet of

LOADS

$$P^* = 3.5 \text{ kN ULS}, \quad 3.2 \text{ kN}$$

FROM TRUSS MODEL - INCLUDES TRUSS SELF WEIGHT.

$$L = 3.0 \text{ m}$$

$$M^* = \frac{3.5 \text{ kN} \times 3.0 \text{ m}}{4} = 2.6 \text{ kNm}$$

$$V^* = \frac{3.5 \text{ kN}}{2} = 1.8 \text{ kN}$$

PROVID $\Rightarrow 2 \times 140 \times 45 \text{ SLB}$

$$d = \frac{PL^3}{48EI} = 11 \text{ mm}$$

$$E = 8.0 \text{ kPa}$$

$$I = \frac{2 \times 45 \times 140^3}{12}$$

$$L/d = 273$$

$\Rightarrow$ BEAMS HAVE SOME CONTINUITY TO NEXT SPAN, SO OK

$$\phi M_n = \phi k_f b Z = 2.63 \text{ kNm}; \text{ OK}$$

$$\phi V_n = \phi k_f b A_s = 20.4 \text{ kN}, \text{ OK}$$

$$\phi = 0.8$$

$$k_f = 0.9$$

$$k_g = 1.0$$

$$f_b = 14 \text{ MPa}$$

$$Z = \frac{40 \times 140^2}{6}$$

$$f_s = 3.8 \text{ MPa}$$

$$A_s = \frac{2}{3} \times 40 \times 140$$

$\Rightarrow$ BEAMS OK.



Consulting Engineers

177 Old Tapanui Road

Job Ref 26471

Date

POSTS

Sheet of

LOADS

$$N^* = 2 \times P^* = 7.0 \text{ kN ULS}, 6.4 \text{ kN SLS}$$

$$h = 2.4 \text{ m}$$

$$\phi M_c = \phi k f_c A = 36 \text{ kN}, \text{ ok}$$

$$\begin{aligned} \phi &= 0.8 \\ h &= 0.8 \\ f_c &= 18 \text{ MPa} \\ A &= 125 \text{ mm}^2 \\ L_{d10} &= 2.0 \\ L_{d8} &= 0.25 \end{aligned}$$

BEARING

$$A = \pi \left(\frac{0.5}{2} \right)^2 = 0.19 \text{ m}^2$$

$$P_b^* = 36 \text{ kPa}$$

UPLIFT

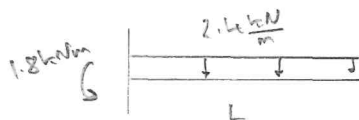
$$G_{\text{foot}} = \frac{2.4 \text{ kN}}{\text{m}^3} \times 1.0 \text{ m} \times \pi \left(\frac{0.5 \text{ m}}{2} \right)^2 = 4.7 \text{ kN}, \text{ NOT ok}$$

If slab is connected to footings:

$$\text{Slab: } G_{\text{slab}} = 1.8 \text{ kNm}$$

$$G_{\text{slab}} = \frac{2.4 \text{ kN}}{\text{m}^3} \times 0.1 \text{ m} = 2.4 \text{ kPa}$$

$$A_{\text{reqd}} = \frac{7.0 \text{ kN} - 4.7 \text{ kN}}{2.4 \text{ kPa}} = 0.95 \text{ m}^2$$



$$L_{\text{reqd}} = 1.0 \text{ m}$$

$$L_{\text{available}} = 1.2 \text{ m}, \text{ ok.}$$

$$\sum G_{\text{foot}} + G_{\text{slab}} = 4.7 \text{ kN} + 2.4 \text{ kPa} \times 1.2 \text{ m} \times 1.0 \text{ m} = 7.6 \text{ kN}, \text{ ok.}$$

RC Beam Flexural Strength Capacity

rebar dia =	6.1 mm
# bars =	5
f_y =	500 MPa
f'_c =	20 MPa
ϕ =	0.85
t =	100 mm
w =	1000 mm
Cover =	50 mm
d =	$(t - \text{Cover}) - (\text{rebar dia}/2)$ 46.95 mm
A_s =	146 mm ²
α =	0.85
a =	$T/\alpha \cdot f'_c \cdot w$ 4 mm
ϕM_n =	$\phi \cdot A_s \cdot f_y \cdot (d - a/2)$ 2.8 kNm

Note:

1.8 kNm used in calcs, negative moment demand, so cover of 50 mm is conservative.

If slab is not connected to footings, consider skin friction on footing:



Consulting Engineers

Structural + Geotechnical + Civil

Project	177 Old Taupo Rd, check for skin friction	Job No.	26471
		Date	26/02/2026

Pile design as per NZ Building Code B1/VM4

GROUND MODEL

Soil type	Depth to Base, z (m)	Thickness, H (m)	Unit Weight, γ (kN/m³)	Friction Angle, Φ (°)	Effective Cohesion, c' (kPa)	Undrained Shear Strength, Su (kPa)
Loose Pumice Sand	10	10	16	26	0	Not Applicable
Cohesion less soil, conservative values used						

Depth to groundwater (m)

1

PILE

Pile type	Pile Length (m)	Pile Diameter (mm)	Ultimate End Bearing Capacity (kN)	Ultimate Shaft Friction (kN)	Allowable/ Design Capacity (kN)
Anchor	1	500	25.6	4.6	15.1
			0.0	0.0	0.0
			0.0	0.0	0.0

Strength Reduction Factor	0.5
Design Cases	Drained
	Cohesionless
	Bored
	<40% Relative Density

Cut-off is 3 Blows per 100mm

Ultimate shaft friction = 0.5 * 4.6 kN = 2.3 kN

Total Uplift resistance = 4.7 kN + 2.3 kN = 7.0 kN, OK



Consulting Engineers

177 Old Taupo Road

Job Ref 26471

Date

LATERAL LOADS

Sheet of

$$\begin{aligned}
 C_{dCT} &= 0.72, \mu = 1.0 - \text{FOUNDATIONS} \\
 &= 0.24, \mu = 3.0 - \text{TIMBER POSTS} \\
 L &= 0.31 \text{ kPa} \\
 TA &= \frac{9.7\text{m}}{3} \times \frac{7.6\text{m}}{2} \\
 &= 12.3 \text{ m}^2
 \end{aligned}$$

POST DEMAND

$$\begin{aligned}
 F^* &= 0.24 \times 0.31 \text{ kPa} \times 12.3 \text{ m}^2 \\
 &= 0.92 \text{ kN} = V^* \\
 M^* &= 2.2 \text{ kNm} \\
 \phi M_n &= \phi k f_b Z \\
 &= 2.9 \text{ kNm}
 \end{aligned}$$

FOOTING:

BROMS EQUATION:

$$\begin{aligned}
 \phi H_n &= \frac{\phi \gamma_d L^3 k_p}{2 \times (e + L)} \\
 &= 1.9 \text{ kN} \\
 F^* &= 0.72 \times 0.31 \text{ kPa} \times 12.3 \text{ m}^2 \\
 &= 2.75 \text{ kN}
 \end{aligned}$$

$$\begin{aligned}
 \phi &= 0.8 \\
 k_1 &= 0.8 \\
 k_{eq} &= 1.0 \\
 f_b &= 14 \text{ MPa} \\
 Z &= bd^2/6
 \end{aligned}$$

$$\begin{aligned}
 \phi &= 0.5 \\
 \gamma &= 17 \text{ kN/m}^3 \\
 d &= 0.5\text{m} \\
 L &= 1.0\text{m} \\
 e &= 2.4\text{m} \\
 k_p &= 3.0, \phi = 30^\circ
 \end{aligned}$$

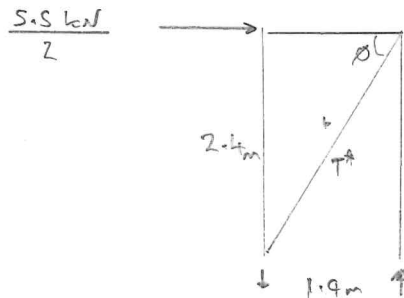
⇒ POSTS CANNOT CANTILEVER UNDER SEISMIC LOADS

BRACE:

$$\begin{aligned}
 N^* &= 0.24 \times 0.31 \text{ kPa} \times 7.6\text{m} \times 9.7\text{m} \\
 &= 5.5 \text{ kN} \\
 \phi M_e &= 6.2 \text{ kN} - 91 \times 25\text{mm Sheet Brace Strap, OK.}
 \end{aligned}$$

WALL BRACES

WORST DIMS:



2x Brace ends per direction

$$b = \sqrt{2.4^2 + 1.9^2}$$

$$= 3.1m$$

$$T^* = \frac{S.S \text{ kN}}{2} \times \frac{3.1m}{1.9m}$$

$$= 4.5 \text{ kN}$$

$$\phi N_t = \phi k f_t A$$

$$= 12.0 \text{ kN, ok.}$$

$$\phi = 0.8$$

$$k_t = 0.8$$

$$f_t = 6 \text{ MPa}$$

$$A = 90 \times (45-10) \text{ mm}^2$$

(-10 to allow for slot for brackets)

FIXING

BLKS POLE BRACE BRACKET - 30 kN

→ Require 90 mm end distance for connection.
→ reduces ϕN_t from 12.0 kN to $\frac{6 \times 45}{2 \times 45} \times \phi N_t = 9 \text{ kN, ok.}$

Check compression in 90x90 Posts.

$$N^* = \frac{S.S \text{ kN}}{2} \times \frac{2.4m}{1.9m}$$

$$= 3.5 \text{ kN}$$

$$\phi N_c = \phi k f_c A$$

$$= 51.3 \text{ kN, ok}$$

$$\phi = 0.8$$

$$k_c = 0.8$$

$$k_{c0} = 1.0$$

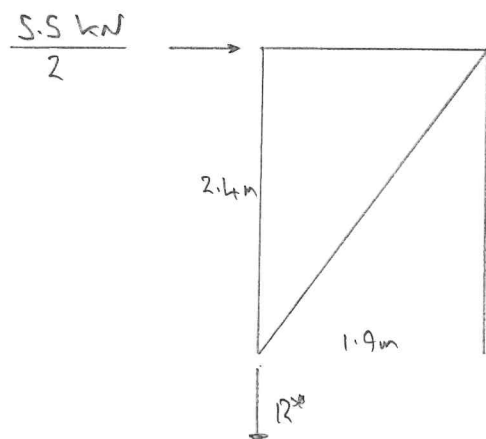
$$k_{cg} = 0.55$$

$$f_c = 18 \text{ MPa}$$

$$A = 90 \text{ mm}^2$$

→ Other direction has lower demands

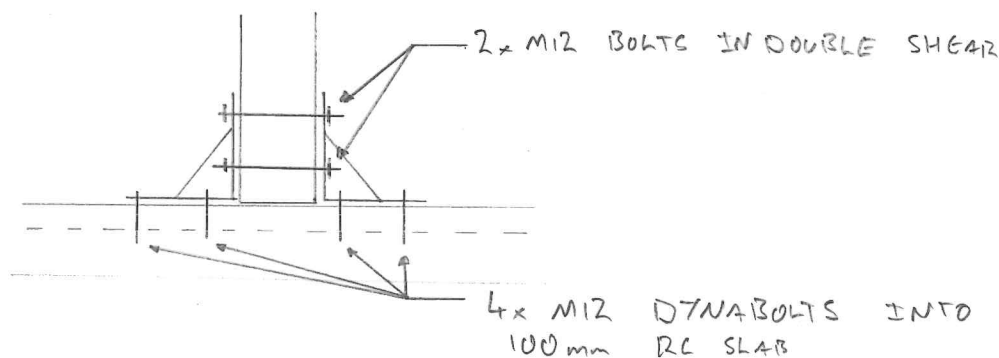
DEMAND:



$$R^* = \frac{5.5 \text{ kN}}{2} \times \frac{2.4 \text{ m}}{1.9 \text{ m}}$$

$$= 3.5 \text{ kN}$$

CAPACITY:



Bolts - ok by inspection

Dynabolts - 4x M12 - TYP CAPACITY RANGE 2.7 - 16.6 kN TENSION
 $\Rightarrow$ ok

Bracket - TENSION ok by inspection
 BENDING $\Rightarrow e' \sim 30 \text{ mm}$

$$m^* = \frac{3.5 \text{ kN}}{4} \times 30 \text{ mm} = 0.026 \text{ kNm}$$

$$\phi M_n = \phi f_y Z$$

$$= 0.028 \text{ kNm.}$$

ok

$$\phi = 0.9$$

$$f_y = 250 \text{ MPa}$$

$$Z = 30 \times 5^2 / 6$$

$\Rightarrow$ FIXING ok.



Consulting Engineers

177 Old Tapanui Road

Job Ref 26421

Date

TRUSS CANTILEVER

Sheet of

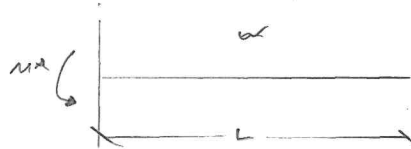
$$m^* = 1.6 \text{ kN/m}$$

$$\phi Q_n = 0.5 \text{ kN} \quad - \quad 3.15 \text{ mm } \phi \text{ nail}$$

$$@ 50 \text{ mm}$$

$$w = \frac{0.5 \text{ kN}}{50 \text{ mm}}$$

$$= \frac{10 \text{ kN}}{\text{m}}$$



$$L_{\text{reqd}} = \sqrt{\frac{2m^*}{w}}$$

$$= 0.57 \text{ m}$$

⇒ BACKSPAN 140x45 S48 1.0 m min
NAIL OFF WITH 3.15 mm ϕ NAILS @ 50 mm c/s

(IF STRENGTHENING TRUSSES WITH 90x45)

OR:

STRENGTHEN TRUSSES $\Rightarrow$ 140x45, EXTEND OUT TO
ACT AS CANTILEVER, ONLY REQUIRED ON ONE
SIDE.



