



Determination 2019/011

Regarding the substitution of solid timber framing with glue-laminated timber to the wall framing and roof trusses to a house at 28 Mike Smith Drive, Cambridge

Summary

This determination considers the use of glue-laminated timber as framing to the walls and roof trusses of a house. The glue-laminated framing was substituted during construction for solid timber described in the approved building consent without approval being sought. The determination considers the compliance of the glue-laminated framing and whether the substitution could be considered a minor variation to the approved consent.



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1. The matters to be determined

1.1 This is a determination under Part 3 Subpart 1 of the Building Act 2004¹ (“the Act”) made under due authorisation by me, Katie Gordon, Manager Determinations, Ministry of Business, Innovation and Employment (“the Ministry”), for and on behalf of the Chief Executive of the Ministry.

1.2 The parties to this determination are:

- T Scott, the licensed building practitioner (“LBP”)² who designed the house and applied for the determination (“the applicant”), acting through a building consultant (“the agent”); the agent was also the author of the Product Technical Statement (PTS)
- D Davies, the LBP³ who has been constructing the house (“the builder”) and who works for the same building firm as the applicant
- Waipa District Council, carrying out its duties as a territorial authority or building consent authority (“the authority”)
- the owners of the house, C and A Roberts (“the owners”), acting through a legal adviser.

1.3 I consider the manufacturer of the glue-laminated timber⁴ used in the owners’ house, Wood Engineering Technology Ltd (“the manufacturer”) is a person with an interest in this matter:

1.4 This determination arises from the authority’s refusal to grant an amendment to the building consent allowing the manufacturer’s glulam to be used for framing and roof trusses instead of the solid timber described in the approved building consent for constructing the owners’ house. The authority issued a notice to fix⁵ for the unauthorised use of the manufacturer’s glulam.

1.5 The applicant initially requested a determination to consider the authority’s refusal to grant the amendment but, on my suggestion, has agreed to extend this to also consider the notice to fix.

1.6 Accordingly, I consider the matters to be determined⁶ are:

- whether the manufacturer’s glulam used in place of solid timber for the wall framing and roof trusses in the owner’s house complies with Building Code⁷ Clauses B1 Structure and B2 Durability
- whether the authority correctly exercised its powers of decision in refusing to grant the amendment to the building consent in respect of using the manufacturer’s glulam for framing and roof trusses. In deciding this matter, I must also consider whether the authority was correct to refuse the minor variation for this work

¹ The Building Act, Building Code, compliance documents, past determinations and guidance documents issued by the Ministry are all available at www.building.govt.nz or by contacting the Ministry on 0800 242 243.

² Licence classes: Design, Site, Carpentry

³ Licence classes: Site, Carpentry

⁴ Glue-laminated timber, commonly known as glulam, is a type of structural engineered wood product. It is made up of layers of dimensioned timber bonded together with durable, moisture-resistant structural adhesive.

⁵ Under section 164 of the Act

⁶ Under sections 177(1)(a), 177(1)(b), 177(2)(a) and 177(2)(f) of the Act

⁷ First Schedule, Building Regulations 1992. Unless otherwise stated, references to clauses in this determination are to clauses of the Building Code, and references to sections are to sections of the Act.

- whether the authority correctly exercised its powers of decision in issuing the notice to fix for carrying out building work that was not in accordance with the building consent.
- 1.7 In making my decision I have considered the submissions of the parties, the expert I engaged who is a materials engineer with expertise in building products and the building controls regulatory framework (“the expert”), and the other evidence in this matter.
- 1.8 This determination refers to a large number of standards; I have listed the principle standards below along with relevant Acceptable Solutions and Verification Methods. The full list of standards referred to in this determination are shown in Appendix A, along with which standards, and relevant Acceptable Solutions or Verification Methods they are referenced by:
- B1/AS1 Acceptable Solution for B1 Structure: Structure General
 - B1/VM1 Verification Method for B1 Structure: Structure General
 - B2/VM1 Verification Method for B2 Durability
 - NZS 3602:2003 Timber and wood-based products for use in building
 - NZS 3604:2011 Timber-framed buildings
 - NZS 3640:2003 Chemical preservation of round and sawn timber
 - AS/NZS 1604.5:2012 Specification for preservative treatment - Part 5: Glued laminated timber products
- 1.9 The Appendices also include relevant extracts from the legislation and the Verification Method B2/VM1 (Appendix B), excerpts from the standards (Appendix C) and a summary of the submissions made at the determination hearing (Appendix D).

2. Background

2.1 The house and the building consent

- 2.1.1 On 16 March 2018 the authority issued building consent BC/0130/18 for construction of the house. The approved plans and specifications show a single storey detached dwelling of 298m² with a complex shape but low weathertightness risk score⁸. It has a concrete slab-on-grade foundation with timber wall framing and roof trusses. The stud height is 2.6m throughout the house and 3.8m in the attached garage. The house is clad with brick veneer and a pressed metal tile roof; a small area of vertical aluminium wall cladding on a cavity was later amended to brick veneer.
- 2.1.2 The approved plans⁹ state: “All framing Pinus Radiata SG8¹⁰ H1.2¹¹ KD¹² unless otherwise stated”.

⁸ Paragraph 3 of the Acceptable Solution for Clause E2, E2/AS1, provides a method of assessing the weathertightness risk of a building’s envelope based on environmental factors, and building features and complexity.

⁹ Documents approved for building consent BC/0130/18 issued 16 March 2018, drawing 101

¹⁰ Structural grade SG8 as defined in NZS 3604: Section 1 – Scope and Interpretation

¹¹ Hazard class ratings (Hx) are specified in NZS 3640:2003. H1.2 is for timber products used in situations protected from the weather but where there is a risk of moisture exposure conducive to decay.

¹² Kiln-dried

2.1.3 The approved specifications¹³ provide more detail, stating:

Timber Grade and Quality

Unless otherwise noted or specified on the drawings or specifications, all framing timber shall be minimum structural grade SG8 Radiata pine in accordance with NZS 3622.

Framing timber shall be seasoned or kiln dried... and shall have a moisture content of between 12% and 18% before installation.

Timber Treatment

All non-durable timber framing shall be appropriately treated against moisture and/or insect decay by treatment plants with recognised quality assurance systems that are administered by the Timber Preservation Council (NZTPC). Treatment of timber and wood-based building products shall be to the requirements of NZS 3602 as an absolute minimum...

2.2 The site notice and application to amend the consent

2.2.1 Construction of the house proceeded and on 16 August 2018 the authority's inspector arrived to carry out a framing inspection. Once onsite the inspector found the manufacturer's glulam had been used for framing and trusses instead of the solid timber as approved in the building consent. It is understood this represents the first time the manufacturer's glulam has been used as framing in a building in New Zealand.

2.2.2 This glulam was marked GL8 (a structural grade for glulam) and treated to H1.2. As established by the expert (refer paragraph 1.7) during his site visit and in communications with the manufacturer, the glulam was produced from 10 mm x 45 mm timber sticks which had been cut, dried, gauged, and graded. The timber sticks were then finger-jointed, assembled as laminae, glued, and treated with preservative (boron for treatment to H1.2). The finished product was then machine tested for stiffness and strength.

2.2.3 Following its inspection on 16 August 2018 the authority issued the builder with a site notice¹⁴ that said:

- the framing and trusses did not comply with the consented plans
- installation of bracing was incomplete
- full amended plans were to be approved by the authority before any continuation of work
- all work was to stop until the authority granted approval to continue.

2.2.4 On 21 August 2018 the building firm (on the owner's behalf) applied to the authority for a minor variation to the building consent. The application form described the proposed changes as: "A note on Sheet 101 now says that 'all framing to be [the manufacturer's glulam] H1.2 unless otherwise stated'".

2.2.5 The application form was accompanied by:

- the amended drawing (Sheet 101- Floor framing plan)
- the manufacturer's Warranty document (v1.1 August 2018) and Handling, Storage and Installation Requirements document (v1.0 August 2018)

¹³ Documents approved for building consent, Specification, section 5.4.3 Timber framing

¹⁴ "Memo/Site instruction/Notice" number 12783 dated 16 August 2018

- a proprietary product technical statement¹⁵ (“the PTS”) developed by the agent’s company for the manufacturer’s glulam (v2.2 dated 7 August 2018)
- an extract from AS 1720.1¹⁶ showing characteristic design values for glulam grades.

2.2.6 The authority replied on 23 August 2018 with a request for further information (RFI) and asked for an application for a formal amendment to the building consent, saying the alterations proposed could not be deemed minor but rather were a major variation. The manufacturer emailed the next day “in part response” to the authority’s requests. The RFI and response are summarised below:

The authority asked for: (RFI 23 August 2018)	The manufacturer replied: (part response to RFI on 24 August 2018)
An updated Certificate of Design Work to cover the structural alterations to the project, a revised truss layout, and updated architectural drawings to show the use of the correct truss fabrication system.	–
Clarification whether the manufacturer’s glulam was suitable for vertical framing, as the [PTS] described its use for roof trusses and internal non-loadbearing walls.	The glulam was suitable for framing (this would be clarified in the [PTS]).
A site-specific [producer statement - design “PS1”] from a chartered professional engineer (CPEng) showing all pre-cut and pre-nailed wall frames complied with Building Code Clause B1 Structure and Clause B2 Durability.	Compliance with Clause B1 was via Acceptable Solution B1/AS1. Compliance with Clause B2 was via B2/VM1 as the glulam was outside the scope of B2/AS1. A site-specific PS1 should not be required as compliance was established via B1/AS1.
Clarification about durability with respect to moisture content, as the manufacturer’s Handling, Storage and Installation Requirements document stated that moisture content (“mc”) should not exceed 18%.	The glulam was supplied to site at no more than 18% mc, internal lining should not be installed until a maximum mc of 18% was recorded, and the installation sheet would be amended to reflect this.
Suitable testing to show the glulam was treated to the requirements of H1.2.	Treatment was established through the certifying body. The manufacturer named the organisation responsible – a state-owned enterprise which is an auditing, inspection and certification body (“the certifying body”).

2.2.7 On 30 August 2018 the applicant applied (on the owners’ behalf) for an amendment to the building consent. The application form described the building work as: “Change truss + wall framing to [the manufacturer’s glulam]. Delete aluminium wall cladding and change to brick cladding.” Compliance pathways for Clauses B1 Structure, B2 Durability and E2 External moisture were noted as B1/AS1, B2/AS1¹⁷ and E2/AS1¹⁸ respectively.

2.2.8 The application was accompanied by updated plans and specifications, technical documents regarding the manufacturer’s glulam, and the applicant’s certificate of design work. This certificate described the restricted building work relating to the use of the manufacturer’s glulam as per NZS 3604 clause 2.3.9.5 for the wall

¹⁵ A product technical statement summarises key details about a building product or system and is intended to help demonstrate compliance with the Building Code. The concept of product technical statements was developed by the Ministry.

¹⁶ AS 1720.1:2010 Timber structures Design methods

¹⁷ Acceptable Solution for Clause B2 Durability

¹⁸ Acceptable Solution for Clause E2 External moisture

framing, and with “design of trusses and producer statement by others” for the roof trusses.

2.2.9 On 11 September 2018 the authority issued another RFI, asking for:

- truss layout and PS1
- more information regarding the structural capacity using the manufacturer’s glulam; in particular, a site-specific PS1 showing all pre-cut and pre-nailed wall frames complied with Clause B1 (saying NZS 3604 had an expectation that supporting information would include such a statement)
- an explanation of how the manufacturer could change the PTS “to suit queries raised and alter the proposed limitations of use of the product without further verification by the testing authority”
- an explanation of delaminated glulam it said had been observed onsite, and suitable solutions to show how the product would meet the requirements of Clauses B1 and B2
- documentation from the certifying body stating the certification method used for the glulam treatment and clearly stating compliance had been achieved with the requirements of Clause B2.

2.2.10 The agent responded to the RFI by email 14 September 2018, providing more details of certification and compliance pathways for the glulam and about the PTS use and development. Further documents supplied to the authority included:

- an updated PTS (v3.0)
- the manufacturer’s Handling, Storage and Installation Requirements document v1.0, Care and Maintenance document v1.1, and Warranty document v1.1
- a treatment certificate of analysis (test report) by the certifying body dated 21 June 2017 for the manufacturer’s glulam
- certificates issued by the certifying body for the manufacturer’s glulam as follows:

Certificate (issued 15 June 2018)	Scope of certification includes:
Verification of Timber Properties Programme	NZS 3622 ¹⁹ , AS 1720.1 (and other grading-related standards)
Timber Treatment Programme	NZS 3640, AS/NZS 1604.5
Engineered Wood Products Programme	AS/NZS 1328 Parts 1 and 2

2.2.11 Regarding compliance with Clause B1 the agent said:

- where the end use was within the scope of NZS 3604, then glulam members fell within the scope of that standard
- where the end use was outside the scope of NZS 3604, compliance of the glulam members was covered by NZS 3603²⁰ which linked to AS 1720.1.

2.2.12 Regarding compliance with Clause B2 the agent said this was via B2/VM1²¹, because:

¹⁹ NZS 3622:2004 Verification of timber properties

²⁰ NZS 3603:1993 Timber Structures Standard

²¹ The Verification Method for Clause B2 Durability, B2/VM1

- “the establishment of [AS/NZS 1604.5], like NZS 3640, had been subject to in-service evaluation”
- the compliance with AS/NZS 1604.5 was subject to laboratory testing to ensure that the correct penetration and retention requirements were met, and
- engineered wood products were similar to solid timber.

2.2.13 The agent also said the generic caveats to the truss fabricator’s PS1 were satisfied by the manufacturer’s glulam as:

- all proprietary products met their performance specifications and in the case of the manufacturer’s glulam this was covered by the certifying body
- “timber graded to the requirements of NZS 3603:1993” was also covered by this certification
- regarding the minimum timber treatment: B2/AS1 Table 1A (1D) applied, H1.2 treatment was required, and this requirement had been met and established through the certifying body
- the correct selection and placement of gang-nail connectors would be covered in the fabricator’s design statement.

2.2.14 The agent said compliance with Clauses B1 and B2 had been established through the PS1 and fabricator’s design statement in respect of the engineering software and through the certification by the certifying body. The agent also said the PTS would be clarified regarding moisture content and the glulam’s use for structural framing.

2.3 The authority’s refusal to grant the amendment

2.3.1 On 19 September 2018 the authority issued a refusal to grant the amendment to the building consent. It instructed the builder to either remove the non-compliant building work or apply for a determination within 20 working days – otherwise it would issue a notice to fix.

2.3.2 The authority said its refusal was based on a lack of suitable information about the manufacturer’s glulam, either in the amendment application or responses to its two RFIs, for it to be satisfied on reasonable grounds that the proposed building work would comply with the Building Code.

2.3.3 In its 19 September 2018 letter the authority said:

- it did not accept the certifying body’s “Verification of Timber Properties Programme” certificate – it listed various concerns with this certificate including what it said were references to irrelevant or outdated standards
- it did not accept the certifying body’s “Timber Treatment Programme” certificate – it also listed concerns with this certificate and said there was a lack of certainty regarding the compliance pathway and treatment process
- it could not accept the PTS because of concerns about its accuracy and its amendment process
- it could not accept the manufacturer’s Handling, Storage and Installation Requirements document because:
 - its statement of the glulam’s intended use in horizontal structural members in light timber frame construction was at odds with the latest version of the PTS, which said it would be used where SG8, SG10 and

SG12 were referenced in NZS 3604 section 8, and noting that this also included vertical members such as studs

- the advice not to install where mc >18% had not been addressed and was impractical on New Zealand building sites.

2.3.4 On 21 September 2018 the agent contacted the authority about this refusal, noting that the consented plans included a glulam product supplied by another manufacturer and described as “glulam timber posts treated to H5”, and said that this manufacturer was also part of the certifying body’s Engineered Wood Products programme.

2.3.5 The agent sent the authority further copies of certificates for the manufacturer’s glulam product and test results relating to the penetration and retention of treatment to H1.2, and an Engineered Wood Products Programme certificate issued by the same certifying body for the other manufacturer’s glulam product.

2.3.6 Later on 21 September 2018 the agent emailed the authority regarding the refusal, saying that when the decision was made to use the manufacturer’s glulam it was not considered necessary to apply for an amendment to the consent because (in summary):

- glulam timber was within scope of NZS 3604 and, as the manufacturer was certified by the certifying body as part of its Engineered Wood Products Programme with respect to the glulam timber standard AS/NZS 1328.1, this product met the NZS 3604 requirements
- as NZS 3604 was an Acceptable Solution for Clause B1 (via B1/AS1) and compliance with this standard must be accepted as compliance with Clause B1
- the manufacturer was certified by the certifying body as part of its Timber Treatment Programme to the standards NZS 3640 and AS/NZS 1604.5
- glulam was outside the scope of NZS 3640, but within scope of AS/NZS 1604.5. H1.2 was defined in NZS 3640 and the penetration and retention requirements were articulated in AS/NZS 1604.5. The agent attached a test result that demonstrated these requirements had been met.

2.3.7 The agent said the authority had clearly accepted the certification by the same certifying body with respect to AS/NZS 1328.1 for the other glulam products used in the owners’ house.

2.4 The notice to fix

2.4.1 On 21 September 2018 the authority issued notice to fix NF/0003/18 to the builder. This notice stated the contravention of the Act as a breach of section 40²² for using a framing timber other than that detailed in the building consent.

2.4.2 The required remedy was to remove the non-compliant framing timber or to apply for a determination from the Ministry by 19 October 2018. The notice also required all building work to cease until the authority was satisfied that the work was in compliance with the Act and its associated regulations.