Consulting Engineers

177 Old Taupo Road

Job Ref 26471

Date

'END WALL' TRUSS

Sheet of

→ NO TRUSS ACTION FROM INSTALLED TRUSS.
→ IGNORE EXISTING.

Try: 140x45 TRUSS

$$N^* = 9.9 \text{ kN}^*$$

$$\phi N = 13.6 \text{ kN}, \text{ OK.}$$

$$\phi = 0.8$$

$$k_1 = 1.0$$

$$k_{12} = 0.15$$

$$f_c = 18 \text{ MPa}$$

$$A_c = 140 \times 45$$

⇒ BUILD NEW TRUSS COPYING TYPICAL
TRUSS GEOMETRY $\Rightarrow$ 140x45 SGB.
STITCH TO 'END WALL' TRUSS TOP AND BOTTOM
CHOIRDS $\Rightarrow$ 3.15 mm ϕ nails @ 400 mm C'S.

* SEE MAIN TRUSS DEMANDS.



Consulting Engineers

177 Old Tapanui Road

Job Ref 20471

Date

BETWEEN TRUSS BRACING

Sheet of

$$C_{d\text{ CTJ}} = 0.24, \text{ ULS, } \mu = 3.0$$

$$G = 0.31 \text{ kPa}$$

$$A = 67 \text{ m}^2$$

$$F_{\text{LAT}}^* = 5.0 \text{ kN}$$

$$F_{\text{BRACE}}^* = F_{\text{LAT}}^* / n_{\text{bays}}$$

$$n_{\text{bays}} = 6$$

$$= 0.83 \text{ kN}$$

$$L = \sqrt{1.5^2 + 1.7^2}$$

$$= 2.3 \text{ m}$$

$$N_{\text{BRACE}}^* = F_{\text{BRACE}}^* \times \frac{2.3 \text{ m}}{1.5 \text{ m}}$$

$$= 1.3 \text{ kN}$$

$$\phi N_t = \phi k f_t A$$

$$= 12 \text{ kN}$$

$$\phi = 0.8$$

$$k_1 = 0.8$$

$$f_t = 6 \text{ MPa}$$

$$A = 90 \times 35$$

→ Governed by connections.

Try Compression Brace:

$$\phi N_c = \phi k f_c A$$

$$= 2.9 \text{ kN, ok}$$

$$f_c = 18 \text{ MPa}$$

$$k_{10} = 1.0$$

$$S = 2.3 / 0.035$$

$$= 65$$

$$k_8 = 0.08$$

$$A = 90 \times 35$$

⇒ Shear nails ok.



Consulting Engineers

177 Old Tapanui Road

Job Ref 26471

Date

Purlin Strengthening

Sheet of

DEMAND:

$$P^* = 1.1 \text{ kN}$$

$$M^* = 0.69 \text{ kNm} \quad - \text{ See purlin calcs.}$$

$$\phi M_n = 0.84 \text{ kNm} \quad - 90 \times 45 \text{ S48 on FLAT @ 600}$$

$$M_{req'd} = 0.85 \text{ kNm}$$

Try: Screw extra 90 x 45 on EDGE under ex purlins.

$$\phi M_n = \phi k f_p Z$$

$$= 0.54 \text{ kNm}$$

$$\phi = 0.8$$

$$k_1 = 0.8$$

$$k_2 = 1.0$$

$$f_p = 14 \text{ MPa}$$

$$Z = 45 \times 90^2 / 6 \text{ mm}^3$$

$$\Sigma \phi M = 0.88 \text{ kNm.}$$

CONNECTION:

$$UDL_{EK} = \frac{8 \times M^*}{L^2}$$

$$= 2.5 \frac{\text{kN}}{\text{m}} \quad - \text{ shear load on fixings.}$$

Try Screws @ 300 mm C/S

$$\phi N_d = \phi L_{T3} l_{pn} Q_u$$

$$= 1.15 \text{ kN}$$

$$\phi = 0.8$$

$$L_{T3} = 1.0$$

$$l_{pn} = 30 \text{ mm}$$

$$Q_u = 48 \frac{\text{N}}{\text{mm}} 12g$$

$$N_x = \frac{2.5 \text{ kN}}{\text{m}} \times 0.3 \text{ m}$$

$$= 0.75 \text{ kN}, \text{ Ok.}$$

⇒ 90 x 45 S48 on EDGE FIXED UNDER EXISTING PURLINS
 12g x 120mm MINIMUM SCREWS @ 300 mm C/S

Not what has been shown on the drawings,
 see further calculations in the updates section

END TRUSSES

$$L = 1.6 \text{ m}$$

$$w = -1.1 \frac{\text{kN}}{\text{m}}$$

$$= -0.77 \frac{\text{kN}}{\text{m}}$$

$$\left. \begin{array}{l} \text{ULS} \\ \text{SLS} \end{array} \right\} \begin{array}{l} \text{For } T_w = 1.55 \text{ m} \\ \text{END WALLS } T_w = 0.8 \text{ m} \end{array}$$

$$v = -0.55 \frac{\text{kN}}{\text{m}}, -0.39 \frac{\text{kN}}{\text{m}} \quad \text{ULS, SLS}$$

140 x 45:

$$\begin{array}{lcl} \text{ULS} & M^* & = 0.35 \text{ kNm} \quad 0.18 \text{ kNm} \\ & V^* & = 0.88 \text{ kN} \quad 0.44 \text{ kN} \end{array}$$

$$\phi M_u = 0.33 \text{ kNm}, \quad \text{Ok}$$

$$\phi V_u = 9.9 \text{ kN}, \quad \text{Ok}$$

$$\text{SLS} \quad \Delta = \frac{5 w L^4}{384 EI}$$

$$= 0.4 \text{ mm}$$

$$L/\Delta = \sim 4000, \quad \text{Ok}$$

$$\phi = 0.8$$

$$L_1 = 0.8$$

$$L_8 = 0.25$$

$$\frac{L}{b} = 36$$

$$\frac{D}{b} = 3$$

$$f_b = 14 \text{ MPa}$$

$$Z = 45 \times 140^2 / 6$$

$$A_v = 4200 \text{ mm}^2$$

$$f_s = 3.7 \text{ MPa}$$

$$E = 8 \text{ GPa}$$

$$I = b d^3 / 12$$

$$I = b d^3 / 12$$

$$I = b d^3 / 12$$

FIXINGS

$$V^* = 0.55 \frac{\text{kN}}{\text{m}} \times \frac{1.6 \text{ m}}{\text{m}}$$

$$= 0.9 \text{ kN}$$

$$Q_k = 0.78 \text{ kN} - 3.75 \text{ mm } \phi$$

$$N_{d,2} = \phi k_1 k_{13} k_{14} k_{16} k_{17} n Q_k$$

$$= 1.0 \text{ kN}, \quad \text{Ok}$$

$$\phi = 0.8$$

$$k_1 = 0.8$$

$$k_{13}/k_{14}/k_{16} = 1.0$$

$$k_{17} = 1.0$$

$$n = 2$$

Panel Nailed Connection:

→ for fixing of further panel members.

$$U_{ax} = 2.5 \frac{kN}{m}$$

→ 2 x 3.75 x 90 mm Nails @ 300 mm's

$$M_{d3} = \phi k_1 k_{13} k_{14} k_{16} k_{17} n Q_n$$

$$= 3.3 \frac{kN}{m}, \text{ ok}$$

Not what has been provided in the drawings, see the following page for justification of provided fixings

$$\begin{aligned} Q &= 0.8 \\ k_1 &= 0.8 \\ k_{13} &= 1.0 \\ k_{14} &= 1.0 \\ k_{16} &= 1.0 \\ k_{17} &= 1.0 \\ n &= 2 \times 1.0m / 0.3m \\ Q_n &= 0.78 kN \end{aligned}$$

Beam

→ Additional 140 x 45 SHB

$$p_x = \begin{aligned} &= 3.5 \text{ kN} \text{ ULS} \\ &= 3.2 \text{ kN} \text{ SLS} \end{aligned}$$

$$m_x = 2.63 \text{ kNm}$$

$$\phi M_x = \phi k_1 k_8 k_9 z$$

$$= 3.95 \text{ kNm}, \text{ ok}$$

V ok - see previous calcs.

$$\Delta = 7.3 \text{ mm} = \frac{PL^3}{48EI}$$

$$L/\Delta = 409$$

$$\begin{aligned} Q &= 0.8 \\ k_1 &= 0.8 \\ k_8 &= 1.0 \\ k_9 &= 1.0 \text{ MPa} \\ z &= 3 \times 45 \times 140^2 / 6 \end{aligned}$$

$$\begin{aligned} E &= 8172 \text{ N/mm}^2 \\ I &= \frac{3 \times 45 \times 140^3}{6} \\ L &= 3.0 \text{ m} \end{aligned}$$

→ Total 3 x 45 x 140 SHB Beams, ok



Consulting Engineers

177 Old Tapanui Road

Job Ref 26471

Date

Updates

Sheet of

Purlin nailed connection

Provided : 90×3.75 @ 300 c/s + $2 \times 90 \times 3.75$ shear nails/end.

$$M_{pt} = 0.69 \text{ kNm} \quad - \text{ See purlin calcs}$$

$$\phi_{purlin} = 0.34 \text{ kNm} \quad - \text{ See purlin calcs}$$

90x45 on edge flat

$$M_{max} = 0.35 \text{ kNm}$$

$$\phi_{N_{d,i}} = \phi_{k,n} Q_{k,n}$$

$$= 1.0 \text{ kN}$$

$$V_{t} = \frac{M_{max} \times 4}{L}$$

$$= 0.93 \text{ kN}$$

$\Rightarrow$ Shear load on shear nails from bending - when pt load is above support, ex purlin on flat can take this load through shear.

$$\begin{aligned} \phi &= 0.8 \\ L &= 0.8 \\ n &= 2 \\ Q_{k,n} &= 0.78 \text{ kN} \end{aligned}$$

$$L = 1.5 \text{ m}$$

$$\phi_{purlin} \Rightarrow 0.34 \text{ kNm}, \text{ ok}$$

90x45 on edge

$\Rightarrow$ There will also be load transfer w/ the nails @ 300 c/s - shear flow that will reduce the load on these connections $\rightarrow$ Therefore this is a conservative approach.

proposed : AS BUILT CARPORT

for : BRUCE NICKALLS

at : 177 OLD TAUPŌ ROAD ROTURUA



**DRAUGHTING
SERVICES**

TREVOR ROWSON.,

Regency Park Estate
3A Brent Road, Unit 25
Rotorua 3010
Ph: (07) 348 2577

set n° : _____



AERIAL LOCATION PLAN

**DRAUGHTING
SERVICES**

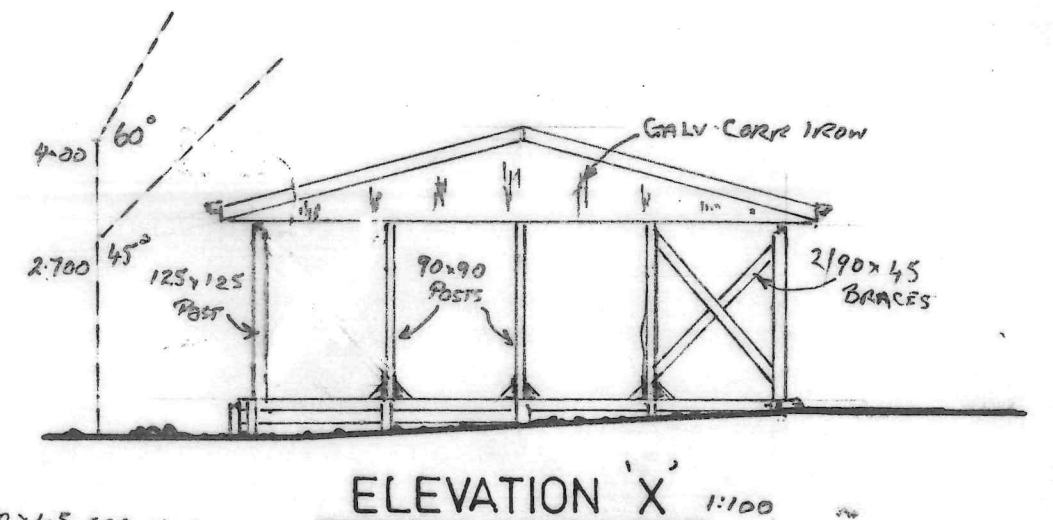
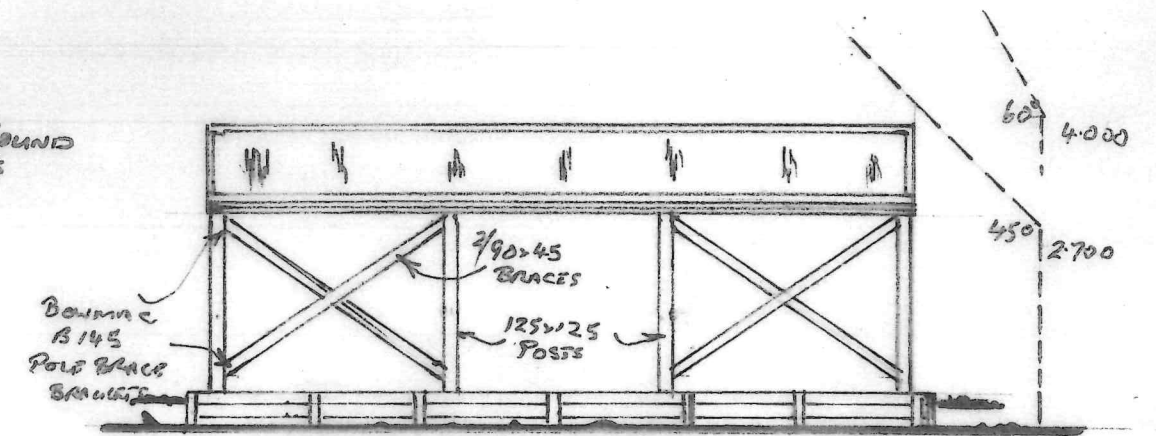
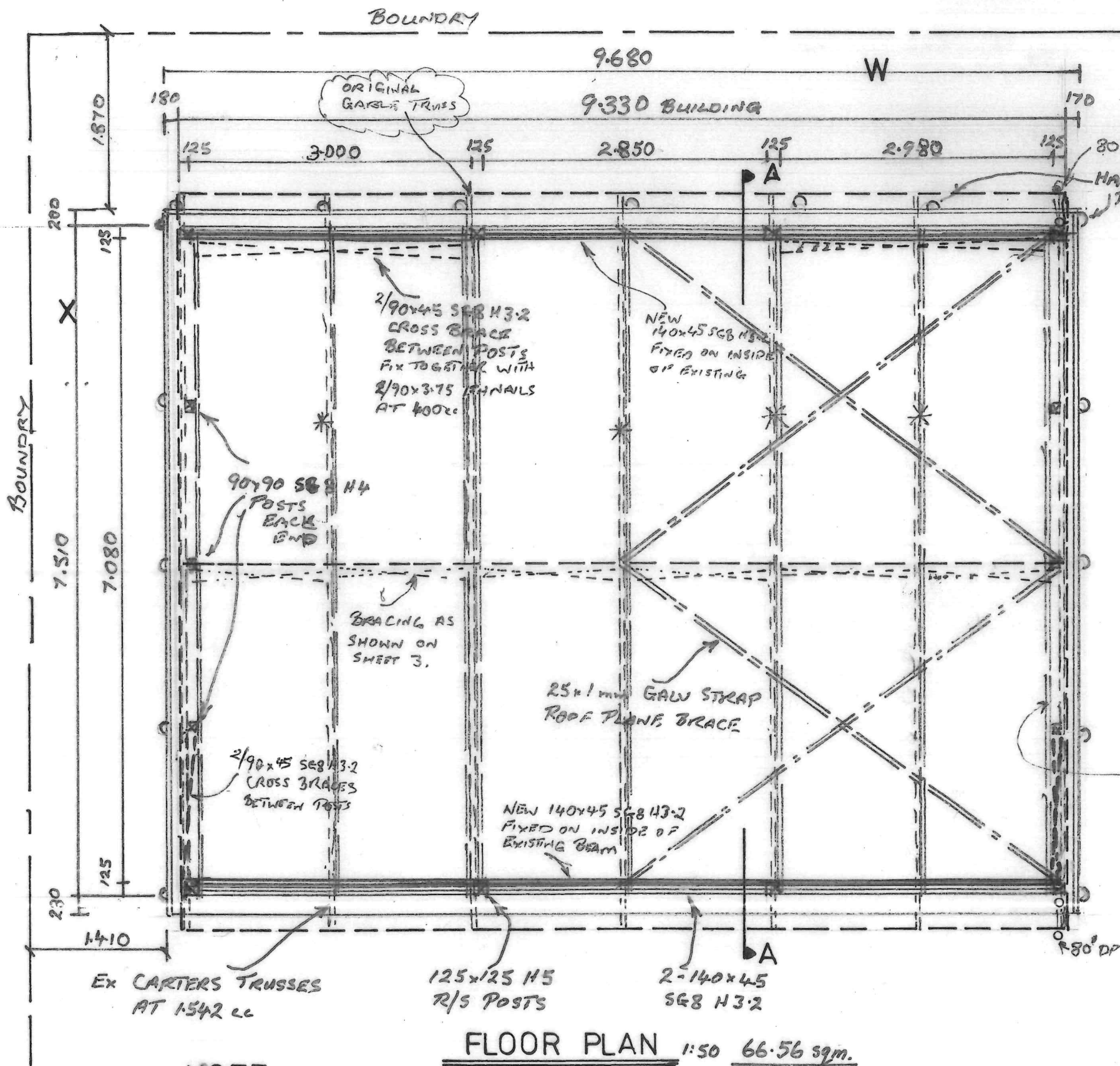
TREVOR ROWSON

Regency Park Estate
3A Brent Road, Unit 25
Rotorua 3010
Ph: (07) 348 2577

BRUCE NICKALLS
177 OLD TAUPO ROAD

PLAN No 2603

DATE: MAR 26 | SHEET 1 OF 4



NEW 140x45 SGB H1.2 RAFTER AS TOP COVER ONLY FIX TO EACH POST WITH 3-90x3.75 IN NAILS SAME AT OTHER END

NOTE
EXISTING AS BUILT CARPORT
WITH ENGINEERING DESIGN

DRAUGHTING SERVICES
TREVOR ROWSON,

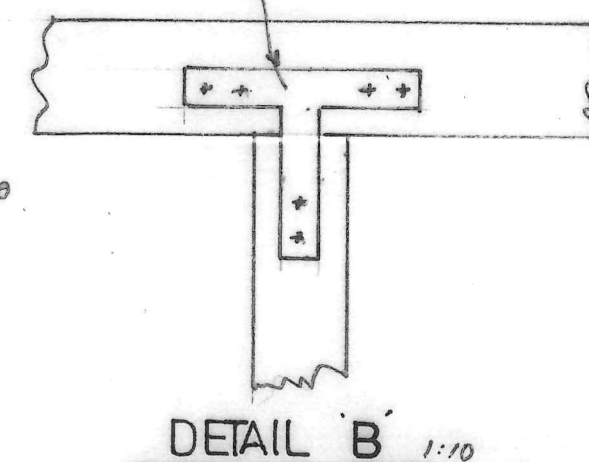
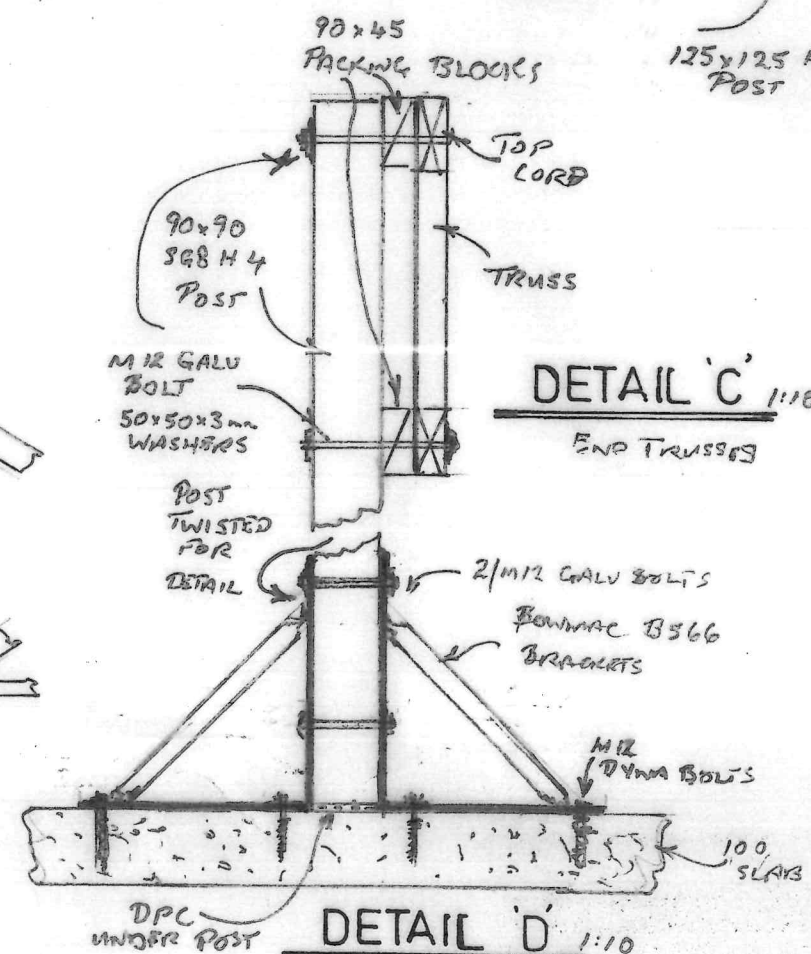
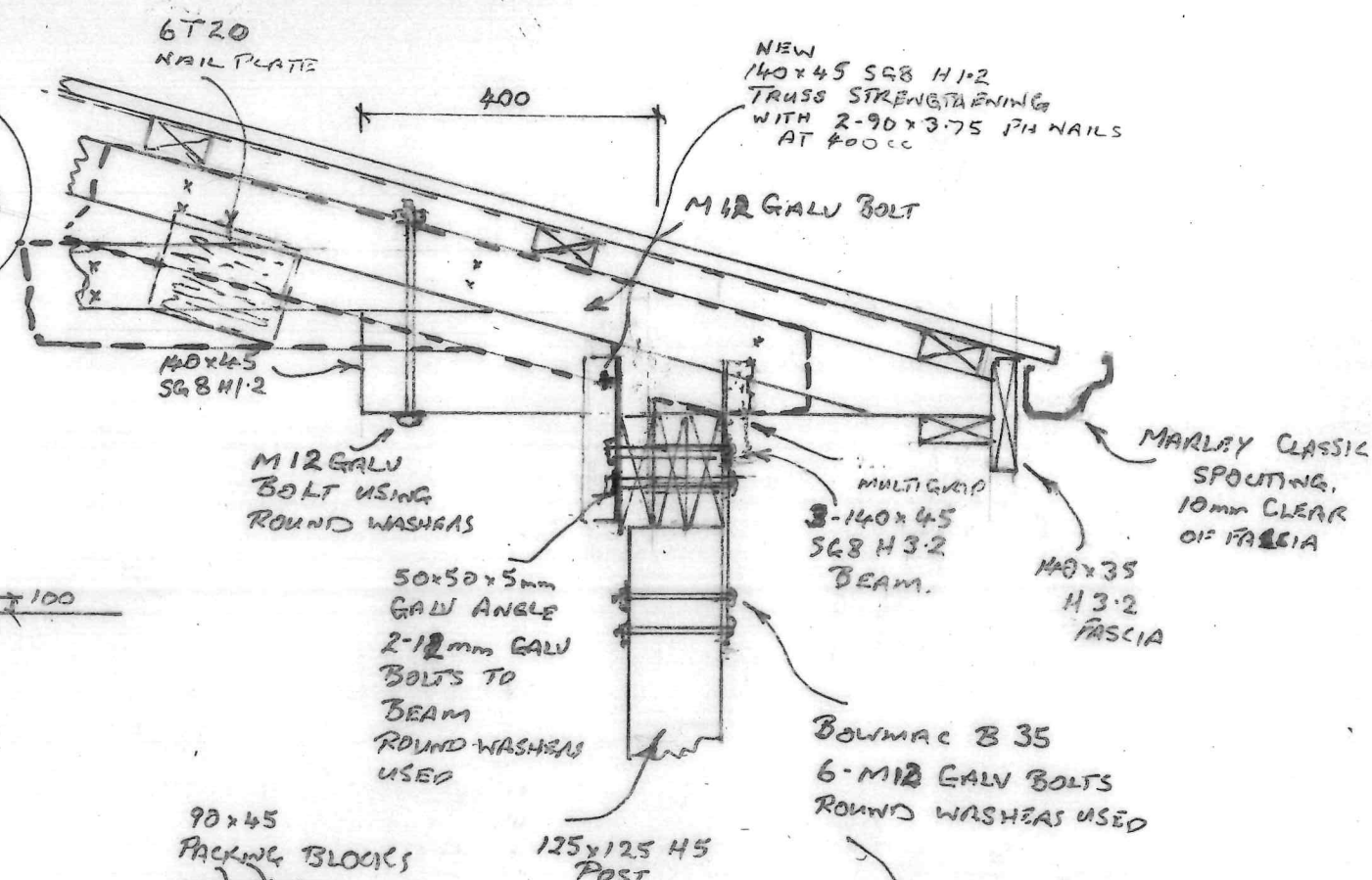
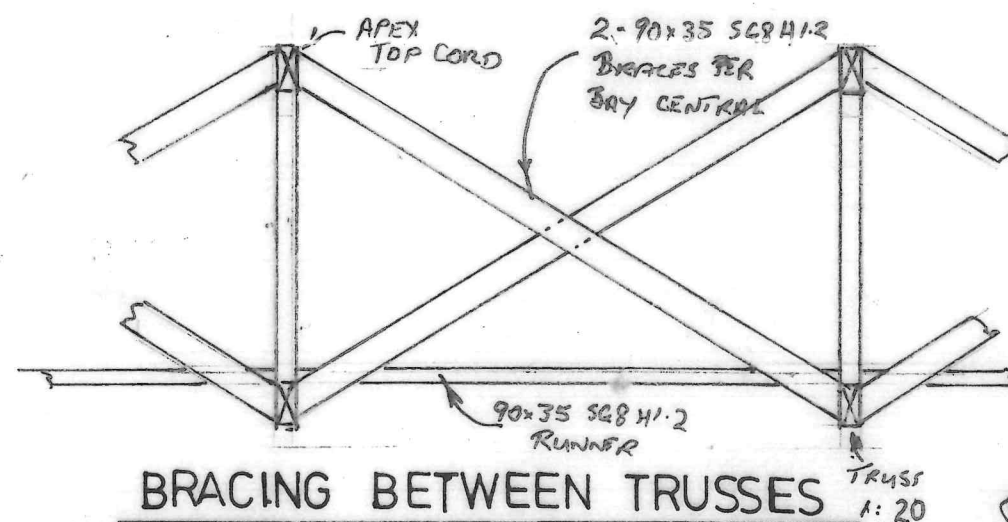
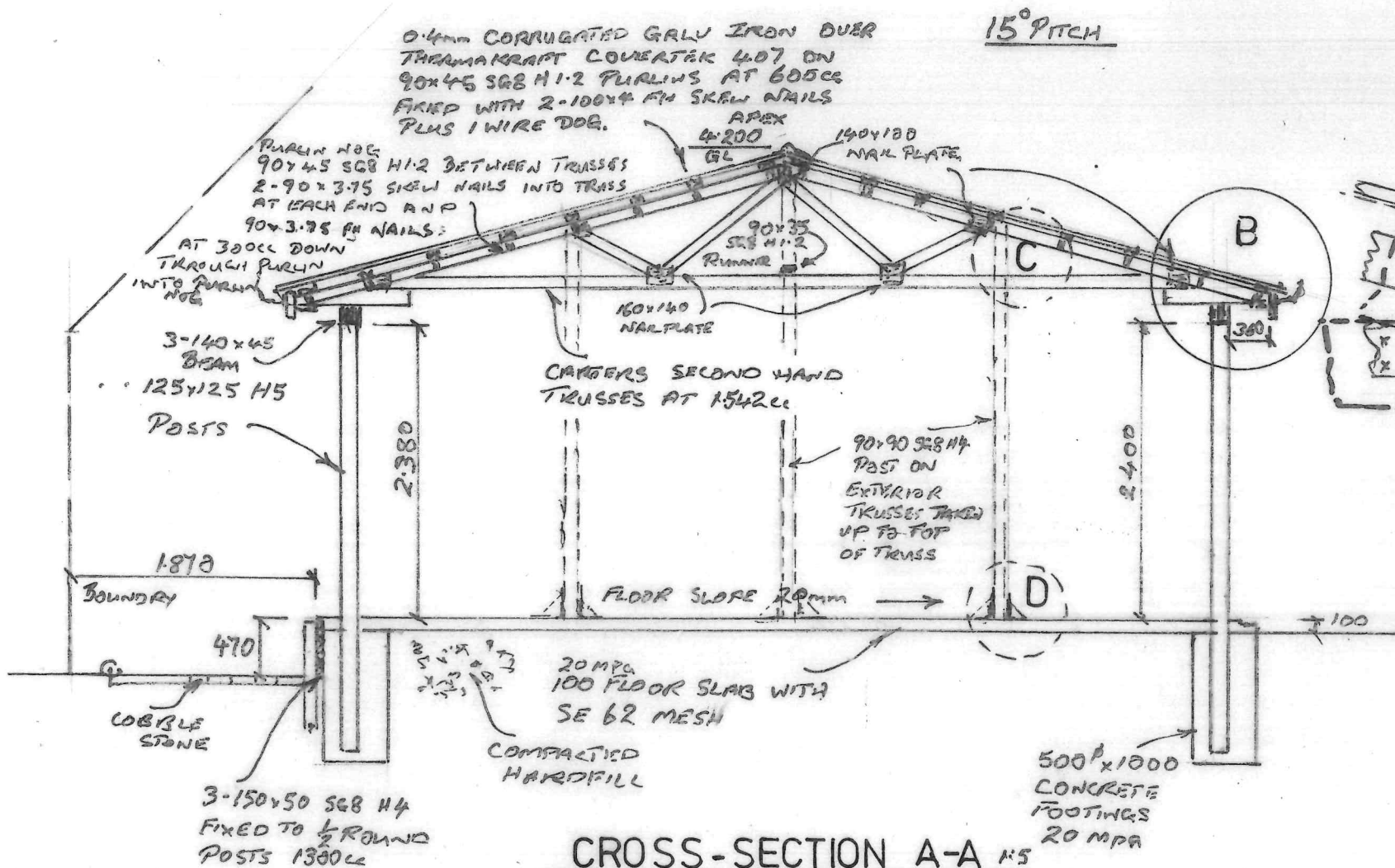
Regency Park Estate
 3A Brent Road, Unit 26
 Rotorua 3010
 Ph: (07) 348 2577