²² Section 40 Buildings not to be constructed, altered, demolished, or removed without consent

2.4.3 On 3 October 2018 the authority wrote to the builder saying it had considered further correspondence received from the agent, but it still considered the manufacturer’s glulam did not comply with Clauses B1 and B2 “to the reasonable satisfaction of [the authority]”. The authority said:

It is for your company to provide sufficient assurance to allow [the authority] to be satisfied on reasonable grounds that the provisions of the Building Code will be met if the building work is completed using [the manufacturer’s glulam].

2.4.4 The agent emailed the authority on 4 October 2018 to ask if a site-specific PS1 issued by a chartered professional engineer would provide sufficient assurance. The authority replied the following day that this would not address its concerns as a PS1 was a statement in regard to design and could not be accepted as a means of demonstrating product compliance.

2.4.5 In response to a phone call from the agent, the authority wrote to the agent on 9 October 2018 saying it considered the applicant had three options: remove the non-compliant framing timber, apply for a determination (in which case the framing could remain in place until the determination decision) or provide a CodeMark certificate²³.

2.4.6 The Ministry received an application for a determination on 16 October 2018. The application fee was paid on 30 October 2018.

3. The submissions and the first draft determination

3.1 Initial submissions

The applicant

3.1.1 The agent for the applicant provided a description of events and supporting material with the application for determination, including copies of the:

- building consent application, associated checklist and Licensed Building Practitioner notification form; certificate of design work (completed by the designer); the building consent; consented plans and specifications; and the certificate of title
- application for a minor variation dated 21 August 2018; a drawing from the truss fabricators and a designer/fabricator statement (“the second PS1”) for the roof trusses manufactured for the owners’ house and dated 17 August 2018; and an amended floor framing plan specifying the manufacturer’s glulam
- the authority’s site notice and notice to fix; related correspondence including the authority’s RFIs, the manufacturer’s response, and the authority’s refusal to grant the amendment
- PTSs for the manufacturer’s glulam v2.2 and v3.0; the manufacturer’s Warranty document (v1.1 August 2018), Handling, Storage and installation Requirements document v1.0 August 2018, and Care and Maintenance document v1.1 August 2018
- certifying body’s certificates for the manufacturer’s glulam: Engineered Wood Products Programme, Timber Treatment Programme and Verification of

²³ CodeMark is a voluntary product certification scheme that meets the requirements of the Act. Building consent authorities must accept a CodeMark certificate as evidence of compliance with the Building Code as long as the product is used in accordance with the use and limitations defined on the certificate.

Timber Properties Programme (all with issue date 15 June 2018), and a Certificate of Analysis (final test report) dated 21 June 2017

- certifying body's Engineered Wood Products Programme certificate for the other manufacturer dated 3 July 2017
- correspondence between the agent and the authority 14 September to 9 October 2018.

3.1.2 The agent highlighted the authority's refusal to approve the use of the manufacturer's glulam notwithstanding that the consented plans included another manufacturer's glulam product, which was certified by the same certifying body.

The authority

3.1.3 The authority sent copies of the following on 19 October 2018, with some annotations as noted:

- the owners' application for an amendment to building consent No. BC/0130/18 dated 30 August 2018, stamped "received 5 Sep 2018" and annotated "Major amendment", and the designer's certificate of design work dated 30 August 2018 and annotated "This memorandum relates solely to the major amendment"
- highlighted extracts from NZS 3604 relating to engineered wood products (an annotation above clause 2.3.9.6 says "Not a proprietary grade – it is a substitution for SG8 grade timber")
- the certifying body's certificates for the manufacturer's glulam issued 15 June 2018 for the Engineered Wood Products Programme, Verification of Timber Properties Programme and Timber Treatment Programme
- correspondence from the building firm dated 6 September 2018 with a link to the PTS for the manufacturer's glulam (v3.0)
- plans for the owners' home dated 28 March 2018 (foundation plans and details) and 31 August 2018 (floor plans, elevations, sections, brick slip detail and a floor framing plan noting the proposed amendment to use the manufacturer's glulam)
- product information and specifications for a fibre-cement sheet, cementitious mortar and a cement-based powder adhesive.

3.2 The first draft determination and submissions in response

3.2.1 The first draft determination ("the first draft") was issued to the parties for comment on 12 December 2018. The first draft found that:

- the change from solid timber to the manufacturer's glulam was not a minor variation to the building consent
- the authority's decisions to refuse the building consent amendment and to issue the notice to fix were confirmed.

3.2.2 The first draft did not determine the code-compliance of the manufacturer's glulam (this matter was added later – refer paragraph 3.2.4). However, it:

- discussed the possible compliance pathways for the manufacturer's glulam (B1/AS1, B2/AS1, B2/VM1)

- considered reliance was able to be placed on the statements issued by the certifying body
 - concluded the manufacturer's glulam was compliant but that an updated PS1 was required for the glulam trusses, and verification of the performance of limited area of glulam subject to delamination was needed.
- 3.2.3 On 13 December 2018 the agent did not accept the conclusions reached in the first draft and requested a hearing. The applicant made a submission saying (in summary) that:
- The minor variation regulations were referred to as well as the Ministry's guidance²⁴ and that the applicant had evaluated the manufacturer's glulam using both in terms of compliance, a known product and comparable product, the compliance assessment, industry practice, and likelihood of failure. Glulam was a "known product".
 - The stance taken in the draft suggested that any substitution from solid lumber to engineered wood would trigger a consent amendment. This would have an adverse impact on the current regulatory management of all engineered wood products.
- 3.2.4 On 18 December 2018 the agent requested that the matter for determination be amended to include a decision under 177(1)(a) that the manufacturer's glulam complied with the Building Code. This was accepted by the Ministry on 19 December 2018, and was added to the matters to be determined, but only in respect of the compliance of the manufacturer's glulam as installed in the owners' house (refer paragraph 1.6).
- 3.2.5 The authority accepted the first draft without comment on 17 December 2018.
- 3.2.6 On 17 December 2018 the owners advised that the first draft was not accepted and also requested a hearing. Also on 17 December 2018, the builder advised that the first draft was not accepted and "retain[ed] the right" to a hearing.
- 3.2.7 On 21 December 2018 the manufacturer responded saying (in summary) that:
- The manufacturer was aware of its obligations under the Fair Trading Act. It was also very aware of a complaint between a solid timber supplier and a laminated veneer lumber ("LVL") manufacturer and the compliance route taken by the latter who had relied on a Codemark certificate.
 - The manufacturer also wanted the determination to articulate the compliance pathways correctly saying:

...the expert's report ... concluded that compliance for our glulam with [Clause] B1 was via B1/AS1 and [Clause] B2 via either B2/AS1 or B2/VM1. However, this view is not clearly reflected in the [first draft] Determination. We would therefore ask [that] the Determination makes it explicit what the compliance pathways are.

²⁴ Minor variations to building consents: Guidance on definition, assessment and granting (1st edition, 1 January 2010)

4. The hearing and the second draft determination

4.1 A hearing was held in Hamilton on 29 January 2019 which was attended by the following:

- the agent for the applicant
- two representatives for the manufacturer and the manufacturer's technical expert²⁵
- the owners and their legal adviser
- an officer of the authority
- myself accompanied by two officers of the Ministry and a legal adviser.

4.2 All attendees spoke at the hearing and were of assistance to me in preparing the second draft determination. The expert joined the hearing by phone in the latter stages to answer specific questions from the parties regarding his findings. The submissions made at the hearing are summarised in Appendix D. The hearing did not include a visit to the site.

4.3 Submissions following the hearing

4.3.1 On 30 January 2019 the manufacturer provided an email confirming aspects of the glulam's manufacture and the finished product, and also confirming aspects of the second PS1.

4.3.2 On 31 January 2019 the Ministry sought advice from the agent regarding the second PS1 for the roof trusses provided with the application for a building consent amendment, as this PS1 appeared to make no reference to these trusses being designed for, and made of, glulam timber as was stated at the hearing.

4.3.3 The agent responded on the same day providing advice on the FTMA²⁶ Code of Practice and excerpts from the same document in relation to a fabricator design statement, truss layout plans, and the information to be provided in a PS1. The latter made no reference to the timber used and the agent advised "according to the [truss manufacturer's] engineer none of their PS1[s] ever identifies the type of wood (solid or engineered) because of the potential for use of more than one type", adding that an authority "would never know what type of wood was required by the software (solid, LVL or [glulam])".

4.3.4 The agent attached a letter from the truss manufacturer, dated 31 January 2019, that said:

[The truss manufacturer] certifies that the following materials were used in the Manufacture of the Prenailed Frames and Trusses supplied to [28 Mike Smith Drive].

Trusses Grade GL8 – Treatment - H1.2

[The truss manufacturer] certifies the Trusses were manufactured in accordance with the Fabricator Design Statement attached.

4.3.5 In an email dated 1 February 2019 the agent provided excerpts from NZS 3604 (clauses 2.3.9.1 to 2.3.9.5) saying that the manufacturer's glulam met these requirements and the substitution was therefore a minor variation.

²⁵ The manufacturer's technical expert is employed by the same company as the agent.

²⁶ Frame and Truss Manufacturers' Association of New Zealand, refer <http://www.ftma.co.nz>

- 4.3.6 On 11 February 2019 in response to a request from the Ministry the agent provided photographs of the onsite framing that had shown signs of delamination (refer paragraph 2.2.9). Any fault with the timber was not readily discernible from the photographs.
- 4.3.7 On 13 February 2019 the Ministry requested advice about which standard the manufacturer's glulam used at the owners' house had been treated to, as the certifying body's Timber Treatment Programme certificate says the manufacturer has a production system that meets either standard (NZS 3640 and AS/NZS 1604.5).
- 4.3.8 In an email of the same date, the agent advised that the manufacturer's glulam was treated to AS/NZS 1604.5 and clause 1.9 of that standard "creates a link to NZS 3640 in terms of retention and penetration".
- 4.3.9 In an email dated 14 February 2019 the agent said her "assumption as to why both standards were included is that it enabled [the certifying body] to clearly articulate that whilst the [manufacturer's glulam] had been treated to AS/NZS 1604.5 it did in fact also meet the requirements of NZS 3640 to the extent required by AS/NZS 1604.5". The agent asked representatives of the certifying body to confirm this, saying it was "important that the compliance pathway is articulated correctly", and offered an opinion that "from the perspective of [section 19 of the Act] there is no statutory difference in terms of reliance between an [Acceptable Solution] and a [Verification Method]."
- 4.3.10 A representative of the certifying body responded on 14 February 2019 saying:
- [The manufacturer is] in effect certified to both standards AS/NZS 1604.5 and NZS 3640. As with all products in New Zealand that come under the AS/NZS 1604 series compliance with penetration is detailed within that standard whilst compliance with retention requirements refers back to NZS 3640.
- Therefore [the certifying body] in this case have certified [the manufacturer's glulam] to NZS 3640 to the extent that is required by Clause 1.9 of [AS/NZS 1604.5], i.e. the retention requirements for H1.2 Boron.
- Without compliance to this section of NZS 3640 [the certifying body] could not certify this product.
- 4.3.11 On 15 February 2019 the Ministry asked the certifying body why the original statement in the Timber Treatment Programme certificate that the production system meets NZS 3640:2003 has been made without the qualification stated in its email dated 14 February 2019. The Ministry's email noted that the treatment requirements described in NZS 3640 include preservative type, penetration and retention.
- 4.3.12 The certifying body responded on 22 February 2019 advising that the Standard Operating Procedures for Timber Treatment Plants and Treatment Auditors "covers the actual system requirements required to meet both NZS 3640 and AS/NZS 1604.5" and that the manufacturer was the only site it audited that solely treated glue-laminated timber. To remove any ambiguity about the scope of Timber Treatment Programme certification, the certifying body provided an undated reissued certificate, in draft, that cited:
- AS/ NZS 1604.5:2012 – Specifications for preservative timber – Glue Laminated Timber Products. (including para 1.9 reference to NZS 3640:2003 – Chemical Preservation for Round and Sawn Timber)
- 4.3.13 The certifying body advised it was mid-way through a full review of all certificates issued and said one alteration to the planned updates would be the addition of the product type, and the hazard class and preservative used for each product.

4.3.14 I have taken account of the parties' submissions and amended the determination as appropriate. I also note that the expert report was also amended following the hearing, as noted in paragraph 5.1.7 below.

4.4 The second draft determination and submissions in response

4.4.1 The second draft determination ("the second draft") was issued on 21 February 2019. The second draft found that:

- the manufacturer's glulam complied with Clause B2 and, complied with Clause B1 with the possible exception of the limited delamination to the bottom plate
- the authority was correct to refuse the substitution of timber for glulam as a minor variation at the time this was sought, but that a different decision could be arrived at in future
- the authority's decisions to refuse the building consent amendment and issue the notice to fix were confirmed.

The parties responded to the second draft determination as follows.

The authority

4.4.2 In a submission dated 26 February 2019 the authority said that it accepted the second draft subject to clarification of the options available to it with respect to the possible remedies on the notice to fix and "on the options available to the parties for discussion regarding the continuing need for the notice to fix and the possible options available to regularise the work already completed".

The designer and builder

4.4.3 In a joint submission received on 5 March 2019 the designer and builder said they did not accept the second draft. In summary, the designer and builder said:

- They had acted in good faith and applied the same minor variation process the authority used elsewhere for the substitution of solid timber framing with LVL.
- The manufacturer was new and the authority's reticence was understood, but the use of glulam was not new. The manufacturer's glulam was certified to "an extent greater than many solid timber suppliers".
- The second draft suggested that the use of glulam for framing and trusses was "innovative", yet clause 2.3.9.6 of NZS 3604 referred to the use of engineered wood products as "framing members".

The owners

4.4.4 The owners provided a detailed submission dated 5 March 2019 that included three photographs of the current building work. The owners did not accept the second draft, and said in their submission (in summary):

- The authority had informed the owners that a minor variation would not be possible "unless clarified by [the Ministry as] an appropriate option" and was necessary because of decisions made in the second draft. "Given you strongly indicated the courses of action to [the authority] in the [second] draft we are concerned you will not confirm that [the authority] is able to issue a minor variation."

- The basis of assessment with respect to the minor variation was disputed, with the owners noting that:
 - engineered timber was regularly treated as a minor variation and the relevance of the manufacturing process was questioned
 - the repair of the bottom plate at their house had been completed and the authority had no concerns about this
 - they questioned the need for the authority to seek more information, given the material provided before the amendment was refused
 - the second PS1 was issued “earlier” but went astray and was reprinted. The second PS1 was issued in accordance with FTMA practice.
- “In terms of compliance pathway [the second draft does] not arrive at a decision of the compliance pathways in respect of [Clauses] B1 and B2 even though your own expert concluded B1 was via B1/AS1 and B2 was via B2/VM1 or B2/AS1.”
- It was evident the second draft had not been reviewed internally before its distribution and the owners submitted that the draft decision be urgently reviewed. The draft did not take account of the ongoing delay, and the owners described the consequences of this in detail.

The manufacturer

4.4.5 The manufacturer provided a submission dated 7 March 2019 which said (in summary):

- The determination should be amended to:
 - use the term “comply” instead of “satisfy” with respect to meeting the Building Code as this reflected the statutory framework – “satisfy” was not used in the Act
 - state the compliance pathway for Clause B1 (being “established through B1/AS1”) and Clause B2 (being “established by B2/AS1 or B2/VM1”) as this was consistent with the regulations²⁷ that required an application for building consent to say how compliance was to be achieved
 - reverse the authority’s decision to decline the minor variation.
- The use of the manufacturer’s glulam should have been treated as a minor variation as the use of the material was fully consistent with the Ministry’s guidance on minor variations.

4.4.6 I have taken account of the parties’ submissions and amended the determination as appropriate.

4.5 The third draft determination and submissions in response

4.5.1 The third draft determination (“the third draft”) was issued on 27 March 2019.

4.5.1.1 The applicant and the authority accepted the third draft without comment on 27 March 2019. The builder (via the agent) accepted the third draft without comment on 28 March 2019.

²⁷ Building (Forms) Regulations 2004, Form 2

- 4.5.1.2 The owner also accepted the third draft on 28 March 2019. The owner questioned why the expert's report was not 'appended' to the third draft as had been done for the second draft. In response I note the expert's further revised report (referenced in paragraph 5.1.7) was issued at the same time as the second draft but was not appended to that draft.
- 4.5.1.3 The manufacturer accepted the third draft on 2 April 2019 noting a correction to the manufacturer's name.

5. The expert's report and responses received from the parties

5.1 General

- 5.1.1 On 6 November 2018 I engaged the expert described in paragraph 1.7 to provide a view on whether the authority had sufficient information to be satisfied on reasonable grounds that the manufacturer's glulam would be code-compliant, both in terms of the accuracy and completeness of the information provided and in terms of its reliance on the stated quality assurance processes.
- 5.1.2 I also asked the expert to establish the manufacturing process used, to consider the various compliance pathways for this product and whether it complied with Clauses B1 and B2, and to review the delamination reported onsite.
- 5.1.3 The expert made a site visit on 16 November 2018 and met the owners. At that stage the building was framed, roofing installed and wall underlay fixed. The expert was able to observe that the manufacturer's glulam had been used for all general framing and roof trusses.
- 5.1.4 The expert also discussed the glulam's manufacture and quality assurance processes with the manufacturer and with one of the owners who is an investor in, and familiar with, the manufacturing process.
- 5.1.5 The expert supplied a final report on 3 December 2018 and I provided this to the parties on the same day.
- 5.1.6 A revised expert report was issued to the parties on 25 January 2019 that made minor corrections to the manner in which NZS 3602 and NZS 3640 were affected by the modifications to those standards made in B2/AS1.
- 5.1.7 A further revised expert report dated 12 February 2019 was issued to the parties at the same time as the second draft determination, on 21 February 2019. This revision addressed matters raised at the hearing and clarified the expert's conclusions regarding the appropriate compliance pathway. It also added a diagram showing the compliance pathways for glulam.