BRUCE NICKALLS
177 OLD TAUPU ROAD

PLAN N° 260

DATE MAR 26 SHEET 2 OF 2

EXISTING AS BUILT CARPORT DETAILS WITH ENGINEERING DESIGN



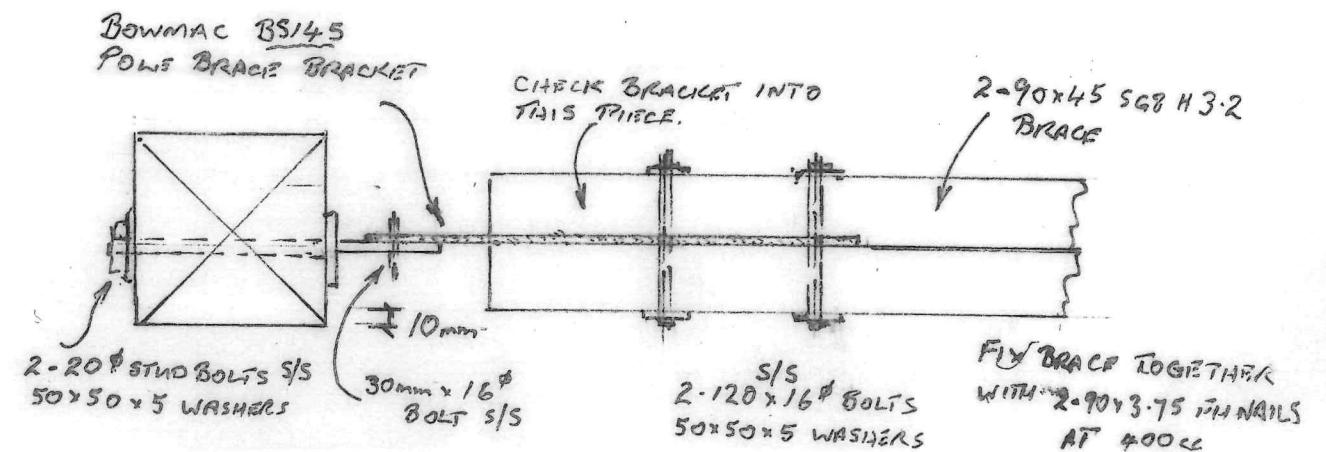
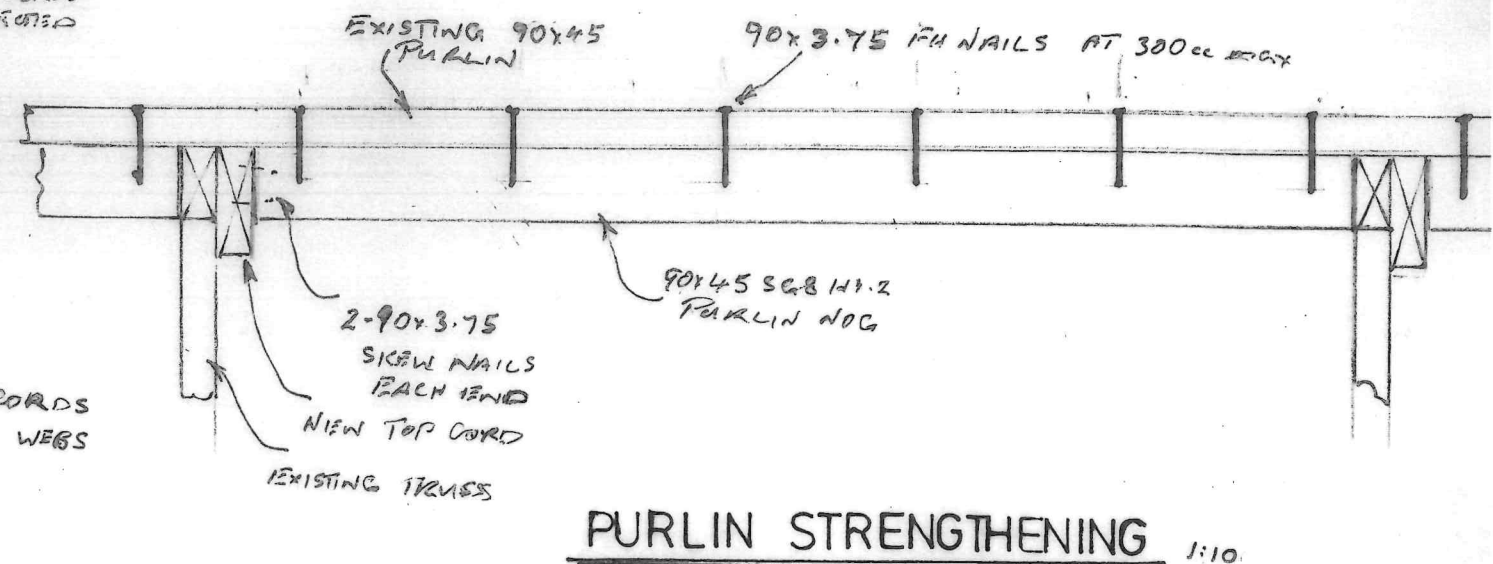
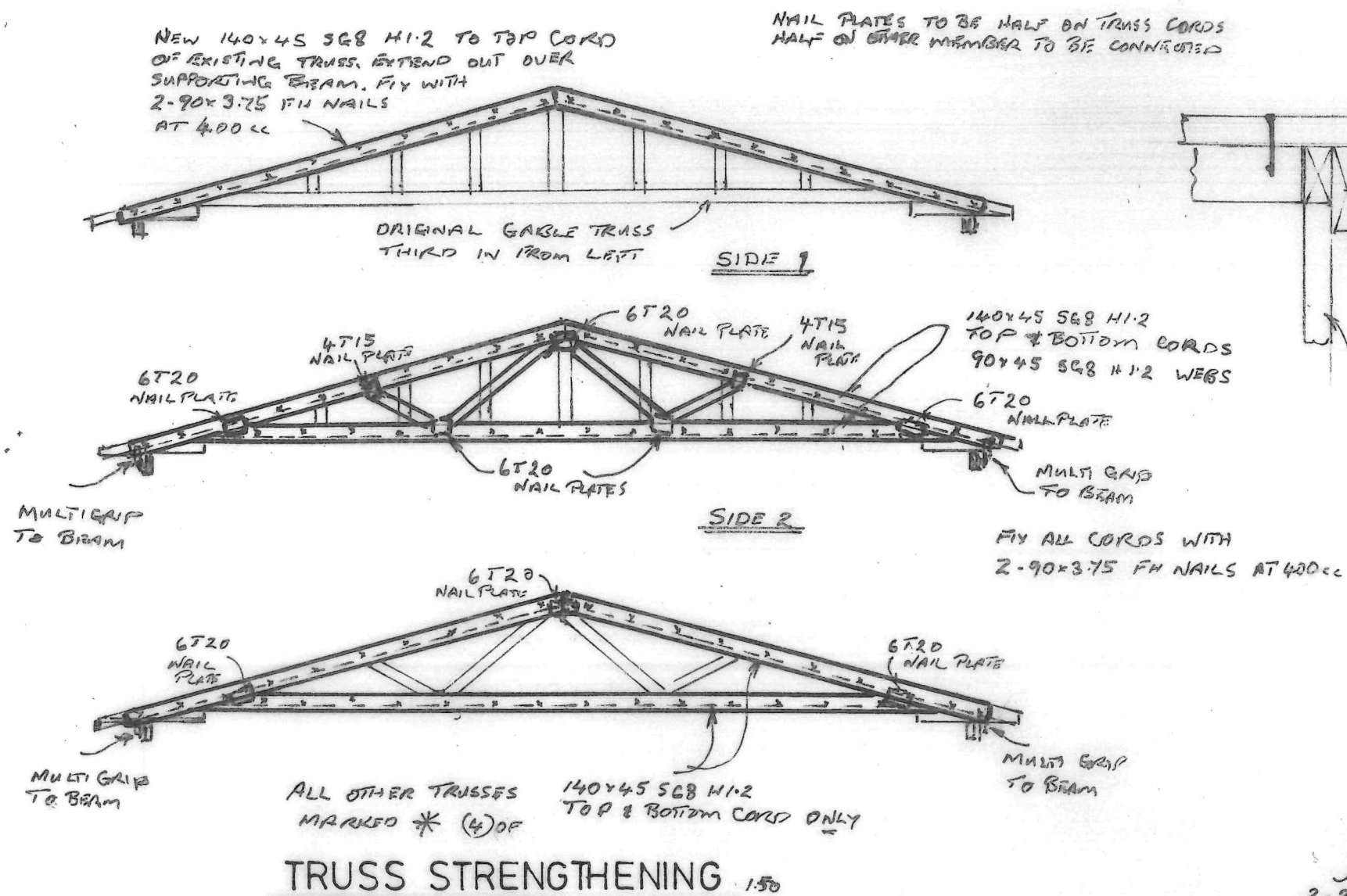
**DRAUGHTING
SERVICES**
TREVOR ROWSON,

Regency Park Estate
3A Brand Road, Unit 25
Roxburgh 3010
Ph: (07) 348 2877

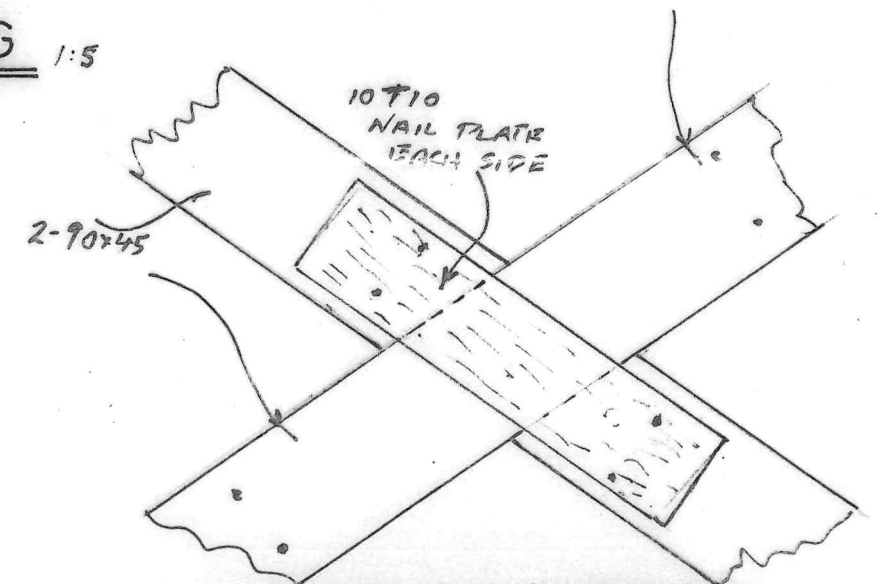
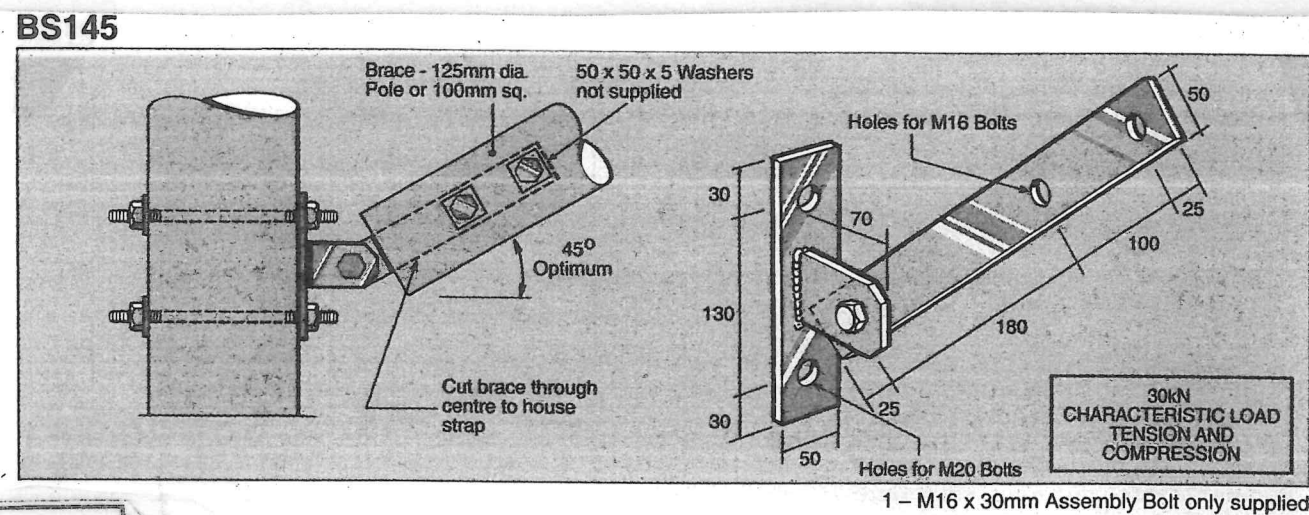
BRUCE NICKALLS, 177 OLD TAUPU ROAD

PLAN N° 2603

DATE MAR 26 SHEET 3 of 4



BRACE TO POST FIXING 1:5



DRAUGHTING SERVICES
TREVOR ROWSON,

Regency Park Estate
3A Brent Road, Unit 26
Rotorua 3010
Ph: (07) 348 2577

BRUCE NICKALLS 177 OLD TAUPU ROAD

PLAN N° 2603

DATE: MAR 26 SHEET 4 OF 4



Consulting Engineers

Structural + Geotechnical + Civil

23rd July 2026

Building Control Manager
Rotorua Lakes Council
Private Bag 3029
ROTORUA 3046

Attention: Building Consents Department

Dear Sir/Madam,

**RE: CONSTRUCTION REVIEW: CARPORT REMEDIATION WORKS AT 177 OLD
TAUPO ROAD, ROTORUA**

For COA application

OUR REF: 26471

We confirm that we have undertaken construction monitoring services in relation to the carport remediation at the above address. Our site inspections and construction monitoring has been undertaken to level CM3 as per Engineering New Zealand guidelines.

Structural inspections (with respect to NZBC Clause B1) that have been undertaken by BSK are as follows and are appended to this letter:

- 12/05/2026 - SED Structural inspection
- 03/06/2026 - SED Structural inspection - revisit
- 08/07/2026 - Roof bracing inspection

In our opinion, based on the above inspections, the work is considered to comply with our design, as described by the PS1 issued by BSK (24/03/2026), with modifications as described in the inspection reports. However, as there is no COA or BC for this work, we are unable to issue a PS4, Construction Review at this time. This can be provided once the work has council approval.

Yours faithfully,

Brad Christie
BE Civil (Hons), CMEngNZ, CPEng, NZDE Civil
BSK CONSULTING ENGINEERS LTD

	Construction Inspection Checklist	
	Project: 177 Old Taupo Road, Car Port	Job Ref: 26471
		Date: 12/05/26
	Inspected by: A Perks	Time: 10:00

Site Hazards:

Work site

PPE Worn:

Boots

Area / Element(s) Inspected:

Carport
☒ Photos taken of area inspected ☒ Saved on S: Drive

View Consent Conditions:

☒ Photograph Conditions

Building Consent #:

Inspection Status:

N/A

☒ Failed (describe failure/defect)		
Bracing, fixings, bolts, wall framing		
<u>Inspection signed off</u> (Acceptance of area when defects rectified) 	☐ Passed NOTES: Bracing in wrong location, fixed incorrectly. Wrong bolt size used for wall bracing brackets. Galv brackets/bolts used instead of SS. Walls are to be installed, therefore galv can be used if greased and DPM separating galv from H5 timber. Girts placed, but do not meet building requirements, options given for upgrade. Trusses, beams and purlins appear to be upgraded as requested in original drawings. See attached mark up for remediation works.	
Name: Aaron Perks	Position: Structural Engineer	Date: 12/05/26



Caption: Roof framing, note missing braced bay



Caption: Upgraded purlins and trusses



Caption: Wall bracing - M16's used instead of M20 for brackets



Caption: Roof bracing, not terminated with a bend and 5 nails as specified

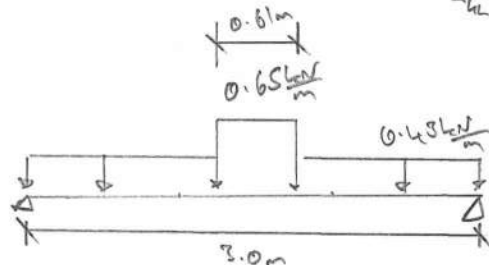
LOADS:

$$\begin{aligned}
 L &= 0.3 \text{ kPa} && \text{(LOTS OF EXTRA FRAMING)} \\
 2\text{st. \à } &= 0.62 \text{ kPa} \\
 C_{pm} &= -1.2 && \text{(LIFT) - As attached canopy} \\
 &= -0.75 && \text{(LIFT) - Dominant opening.}
 \end{aligned}$$

$\Rightarrow C_{pm}$ at -1.2 already considered $\Rightarrow$ Ok. for lift
 $\Rightarrow$ Also L is higher now, so Ok.

WALLS:

$$\begin{aligned}
 W_u &= 0.53 \text{ kPa} && \text{(WINDWARD)} \\
 L &= 3.0 \text{ m} \\
 T_w &= h/3 \\
 &= 2.4 \text{ m}/3 \\
 &= 0.8 \text{ m} \\
 UDL &= 0.43 \text{ kN/m} && (C_{hl} = 1.0) \\
 h_u &= 1.5, && A = 0.25 \text{ m}^2, a = 1.4 \text{ m} \\
 &&& k_u = 0.61 \text{ m}
 \end{aligned}$$



$$\begin{aligned}
 UDL_{eff} &= 0.475 \text{ kN/m} \\
 M^* &= 0.54 \text{ kNm} \\
 V^* &= 0.72 \text{ kN}
 \end{aligned}$$

$\Rightarrow$ 240 x 45 SLP assumed provided

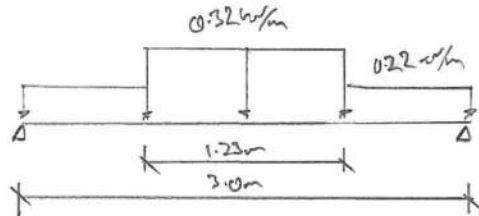
$$\begin{aligned}
 \phi M_n &= \phi k_f b z \\
 &= 0.90 \text{ kNm} \\
 \Delta_{SL} \text{ UDL} &= UDL_{eff} \times 0.75 = 0.36 \text{ kN/m} \\
 \Delta_{SL} &= 26.1 \text{ mm}, && L/A = 115
 \end{aligned}$$

$$\begin{aligned}
 \phi &= 0.8 \\
 k_1 &= 1.0 \\
 k_2 &= 1.0 \\
 P_b &= 14 \text{ MPa} \\
 z &= 240 \times 45^2/6 \\
 E &= 2 \text{ GPa} \\
 I &= 240 \times 45^3/12
 \end{aligned}$$

Try 90×45 on edge between.

$$T_w = 0.4 \text{ m}$$

$$L_{eff} = 1.23 \text{ m}$$



$$UD_{eff} = 0.26 \text{ kN/m}$$

$$M^* = 0.29 \text{ kNm}$$

$$V^* = 0.39 \text{ kN}$$

$$\Delta_{SLs} \quad UDL = UD_{eff} \times 0.75$$

$$= 0.195 \text{ kN/m}$$

$$\Delta = 9.4 \text{ mm}$$

$$L/\Delta = 319, \text{ ok.}$$

$$\phi M_n = \phi k_f b z$$

$$= 0.61 \text{ kNm, ok.}$$

$$\phi V_n = \phi k_f f_s A_s$$

$$= 8.0 \text{ kN, ok.}$$

$$I = 45 \times 90^3 / 12$$

$$k_1 = 1.0$$

$$k_2 = 0.9$$

$$Z = 45 \times 90^2 / 6$$

$$f_s = 3.7 \text{ MPa}$$

$$A_s = 2/3 A$$

⇒ Infill existing with further 90×45 S&B Girt on flat.

⇒ Place 90×45 S&B pucker on flat to existing girts, nail @ 600 c/s or $2 \times 3.15 \text{ mm}$ nails.