5.2 Conclusions

- 5.2.1 In the expert's view:
- the certification by the certifying body of the manufacturer's glulam provides evidence of satisfying the requirements for Clause B1 for buildings designed in accordance with NZS 3604, which is an Acceptable Solution for this clause (via B1/AS1)
 - the certification by the certifying body of timber treatment H1.2 to AS/NZS 1604.5 provides evidence of satisfying the requirements for Clause B2

- the information provided to the authority when applying for the consent amendment was not clear and, given the complexity of the compliance pathways for Clause B2, would not on its own provide reasonable grounds for reaching a decision about code compliance.

5.2.2 In particular, the expert said NZS 3604 provided a compliance pathway via the Acceptable Solution B1/AS1 for the use of glulam framing in buildings designed to that standard (such as the owners' house) for glulam complying with AS/NZS 1328 (parts 1 and 2) and NZS 3622.

5.2.3 The expert said the preservative treatment requirements for glulam were not easily deduced from the Acceptable Solution, Verification Method and referenced standards. The expert said the compliance pathway for the manufacturer's glulam with Clause B2 was complex but could be argued as follows:

- an Acceptable Solution via B2/AS1 which references NZS 3604, and the provisions of NZS 3604 clause 2.3.9.4 which references NZS 3602
- Verification Method B2/VM1 by presenting arguments comparing AS/NZS 1604.5 and NZS 3640.

5.2.4 The expert described the manufacturing process for the manufacturer's glulam, noted that the final product was machine tested for stiffness and strength, and described its markings including treatment and structural grade plus a bar code for reference back to manufacturing information. In the expert's view, appropriate quality assurance systems were in place including appropriate certifying body verification.

[The manufacturer] has been certified by [the certifying body] for the standards applicable for the manufacture and preservative treatment of glulam. This certification includes surveillance of factory quality testing as required by those standards.

5.3 Information requests and quality assurance

5.3.1 Regarding the authority's various requests for information, the expert said:

Revised PS1 for truss design

- In the expert's view it was reasonable to expect this PS1 to reflect the specific design for the owners' house and the materials and components incorporated into that design. NZS 3604 is explicit that trusses were specific engineering design to be supported by a PS1 from a Chartered Professional Engineer. The substitution of the manufacturer's glulam for solid timber was material as this could affect the capacity of nail plate connectors.

Clarity and evidence of Clause B1 compliance

- The expert said NZS 3604 provided for the use of glulam, subject to compliance with certain standards. The information originally provided to the authority (and later amended) was conflicting and it had been reasonable to ask for clarification.

Clarity and evidence of Clause B2 compliance

- The expert said it had been unclear whether there was a compliance pathway via an Acceptable Solution, and the documentation provided to the authority did not show clear arguments explaining the pathway via the Verification Method.

The amendment of the PTS

- The expert said the authority's criticism that this had been changed in haste seemed unreasonable given this was done in response to the authority's request for clarification.

5.3.2 The expert commented that the manufacturer's technical information and instructions for the product's use were critical components of its responsibilities under section 14G²⁸ and were critical to the authority's decision making. The expert also suggested some changes to improve the clarity of the PTS.

In my view the building consent authority can usually, and should, regard the [PTS] as providing reasonable grounds on which to make a decision about Building Code compliance – with all the usual caveats about the product being used as specified etc.

5.3.3 Regarding whether the authority could rely on the quality assurance processes and procedures for the manufacturer's glulam, the expert said:

- the manufacturer's glulam carried certification by the certifying body covering its manufacture and preservative treatment
- the certifying body provided assurance that the manufacturer's glulam was manufactured in accordance with the scope of certification, and the authority could rely on that certification
- the certifying body was audited by JAS-ANZ²⁹.

5.4 Compliance with Clause B1

5.4.1 Regarding compliance with Clause B1, the expert sought to establish whether glulam could be used within the scope of NZS 3604, as the owners' house was designed in accordance with this standard.

5.4.2 NZS 3604 provides for the use of engineered wood products including glulam, so this product could be used in place of solid timber if it met the structural caveats in this standard (being clauses 2.3.9.3 and 2.3.9.5 therein). These caveats required the glulam to be manufactured in accordance with AS/NZS 1328 (parts 1 and 2), to have verified strength and stiffness properties, and to be marked accordingly. The framing dimensions were also required to be the same as originally specified for the building consent.

5.4.3 The expert concluded that the manufacturer's glulam could be a substitute for solid timber as provided for by NZS 3604 and that the certifying body's certification provided evidence satisfying the caveats in that standard.

5.4.4 The expert noted that the PTS supplied with the amendment application referenced certification to AS/NZS 1328 and to NZS 3622, but did not make an explicit connection back to NZS 3604 clauses 2.3.9.3 and 2.3.9.5, which in the expert's view was a necessary requirement.

5.4.5 The expert also said that, with regard to the use of glulam for truss fabrication, NZS 3604 required trusses to be specifically designed in accordance with B1/VM1 and verified by a Chartered Professional Engineer via a PS1. He said that the specific engineering design in this case included appropriate selection of plate connectors.

²⁸ Section 14G Responsibilities of product manufacturer or supplier

²⁹ Joint Accreditation System of Australia and New Zealand

5.5 Compliance with Clause B2

5.5.1 Regarding compliance with Clause B2 the expert said the glulam was specified for internal use and, as a structural element, was required to have a minimum 50-year durability. When glulam is used as a replacement for solid timber as provided for in NZS 3604, the durability requirement is effectively set by NZS 3604, namely:

2.3.9.4 The preservative treatment for engineered wood products shall comply with NZS 3602 provided that where engineered wood products are not already specified the level of treatment shall be the same as that required for kiln-dried radiata pine structural grades to comply with NZS 3602.

5.5.2 The expert described the requirements in NZS 3604 for timber treatment (via NZS 3602 and NZS 3640 in turn) but noted that the Acceptable Solution for Clause B2, B2/AS1, referenced the latter standards with modifications.

5.5.3 The expert said the substantive effect of these modifications was to require all Radiata pine framing within the building envelope to be treated to H1.2 in accordance with NZS 3640. Also, because NZS 3602 does not address treatment for glulam timber for use as framing, NZS 3604 clause 2.3.9.4 then effectively required glulam to be treated to NZS 3640 as though it was kiln-dried Radiata pine.

5.5.4 In commenting on compliance via B2/VM1, the expert said this allowed for a material's durability to be considered by comparison with similar materials for which the durability has been established or proven (paragraph 1.3 of B2/VM1). He said the comment to that paragraph made it clear that arguments had to be advanced about the assessed durability, including consideration of the context of the material's use.

5.5.5 The expert said the certification of the manufacturer's glulam referred to AS/NZS 1604.5 which required glulam to be manufactured in accordance with AS/NZS 1328.1. Clause 1.9 of AS/NZS 1604.5 required glulam timber to be used in New Zealand to have preservative retention (to H1.2) to meet NZS 3640, and preservative penetration to meet AS/NZS 1604.5.

5.5.6 The expert compared the penetration requirements of the two standards as follows:
The penetration in AS/NZS 1604.5 is specified as:

2.2 All timber treated to hazard class H1 shall show evidence of distribution of the preservative in all the sapwood

The penetration in NZS 3640 is specified as:

6.1.1.1 Complete sapwood penetration is required

5.5.7 The expert compared the treatment requirements in AS/NZS 1604.5 and NZS 3640 and concluded that:

- the preservative retention was effectively as specified in NZS 3640, and
- the penetration requirements of the two standards were effectively the same.

5.6 Delamination of the bottom plate

5.6.1 The expert also commented on the minor delamination referred to by the authority and which the expert observed during the site visit. The expert said this was a partial delamination of two short sections of the bottom plate member of wall framing in one area of the building. This had been repaired onsite, and the abutting studs did not appear to be affected and the expert did not observe any other instances.

5.6.2 The expert's inclination was to accept this as an unintended consequence of using a length of product from a pilot plant in its development phase (as the owner had explained) as follows:

I have given some thought to the consequence of that delamination, and note that in its use on the bottom plate the [glulam] beam is effectively working on its minor axis (ie, on its flat), and the member in fact suffers no loss of strength or stiffness as a result of that delamination.

5.6.3 In addition to this, I note that the manufacturer's glulam is assembled using phenol formaldehyde resin, being a Service Class 3 adhesive described in AS 1328 which has a well-established track record of use in wet conditions. It is waterproof and heat-resistant and is used in the manufacture of marine-bonded plywood.