⇒ Fix with LT160 half ceiling ties. 1x per connection.

$$\Delta_{SLs} = \frac{w L^4}{185 E I} \rightarrow \text{DOUBLE SPAN.}$$

$$= 15.7 \text{ mm} \quad L/\Delta = 191 \rightarrow \text{ok}$$

BSR CONSTRUCTION MONITORING 15/1/26

→ UPDATE TO STRUCTURE
→ REMEDIAL INSTRUCTIONS.

proposed: AS BUILT CARPORT

for: BRUCE NICKALLS 027 4 977 546

at: 177 OLD TAUPŌ ROAD ROTURUA



**DRAUGHTING
SERVICES**

TREVOR ROWSON,

Regency Park Estate
3A Brent Road, Unit 25
Rotorua 3010
Ph: (07) 348 2577

set n°:



AERIAL LOCATION PLAN

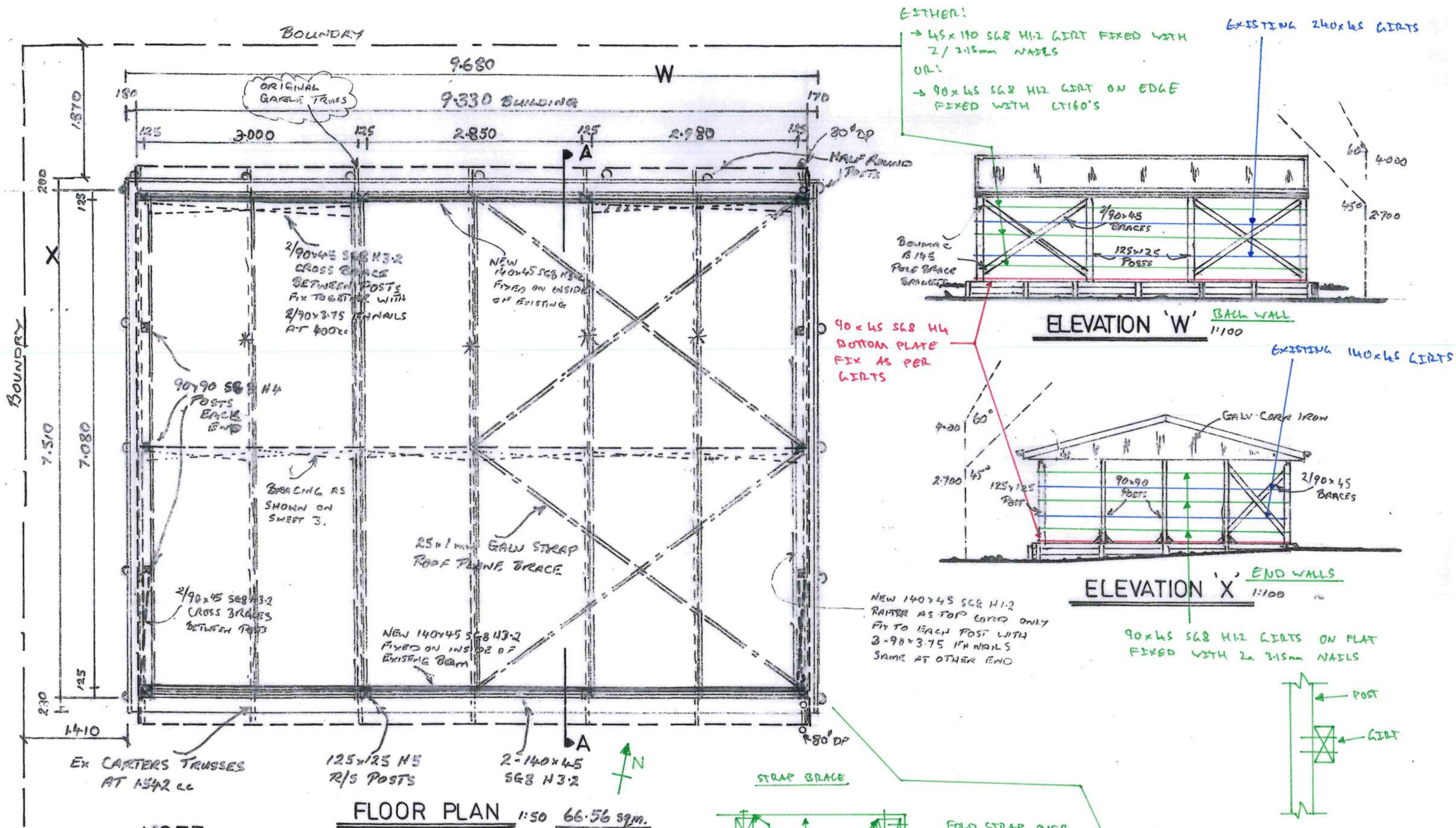
**DRAUGHTING
SERVICES**
TREVOR ROWSON,

Regency Park Estate
3A Brent Road, Unit 25
Rotorua 3010
Ph: (07) 348 2577

BRUCE NICKALLS
177 OLD TAUPO ROAD

PLAN No 2603

DATE: MAR 26 | SHEET 1 OF 4



NOTE
EXISTING AS BUILT CARPORT
WITH ENGINEERING DESIGN

DRAUGHTING SERVICES
 TREVOR ROWSON,

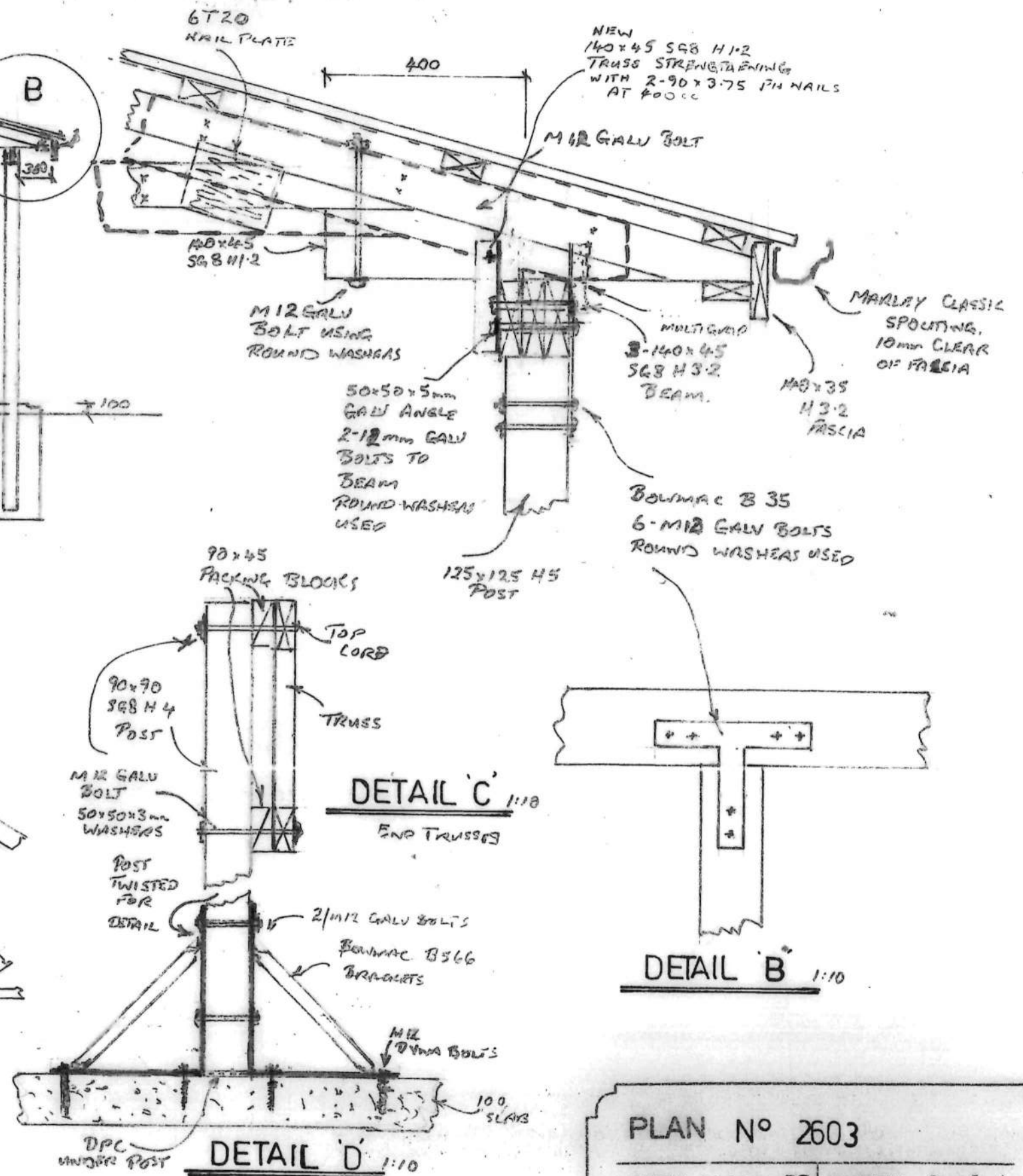
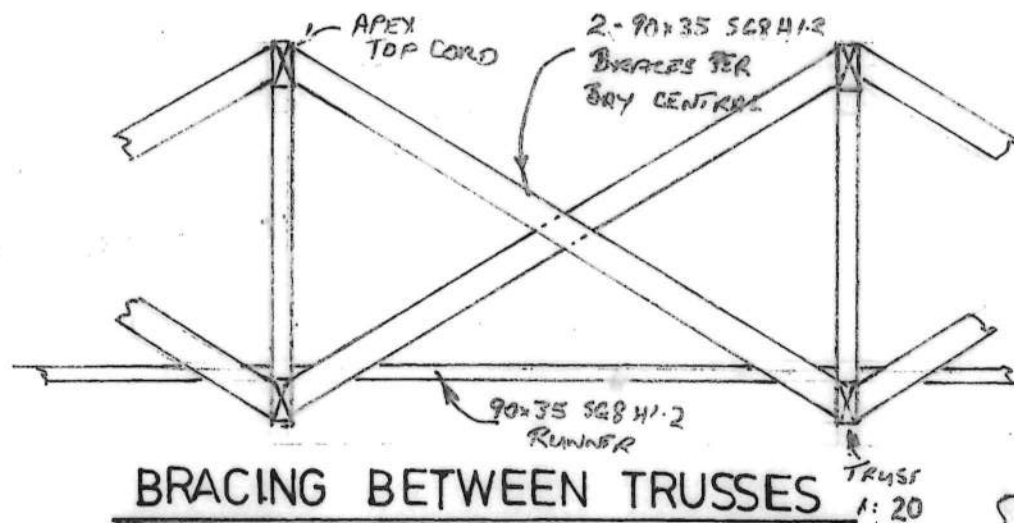
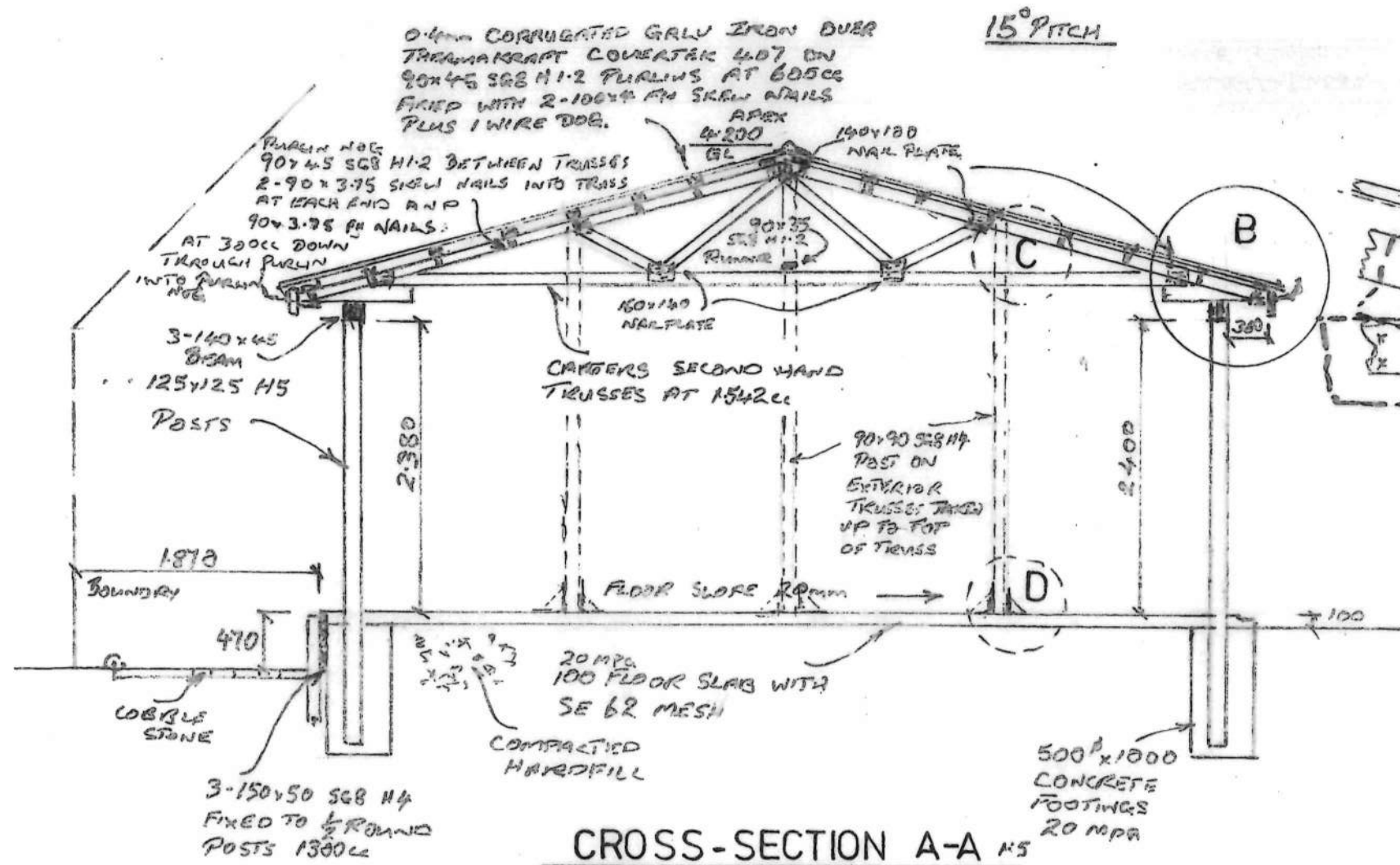
Regency Park Estate
 3A Brent Road, Unit 25
 Rotorua 3010
 Ph: (07) 348 2577

BRUCE NICKALLS
 177 OLD TAUPU ROAD

NOTE:- BRACE IS LOCATED UNDER PURLINS - THIS IS ACCEPTABLE.
 ENSURE BRACE LAYOUT MATCHES

PLAN N° 260
 DATE MAR 26 SHEET 2 OF 4

EXISTING AS BUILT CARPORT DETAILS
WITH ENGINEERING DESIGN



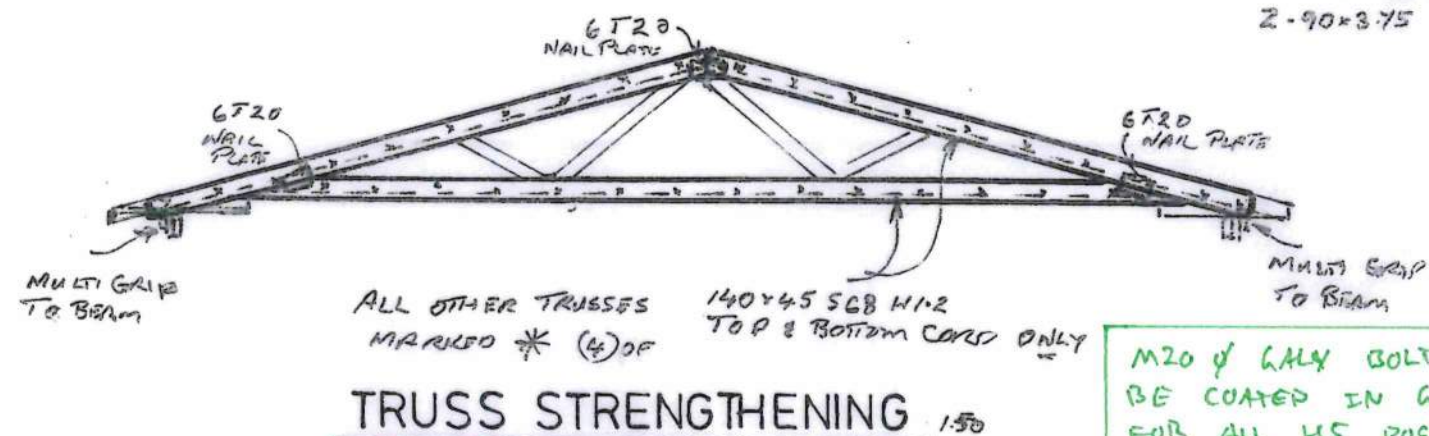
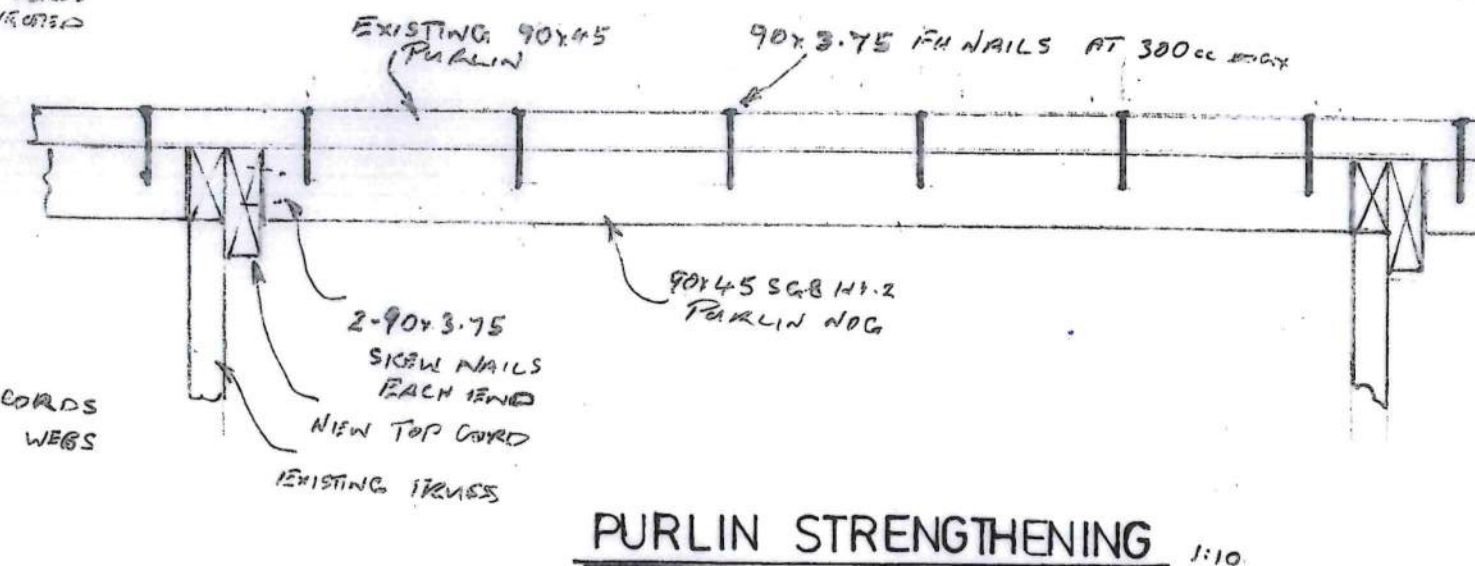
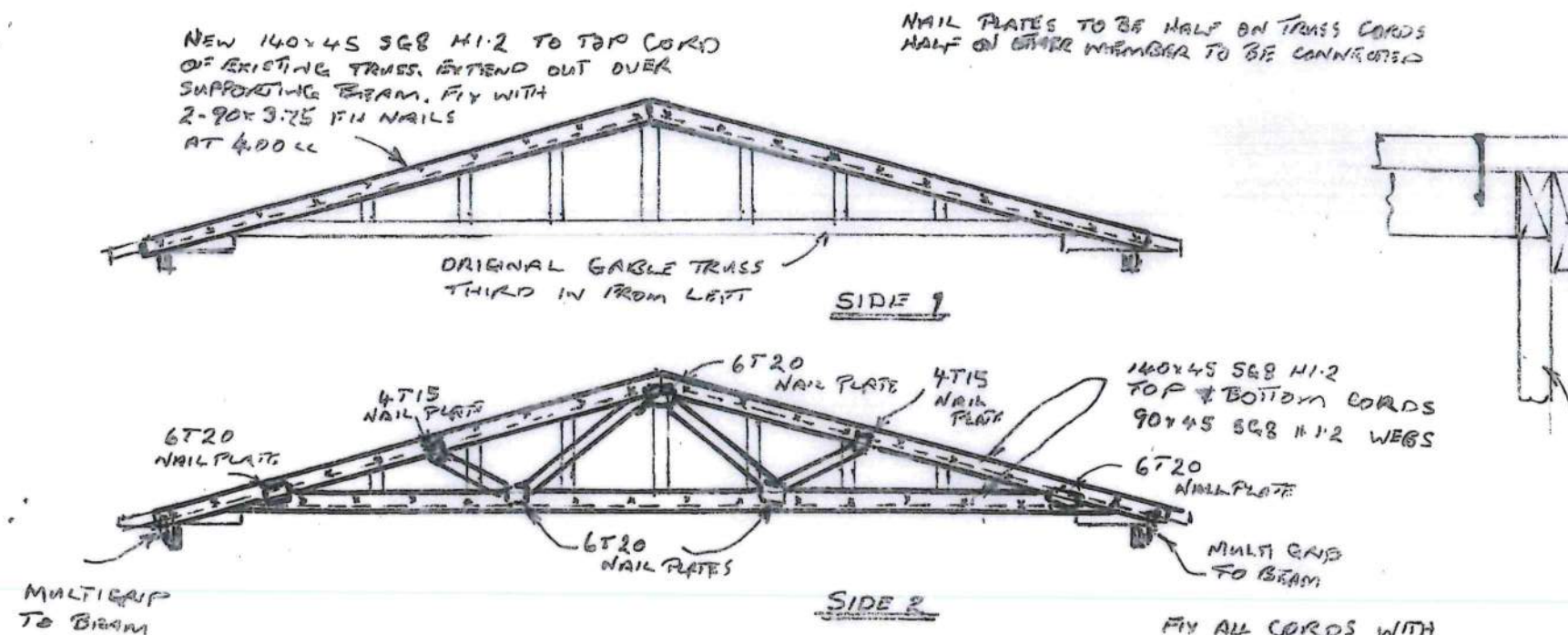
**DRAUGHTING
SERVICES**
TREVOR ROWSON,

Highway Park Estate
3A Birch Road, Unit 25
Eatonville WA 98122
Ph: (360) 341-1373

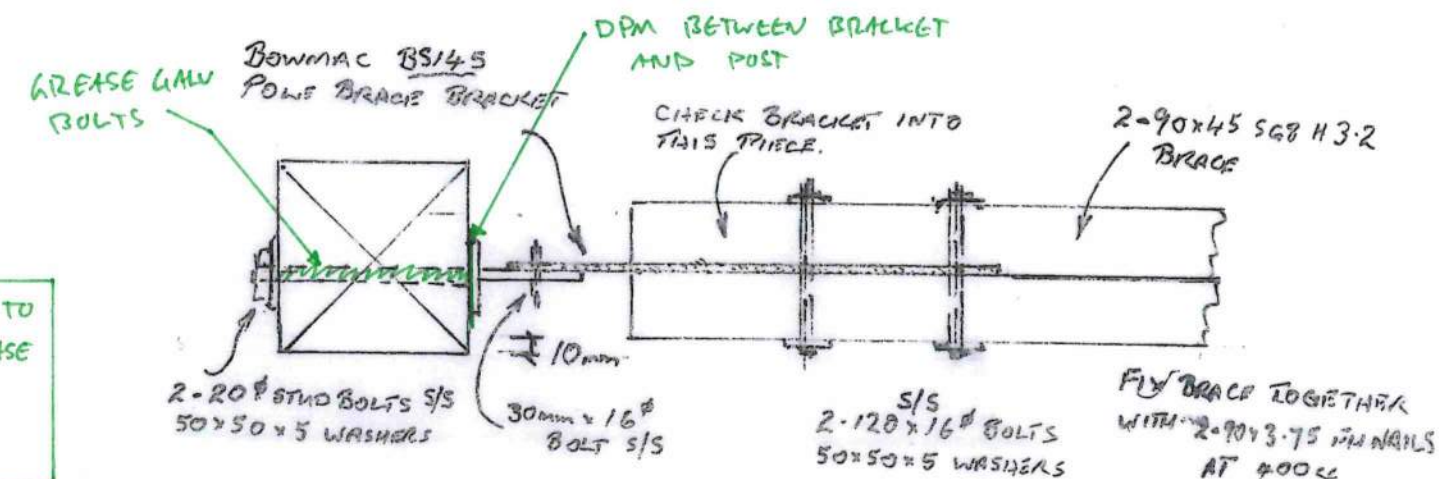
BRUCE NICKALLS, 177 OLD TAUPU ROAD

PLAN N° 2603

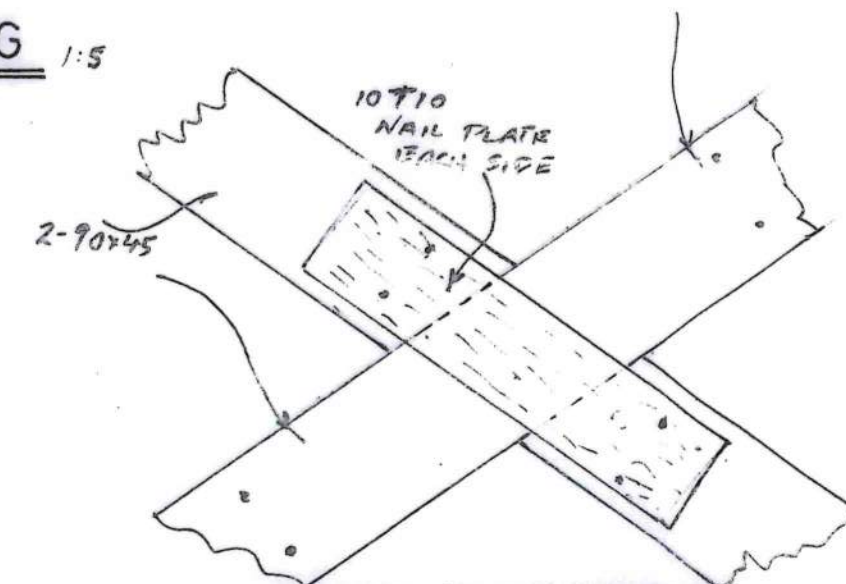
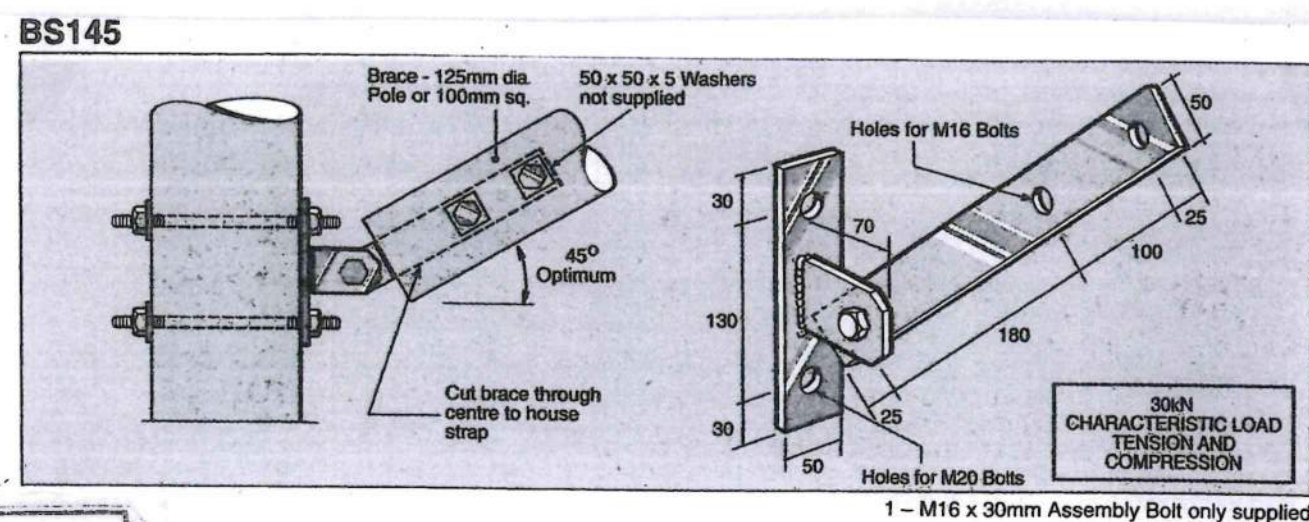
DATE MAR 26 SHEET 3 of 4