5.7 Response to the expert's report

5.7.1 The agent for the applicant responded to the first version of the expert's report on 3 December 2018, saying (in summary):

- a PS1³⁰ for the roof truss design had been provided and the glulam's scope of use had been clarified before the authority's refusal to grant the amendment
- the compliance pathway for B1 (i.e. B1/AS1) had not changed from the outset and the expert had concluded this was the correct compliance pathway
- the agent disagreed with the expert's conclusion that no clear argument had been provided to explain the claim of B2/VM1 as the compliance pathway for Clause B2, and referred to an 14 September 2018 email to the authority (see paragraph 2.2.10)
- the agent disagreed with the expert's comment that connection back to NZS 3604 had not been made explicit, and referred again to the 14 September 2018 email
- the product technical statement would be updated to reflect the current certification.

5.7.2 Subsequent versions of the experts report were issued as noted in paragraphs 5.1.6 and 5.1.7.

6. Discussion: compliance of the manufacturer's glulam

6.1 The first matter to be considered is the compliance of the manufacturer's glulam as it has been used in the house with respect to Clauses B1 Structure and B2 Durability. In the following paragraphs I consider compliance of the wall framing and roof trusses with Clause B1 Structure, and I discuss the relevant standards and compliance pathway with respect to establishing compliance with Clause B2 Durability.

6.2 Clause B1 Structure

6.2.1 The foundation and framing to the house was designed using NZS 3604 which is a standard referenced in B1/AS1; the solutions described in NZS 3604 are therefore deemed to comply with Clause B1 Structure. The approved building consent provided for the timber framing to be fabricated using SG8 grade solid timber; and

³⁰ The second PS1 provided with the application for the formal amendment (see paragraph 3.1.1) does not include any reference to the roof trusses being made with the manufacturer's glulam.

the roof trusses were to be specifically designed and verified by a PS1 Producer Statement - Design.

6.2.2 Clauses 2.3.9.1 to 2.3.9.6 in NZS 3604 (refer Appendix C) specifically provide for the use of engineered timber, including glue-laminated timber made of *Pinus Radiata*, as a “direct substitute” of SG6, SG8 and SG10 timber with the following requirements:

- glue-laminated timber shall be manufactured to AS/NZS 1328 (parts 1 and 2)
- preservative treatment to meet NZS 3602, or, if not already specified, the same as that described for kiln-dried *Pinus Radiata* in NZS 3602 (timber treatment is discussed in paragraph 6.3)
- glue-laminated timber is the same finished size, and has at least the same strength and stiffness properties as the members being substituted, and is marked in accordance with NZS 3622
- the loading on framing members is within stated limits to allow the use of stronger or smaller member sizes.

The wall framing

6.2.3 In this case SG8 solid timber is being substituted with the manufacturer’s glulam which is GL8 grade glue-laminated timber. The manufacturer’s glulam is manufactured to the standards required by NZS 3604 and is marked accordingly. As advised by the manufacturer, the glulam being used for the framing is a “straight substitution” using the same member sizes and fixings as described in NZS 3604. There has been no amendment made to the wall framing to utilise any benefits that could be gained by using GL8 timber of smaller size.

6.2.4 In respect of compliance with Clause B1, the expert has concluded that the manufacturer’s glulam could be a substitute for solid timber as provided for by NZS 3604 and that the certifying body’s certification provided evidence satisfying the specific requirements of that standard with respect to the use of engineered timber.

6.2.5 The limited delamination of the bottom plates in two locations onsite has been raised. The manufacturer advises this fault appears within the same length of glulam as produced in the factory, noting the marking process provides a unique identifier for each member produced. The limited delamination has been repaired and at the hearing the authority appeared to have few specific concerns about the compliance of this element. I leave this to the parties to resolve to the authority’s satisfaction.

The roof trusses

6.2.6 The use of the as-built roof trusses is supported by the second PS1, dated 17 August 2018, that was provided to the authority with the application to amend the consent on 30 August 2018. (I note the date of this PS1 is after the date the trusses were observed onsite, on 16 August 2018, when the authority carried out its framing inspection.)

6.2.7 As noted in paragraphs 4.3.2 and 4.3.3, the PS1 makes no reference to the trusses being designed and manufactured using GL8 timber. However, this has been confirmed in supplementary advice from the truss designer/fabricator dated 31 January 2019. The advice confirms the use of GL8 timber, which is a recognised timber grading for glue-laminated timber, and it also confirms that the design of the trusses has accounted for the use of glue-laminated timber during fabrication.

6.2.8 The second PS1, along with the supplementary advice, can be used to establish that the roof trusses comply with the requirements of Clause B1. Clause 10.2.2 of NZS 3604 (refer Appendix C) describes the sign-off process for the use of specific-designed timber trusses for use in this building. The key steps from this process are that:

- the engineer has verified the design software used in the truss analysis (refer clause 10.2.2.3(a) of NZS 3604), and
- the engineer has identified the grade of timber used within the trusses (refer clause 10.2.2.3(b)(i) of NZS 3604).

6.2.9 In this case while the first PS1 prescribed SG8 timber, the second PS1 was silent on the timber grade and that GL8 glulam material was to be used. (I note that the requirements from NZS 3604 clause 10.2.2 are reproduced in full within Appendix 5 of the FTMA Code of Practice document, so this Code of Practice does not override or modify these requirements.)

6.2.10 In my view, if this "grade of timber" information had been included in the PS1 it would have provided reasonable grounds for the authority to believe that the glulam trusses would comply with Clause B1.

Clause B1 Structure Conclusion

6.2.11 With the exception of the limited area of delamination referred to in paragraph 6.2.5 I consider there is sufficient evidence to show that the wall framing and roof trusses for this building will comply with Clause B1 Structure.

6.3 Clause B2 Durability

6.3.1 Clause B2.3.1 requires the timber framing in the owners' house to perform for a minimum period of 50 years with only normal maintenance (refer Appendix B1.2 of this determination).

6.3.2 The manufacturer's glulam is supported by statements saying it meets the requirements of AS/NZS 1604.5 and NZS 3640. Recent advice from the certifying body has clarified the extent to which certification to NZS 3640 is provided (refer paragraph 4.3.12).

6.3.3 The agent says, in this case, that the appropriate pathway for demonstrating compliance with Clause B2.3.1 is B2/VM1 because:

- "the establishment" of AS/NZS 1604.5 had been subject to in-service evaluation
- compliance with AS/NZS 1604.5 was subject to laboratory testing to ensure that the correct penetration and retention requirements were met, and
- engineered wood products are similar to solid timber.

6.3.4 I consider below the compliance of the manufacturer's glulam in terms of satisfying B2/VM1.

The paths to compliance

6.3.5 The agent says that the appropriate compliance pathway is B2/VM1, and in accordance with section 19 of the Act the authority must accept the manufacturer's glulam as compliant with the Building Code on this basis.

- 6.3.6 As noted by the expert in his report and at the hearing, the Verification Method for Clause B2 requires a comparison of treatment methods in AS/NZS 1604.5 and NZS 3640 as outlined in clause 1.3 of B2/VM1 (refer Appendix B1.3). While the comparison in this instance only applies to the preservative penetration, the compliance pathway with respect to the preservative retention should also have been discussed. It is incumbent on the person seeking a building consent, or a consent amendment to provide this information to an authority if B2/VM1 is to be applied.
- 6.3.7 Some Verification Methods require no such assessment (or judgement) as they provide a well-defined methodology, a referenced design standard or similar; and where the application of (for example) a specified test method requires no additional judgement by a building consent authority. Other Verification Methods such as C/VM2³¹ rely on professional judgement and/or third-party input before a solution developed in accordance with that Verification Method can be considered code-compliant.
- 6.3.8 I note that in the manufacturer's response to the second draft determination (refer paragraph 4.4.5) it was submitted that the compliance pathway for Clause B2 was "established by B2/AS1 or B2/VM1". I also note that the application form for the formal amendment states that the means of compliance for Clause B2 Durability is "B2/AS1". The lack of clarity about the compliance pathway in the documentation supplied to the authority, and in the submissions made to this determination is unhelpful and leads to confusion about what Acceptable Solution, Verification Method and referenced standards are being relied on as a means to establish compliance.