M20 & LALY BOLTS TO BE COATED IN GREASE FOR ALL HS POSTS PLACE DPM BETWEEN BRACKET AND POST



BRACE TO POST FIXING 1:5



DRAUGHTING SERVICES
TREVOR ROWSON,

Regency Park Estate
3A Brent Road, Unit 26
Rotorua 3010
Ph: (07) 346 2577

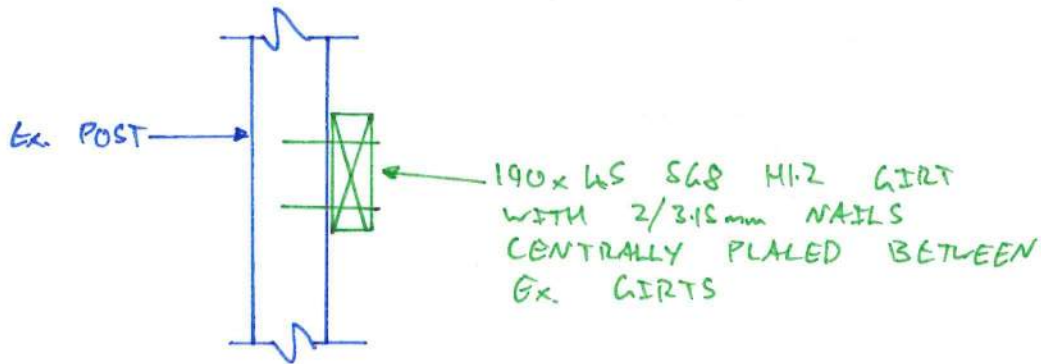
BRUCE NICKALLS 177 OLD TAUPU ROAD

PLAN N° 2603

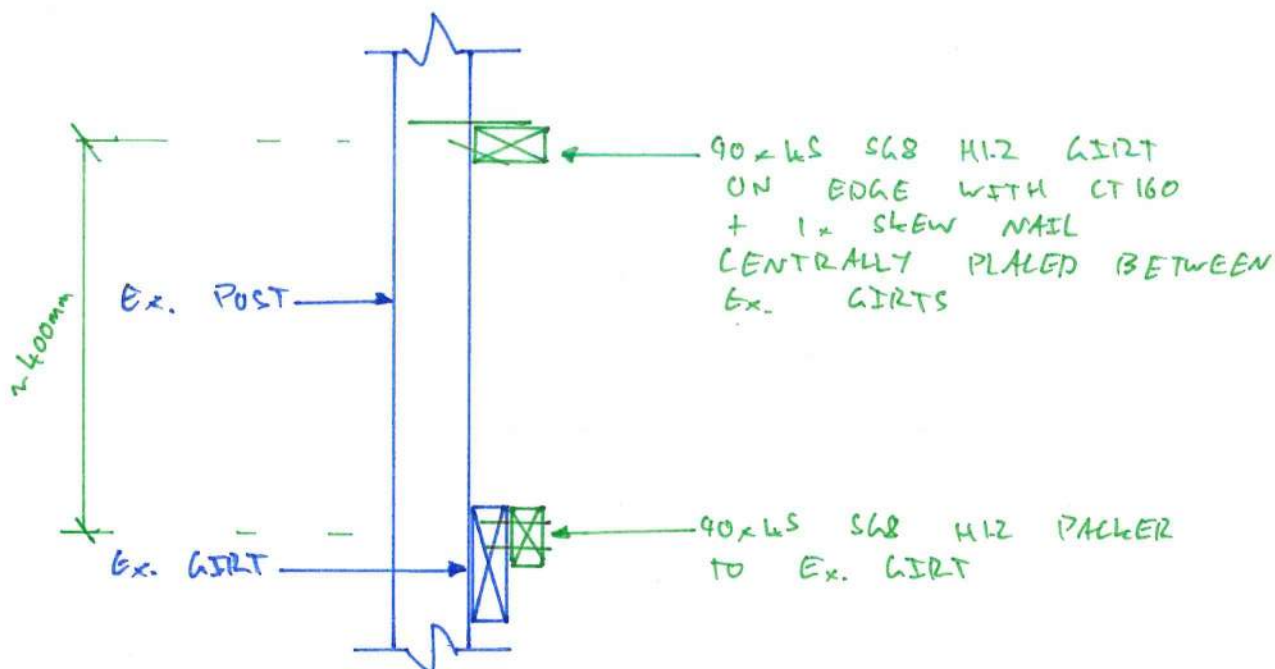
DATE: MAR 26 SHEET 4 OF 4

BACK WALL GIRTS

1) 45×190 SGB GIRT ON FLAT



2) 45×90 SGB GIRT ON EDGE



	Construction Inspection Checklist	
	Project: 177 Old Taupo Road, Car Port	Job Ref: 26471
		Date: 3/06/2026
	Inspected by: A Perks	Time: 2:00

Site Hazards:

Work site

PPE Worn:

Boots

Area / Element(s) Inspected:

Carport
☒ Photos taken of area inspected ☒ Saved on S: Drive

View Consent Conditions:

☒ Photograph Conditions

Building Consent #:

Inspection Status:

N/A

☒ Failed (describe failure/defect)		
Roof bracing end fixings		
Inspection signed off (Acceptance of area when defects rectified) 	☐ Passed NOTES: Most items were updated as discussed at previous inspection, with the following exceptions: - Roof bracing added, more than required, but not fixed as per the specification. - These are to be fixed appropriately, see included calculation. - Wall girts have not been upgraded, but further girts have been added to the interior side of the walls as well. Further calculations have been carried out based on this, and they are OK for strength, but do not meet recommended deflection limits. However, given the nature of the structure, this is acceptable, as long as the client is aware and accepts this. See attached acknowledgement from client.	
Name: Aaron Perks	Position: Structural Engineer	Date: 3/06/2026



Caption: Carport



Caption: Extra roof bracing installed



Caption: Some roof bracing bent over and nailed as specified, though not all



Caption: Bolts greased and dpm placed between bracket and H5 timber



Caption: Bracing end bent but on front face. Nailed with 75 mm nails



Caption: Wall bracing brackets



Caption: Bracing strap bent down on front face and nailed



Caption: Wall framing installed - 140x45 girts along house and back side.

Project: 177 Old Taupo Road - Carport
Inspection type:

Ref: 26471
Date: 3/06/26



Caption: Wall framing along boundary side. 90x45 girts used, 2 spaced up height as per other walls

Caption:

Ex Lints. - 140 x 45

$$\phi M_n = \phi k_f z$$

$$= 0.53 \text{ kNm}$$

$$\phi = 0.8$$

$$k_f = 1.0$$

$$z = 1.0$$

$$P_b = 16 \text{ MPa}$$

$$Z = \frac{45^2 \times 140}{6}$$

⇒ INTERNAL GIRTS ARE USED FOR INTERNAL LINING, THEREFORE, CONSIDER ONLY CPE

$$z_{c.a.}, p = 0.62 \text{ kPa}$$

$$C_{PE} = 0.7$$

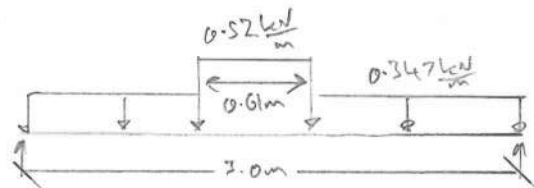
$$P_{des} = 0.436 \text{ kPa} \text{ u/s}$$

$$T_w = 0.8 \text{ m}$$

$$UDL = 0.347 \text{ kN/m}, k_L = 1.0$$

$$k_L = 1.5, A = 0.25a^2, a = 1.4 \text{ m}$$

$$L_{UL} = 0.61 \text{ m}$$



$$M^* = 0.428 \text{ kNm}$$

$$V^* = 0.57 \text{ kN}$$

$$UDL_{eff} = 0.38 \frac{\text{kN}}{\text{m}}, \text{ u/s}$$

$$= 0.29 \frac{\text{kN}}{\text{m}}, \text{ SLS}$$

$$\phi V_n = \phi k_f A_s$$

$$= 12.14 \text{ kN}$$

$$P_b = 3.7 \text{ MPa}$$

$$A_s = \frac{2}{3} \times 45 \times 140$$

$$\Delta_{SLS} = \frac{5 w L^4}{384 EI}$$

$$= 29.9 \text{ mm}$$

$$E = 8 \text{ GPa}$$

$$I = \frac{140 \times 45^3}{12}$$

$$L/\Delta = 100$$

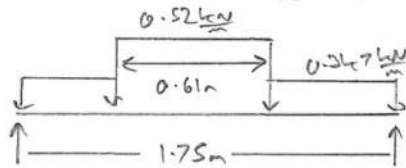
SIDE WALL

$$L = 7.0m / 4 = 1.75m$$

$$Prov. = 90 \times 45 @ 800mm$$

⇒ SAME SITUATION AS PREVIOUS CALC ON OTHER WALLS
I.E PAGE 3.

$$UDL = 0.347 \text{ kN/m ULS}$$



$$M^* = 0.16 \text{ kNm}$$

$$V^* = 0.36 \text{ kN}$$

$$UDL_{eff} = 0.407 \frac{\text{kN}}{m}$$

$$\phi M_n = \phi k f_b Z$$

$$= 0.34 \text{ kNm}$$

$$\phi V_n = \phi k f_s A_s$$

$$= 7.9 \text{ kN}$$

$$UDL_{eff, SLS} = 0.305 \frac{\text{kN}}{m}$$

$$\Delta_{SLS} = \frac{5 w L^4}{384 EI}$$

$$= 6.8 \text{ mm}$$

$$L/\Delta = 256$$

⇒ SIDE WALL OK.

$$\phi = 0.8$$

$$k_1 = 1.0$$

$$k_2 = 1.0$$

$$f_b = 14 \text{ MPa}$$

$$Z = 90 \times 45^2 / 6$$

$$f_s = 3.7 \text{ MPa}$$

$$A_s = \frac{2 \times 90 \times 45}{3}$$

$$E = 20 \text{ GPa}$$

$$I = \frac{90 \times 45^3}{12}$$



Consulting Engineers

177 Old Taro Road

Job Ref 26471

ROOF BRACING

Date 5/06/26

Sheet of

→ Check nail requirements for end of constructed bracing.

$$A_{n, brace} = 5.5 \text{ kN} - \text{see previous calcs.}$$

$$n_{brace} = 2$$

$$W_{brace, end} = 2.75 \text{ kN.}$$

$$q_k = 0.868 \text{ kN/nail} \quad 3.75 \text{ mm}$$

$$\phi_{dn} = \phi_k q_k \quad d = 0.8$$

$$= 0.695 \text{ kN/nail} \quad k_1 = 1.0$$

$$n_{req'd} = 4 \text{ nails/end}$$

→ 4 x 3.75mm nails per brace end, acting in single shear required.



5 June 2026

177 Old Taupo Road
Rotorua

Bruce Nickalls

Acceptance of Girt Performance

This letter brings to your attention the performance of the wall structure of the Car Port constructed at 177 Old Taupo Road, by the Client (Bruce Nickalls).

The wall framing has been checked by BSK and found to pass under the Ultimate Limit State, which checks the strength capacity. However, under the Serviceability Limit State, which checks deflections under typical usage/weather events, the framing is found to perform to a lower level than is typically acceptable.

However, this is based on recommended limits, rather than set values and we can therefore accept this lower level of performance, provided the Client acknowledges they understand this and its implications.

Wall displacements are expected to be $L/\Delta = 100$. Recommended values for this are usually between $L/\Delta = 150-300$.

Please sign below to accept this level of performance.

Bruce Nickalls

Date: 10-6-26

	Construction Inspection Checklist	
	Project: 177 Old Taupo Road, Car Port	Job Ref: 26471
		Date: 8/07/2026
	Inspected by: A Perks	Time: 9:00

Site Hazards:

Work site

PPE Worn:

Boots

Area / Element(s) Inspected:

Carport
☒ Photos taken of area inspected ☒ Saved on S: Drive

View Consent Conditions:

☒ Photograph Conditions

Building Consent #:

Inspection Status:

N/A

☐ Failed (describe failure/defect)		
<u>Inspection signed off</u> (Acceptance of area when defects rectified) 	☒ Passed NOTES: Roof bracing was checked and has now been nailed according to previous instruction. 2x rows of bracing are installed, initial drawings only called for 1 set.	
Name: Aaron Perks	Position: Structural Engineer	Date: 8/07/2026



Caption: Roof Bracing nailed wrapped and nailed off



Caption: Roof bracing wrapped and nailed off