The relevant standards³²

- 6.3.9 As described in NZS 3602, the minimum hazard class for timber framing in this building "not exposed to weather or ground atmosphere and in dry conditions"³³ to achieve a minimum 50-year life is H1.2.
- 6.3.10 The specific treatment requirements to achieve an H1.2 hazard class (being preservative type, retention and penetration) are described in NZS 3640. Both NZS 3602 and NZS 3640 are reference documents for Clause B2 via B2/AS1.
- 6.3.11 AS/NZS 1604.5 specifies preservative treatments for glue-laminated timber products. AS/NZS 1604.5 is not a primary reference document for Clause B2. However, this standard is a secondary reference in NZS 3602 which expressly provides for laminated beams and posts treated to a higher hazard class (being H3) to use either AS/NZS 1604.5 or NZS 3640 as the treatment standard (refer Appendix C2).
- 6.3.12 AS/NZS 1604.5 includes specific requirements from NZS 3640 for glue-laminated timber that is to be used in New Zealand situations. Clause 1.9 of AS/NZS 1604.5 says:

When used in New Zealand in situations where treatment to hazard class H1.2, H3.1 or H3.2 is required as specified in [the Building Code or] in NZS 3602, glued laminated timber products shall be treated to the preservative retention requirements for hazard class H1.2, H3.1 or H3.2 as set out in NZS 3640.

Preservative penetration shall be in accordance with [AS/NZS 1604.5]

³¹ The Verification Method for the Building Code clauses relating to Fire Safety (C1-C6)

³² It is noted that the standards referred to in the relevant Acceptable Solutions and Verifications Methods are current, and that the modification made to the standards by the Acceptable Solutions and Verifications Methods have no material effect on this discussion.

³³ Refer modified entries to Table 1A of NZS 3602 made by paragraph 3.2.2 of B2/AS1

Characteristic values, as defined in NZS 3640, shall apply to both penetration and retention.

- 6.3.13 AS/NZS 1604.5 can therefore be used to provide a means of compliance with Clause B2.3.1, if it can be shown that treatment to AS/NZS 1604.5 is comparable with NZS 3640 to meet the H1.2 hazard class described in that standard.
- 6.3.14 Clause 1.9 of AS/NZS 1604.5 requires preservative retention to glue-laminated timber of H1.2, and other hazard classes, to meet the requirements of NZS 3640; “Retention” is defined in clause 1.4.13 of AS/NZS 1604.5 as the “quantity of preservative in the penetration zone for a particular hazard class” – which in this case, and according to clause 1.9, is H1.2. (It is noted that the comparable hazard classes described in AS/NZS 1604.5 are H1 and H2³⁴ so are identified distinctly from the hazard classes described in NZS 3640, e.g. H1.2.)
- 6.3.15 From this it can be concluded that glue-laminated timber that has been manufactured for use in New Zealand to meet the requirements for preservative retention of AS/NZS 1604.5 must also satisfy NZS 3640 in this respect.
- 6.3.16 With respect to preservative penetration; the expert has noted that the requirements of AS/NZS 1604.5 and NZS 3640 are effectively the same in that they require respectively “preservative in all the sapwood” versus “complete sapwood penetration” (refer paragraph 5.5.6). Both standards hence require full penetration of any sapwood.
- 6.3.17 Table 1 in NZS 3602 says that laminated beams and posts treated to H3 can be treated using either AS/NZS 1604.5 or NZS 3640. While the penetration and retention requirements for H1.2 and H3 hazard classes will be different, it is clear that there is an equivalency in the treatment process required by either standard.
- 6.3.18 The certifying body has certified that the manufacturer has systems in place to produce glulam to meet the requirements of AS/NZS 1604.5. I note the qualification of the statements made by the certifying body in paragraph 4.3.10 and acknowledge that the Timber Treatment Programme certificate has been reissued stating this qualification (refer paragraph 4.3.12). I accept that reliance can be placed on this certificate in relation to AS/NZS 1604.5 and its reference, at clause 1.9 of that standard, to NZS 3640.

Clause B2 Durability Conclusion

- 6.3.19 Taking the above into account I consider there is sufficient evidence to show that the manufacturer’s glulam as installed in this building will comply with Clause B2.3.1(a) by way of B2/VM1.
- 6.3.20 The agent has observed that the issued building consent approved the use of another glulam product that had the same timber treatment certification as the manufacturer’s glulam (being a H5, CCA-treated³⁵ exterior laminated timber post) and that this was accepted by the authority. In response I note that Table 1³⁶ in NZS 3602 provides a level of treatment for “laminated beams” and “laminated posts” in locations “exposed to exterior weather conditions and dampness but not in ground contact”; the minimum treatment being H3. In contrast, laminated framing of the type used in the owner’s house is not included in that table. Clause 104.5 of NZS 3602 refers to a

³⁴ Under AS/NZS 1604.5, preservative treatment to H2 and higher is to resist attack from termites; H1 is to resist borers.

³⁵ Treated with chromated copper arsenate (CCA)

³⁶ Table 1 – Requirements for wood-based building components to achieve a 50-year durability performance

lesser treatment being acceptable for interior locations fully protected from the weather, but this is only in respect of timber members listed in Table 1.

- 6.3.21 I acknowledge the complexities that exist in selecting and navigating the appropriate compliance pathway for Clause B2 Durability given the inter-dependency between a number of standards, the modifications made by the relevant Acceptable Solutions, and technical knowledge necessary to interpret this information.
- 6.3.22 Notwithstanding this, the information that is provided by the applicant to support a product's use must be clear and it is strongly suggested that the information already provided be reviewed taking account of the determination's comments.

7. Discussion: the minor variation and formal amendment

- 7.1 I now consider whether use of the manufacturer's glulam for framing and trusses at the owners' house could be considered a minor variation to the building consent under section 45A of the Act, or should have been treated as a formal amendment of the building consent under section 45(4). I will refer to these as "the minor variation" and "the formal amendment".

7.2 The minor variation

- 7.2.1 The builder initially asked for the use of the manufacturer's glulam to be treated as a minor variation to the consented work. Section 40 specifies that all building work must be carried out in accordance with a building consent. An exception is if a departure from the consent is considered a minor variation.

The legislation and Ministry guidance

- 7.2.2 A minor variation is defined in regulations³⁷ as follows:

3 Minor variation defined

- (1) A minor variation is a minor modification, addition, or variation to a building consent that does not deviate significantly from the plans and specifications to which the building consent relates.
- (2) The following are examples of minor variations and do not constitute an exhaustive list:
 - (a) substituting comparable products (for example, substituting one internal lining for a similar internal lining):
 - (b) minor wall bracing changes:
 - (c) a minor construction change (for example, changing the framing method used around a window):
 - (d) changing a room's layout (for example, changing the position of fixtures in a bathroom or kitchen).

...

- 7.2.3 A minor variation generally does not affect the level of Building Code compliance: it simply achieves the same outcome in a different way.
- 7.2.4 Minor variations can cover a range of situations that are generally not anticipated. Examples include:
- necessary changes arising from unforeseen circumstances that become evident during construction

³⁷ Building (Minor Variations) Regulations 2009

- an owner wanting to make small changes to a room's layout, or
 - a product substitution from what was consented. This could apply where there is a change, essentially, from one known product to another known product – where the use of the substituted product does not require a compliance assessment by the authority.
- 7.2.5 Applications for a minor variation do not have to be on a prescribed form (as was done in this case). In some circumstances they can be as simple as an onsite conversation between the builder and the authority's inspector (and documented afterwards), or a covering letter from the designer or builder accompanying revised architectural plans or construction details. Minor variations do not require the authority to grant an amendment to the consent.
- 7.2.6 However, it is for the authority to decide whether or not a departure from the building consent is a minor variation. If it considers the departure is too significant it can require a formal application for an amendment.
- 7.2.7 The Ministry's guidance on minor variations (refer paragraph 3.2.3) includes advice on what should be taken into account when deciding whether to accept a minor variation. The relevant considerations and questions from this guidance include:
- substituting comparable building products in the same or similar position/manner
 - whether the minor variation complies with the Building Code
 - whether the minor variation reflects common appropriate industry practice or standards, and
 - whether the minor variation significantly increases the likelihood of a building element's performance failure.
- 7.2.8 The Ministry's guidance also states that all proposed minor variations need to be communicated to the building consent authority before the building work is undertaken. This will give the building consent authority the opportunity to make an assessment and advise the relevant party whether a formal amendment is required; and will assist in avoiding the completion of unapproved works that may need to be excluded from the consent and regularised through a certificate of acceptance.

The minor variation application and the authority's refusal

- 7.2.9 The application to the authority for a minor variation, made in respect of the owners' house on 21 August 2018, comprised the following information (refer paragraph 2.2.5 for details):
- the application form
 - an amended floor framing plan
 - the product technical statement (v2.2)
 - the manufacturer's documentation (warranty, handling, storage and installation requirements)
 - an extract from AS 1720.1.
- 7.2.10 The authority replied two days later that it considered the proposed alterations were not minor and a formal amendment was required. The authority also sought the following information (refer paragraph 2.2.6 for details):

- clarification of conflicting statements made in the manufacturer's documentation and the product technical statement
 - site-specific PS1s for the roof trusses and the pre-fabricated wall framing
 - clarification about allowable moisture content in the glulam
 - testing to show the glulam was treated to H1.2.
- 7.2.11 I have considered the information presented to the authority with the application for a minor variation. I note that the authority was able to seek additional information on the minor variation when this was made, and the substitution could have proceeded as minor variation subject to the authority's concerns being adequately addressed. I accept that the authority did not consider this was a minor variation for the reasons described herein (refer paragraphs 2.2.6, and Appendix D4.1).
- 7.2.12 In my view, the information supporting the minor variation was not adequate as some key evidence that was needed to demonstrate how code-compliance would be achieved in this case was absent, and there were other deficiencies in the material provided. In particular:
- The information submitted with the application for a minor variation made no reference to the substitution of solid timber for engineered wood products that is specifically provided for in NZS 3604, and that the conditions placed on the use of engineered wood products in clauses 2.3.9.1 to 2.3.9.6 of that standard had been met.
 - There was no PS1 for the roof trusses that expressly provided for the use of glue-laminated timber. The first PS1 specified the use of SG8 timber but the second PS1 did not specify the timber to be used, and this confirmation was not provided until 31 January 2019. At the time it was received the authority was unable to use the second PS1 as a means of verifying the use of GL8 glulam in the roof trusses.
 - The information did not describe how compliance with Clause B2 was established using B2/VM1 in respect of the preservative retention and penetration requirements of AS/NZS 1604.5, and the interrelationship between that standard and NZS 3640.
 - The information contained conflicting statements between the manufacturer's literature and the PTS, which the PTS did not clarify.
- 7.2.13 As I consider the information presented to the authority in applying for the minor variation was not adequate, it is my view that the authority was correct to refuse this application at the time and to seek additional information.
- 7.2.14 I note here that matters were not helped by what I consider poor process with regard to this substitution. While considering minor variations once building work is underway is unavoidable in some situations, in this case a conscious decision was made to substitute the manufacturer's glulam well in advance of the framing and trusses being manufactured. What is more, construction was specifically delayed to allow the manufacture of these items, meaning that the applicant had plenty of time to raise this variation with the authority and resolve any issues regarding the assessment for compliance.
- 7.2.15 Further, no discussion was held with the authority about how this change was to be managed, either as a minor variation or a formal amendment. The authority was

unaware of the glulam's intended use until its framing inspection onsite, with the application for a minor variation being made five days later.

- 7.2.16 In my view, a departure from the consented plans of this nature should have been brought to the authority's notice as soon as it was known, to allow the authority to make an assessment of whether it was a minor variation and its compliance, and so that any issues could be resolved before the wall framing and roof trusses were installed. In paragraphs 7.4.1 and 7.4.2 I have discussed the problems that arise where building work that requires a formal amendment is carried out without an amendment first being granted.

Reconsideration of the manufacturer's glulam as a minor variation

- 7.2.17 Given the additional information now available and the conclusions reached in this determination regarding compliance of the manufacturer's glulam at the owners' house, I now consider whether the substitution can be considered a minor variation.
- 7.2.18 The following table lists the relevant considerations and questions from the Ministry's guidance on minor variations (as listed in paragraph 7.2.7) and comments on each of these.

The Ministry's guidance on minor variations		Comments on use of the manufacturer's glulam at the owners' house
Item 1	Substituting comparable building products in the same or similar position/manner	The manufacturer's glulam is comparable with the solid timber it was replacing in that it has the same dimensions, is used in the same location, and generally uses the same fixings. The manufacturer's glulam is grade GL8 which is at least equal to the timber it replaced (SG8).
Item 2	Does the minor variation comply with the Building Code?	The determination's finding is that the use of the manufacturer's glulam for wall framing roof trusses meets the Building Code with the possible exception of the limited delamination of the bottom plate which is understood to have been repaired.
Item 3	Does the minor variation reflect common appropriate industry practice or standards?	It is acknowledged that the authority was informed that this was the first time the manufacturer's glulam had been used in New Zealand. The authority was familiar with glulam used in other situations but not as the entire wall and roof framing to a house. Other forms of engineered timber products are commonly used as a substitute for solid timber in wall framing; glulam is common substitute for beams and posts, and LVL is a common substitute for framing and beams.
Item 4	Does the minor variation significantly increase the likelihood of a building element's performance failure?	The determination's findings are that the use of the manufacturer's glulam does not increase the likelihood of failure.

- 7.2.19 This table highlights how the manufacturer's glulam could be considered a minor variation and how any areas of concern have been resolved. In summary:
- The glulam is clearly comparable with solid timber; the use of engineered timber products is specifically provided for in NZS 3604; and the use of engineered timber products is a common substitute for solid timber in beams, posts and framing for buildings within the scope of NZS 3604.
 - It is acknowledged that this is the first time the manufacturer's glulam has been used as timber framing, but I note the building industry's familiarity with glulam's use as a building component in work closely-related to framing.
 - The determination's findings establish that the manufacturer's glulam used at the owners' house for roof trusses complies with Clauses B1 and B2, while its use for wall framing complies with Clause B1 (subject to verification of the limited delamination to the bottom plate) and complies with Clause B2.
- 7.2.20 Accordingly, it is my view that the authority could have accepted the substitution of the manufacturer's glulam at the owners' house as a minor variation if sufficient information had been made available to it at the time.
- 7.2.21 Further, I consider that this type of substitution may be able to be treated as a minor variation in similar circumstances if sufficient information is provided showing the engineered timber product meets the specific requirements of NZS 3604 for Clause B1, for specific and non-specific designed items, and a clear compliance pathway is provided to show the timber is treated to meet Clause B2.
- 7.2.22 I note that a product technical statement for the manufacturer's glulam was provided to the authority with the application for a minor variation. While this statement was later revised it was still called into question by the authority. To assist the parties and others I have made some suggestions regarding this statement and product technical statements in general in paragraph 9.

7.3 The formal amendment of the building consent

- 7.3.1 The authority gave the owners an opportunity to amend the building consent by means of a formal amendment to address the compliance of the manufacturer's glulam already used onsite. However, a building consent amendment cannot be issued for building work that has already been completed. This has been considered in past determinations and by the Courts³⁸.
- 7.3.2 While the authority declined the formal amendment because it considered compliance had not been demonstrated, I consider it was unable to issue the formal amendment even if it had considered the work to be compliant. The authority was therefore correct to decline the formal amendment to the building consent even though the basis for this decision was incorrect.

7.4 The remedy in this case

- 7.4.1 The substitution of the manufacturer's glulam for solid timber framing and trusses at the owner's house is now unable to be considered as a formal amendment to the building consent for the reasons set out in paragraph 7.3.1. In order for the substitution to be regularised at this time:

³⁸ For example; Determinations 2016/046 and 2017/020, and *Environment Waikato v Sutherland* District Court Wellington CIV-2010-085-629, 1 March 2011

- its compliance can be considered via a certificate of acceptance issued under section 96 of the Act, or
- it can be treated as a minor variation.

7.4.2 The owners do not want the substitution to be regularised via a certificate of acceptance; therefore, the question is whether the substitution can now be treated as a minor variation.

7.4.3 As noted in paragraph 7.2.14, I consider a poor process was followed by the applicant in seeking the minor variation as the proposed substitution was known well in advance of the framing and trusses being manufactured, but this was not brought to the authority's notice. However, I consider there are a number of case-specific factors to be taken account of in forming a view on this matter, namely:

- If the substitution is regularised via a certificate of acceptance this means a substantial part of the house's structure (i.e. the wall and roof framing) will be removed from the building consent. This would present administrative difficulties for the authority and has consequences with respect to code compliance³⁹.
- The issue of a certificate of acceptance is also likely to create contractual and insurance difficulties for the owners and the builder, and the owners have made submissions describing the significant and lasting effects of this.
- This is the first time the manufacturer's glulam had been used in a building in New Zealand, and, as acknowledged in paragraph 6.3.21, the compliance pathway with respect to Clause B2 is complex.
- Sufficient information has now been provided to show that the manufacturer's glulam complies with Clause B1 (setting aside the repair to the bottom plate) and Clause B2.
- The manufacturer's glulam could be considered a minor variation following the considerations in the Ministry's guidance on minor variations. The authority could have accepted the substitution as a minor variation with the information now available to it.

7.4.4 Given the above, and the disproportionate effect on the parties of not doing so, I consider it appropriate to reverse the authority's decision to refuse to grant the minor variation. The effect of reversing the authority's decision is that the substitution can be treated as having been a minor variation to the approved consent with this documented accordingly.

8. Discussion: the issue of the notice to fix

8.1 The authority issued the notice to fix on 21 September 2018 for a breach of section 40; i.e. for the installation of the glulam framing and trusses not in accordance with the building consent.

8.2 In my view the authority was correct to issue this notice at the time as: the manufacturer's glulam had already been used onsite for framing and trusses (as noted in the site notice of 16 August 2018); this was not described in the approved building consent; and the authority came to the view that the work was not a minor variation.

³⁹ For example, the minimum durability periods for the framing under Clause B2.3.1(a) will not commence at the time the code compliance certificate is issued.

I consider that the possible remedies listed on this notice should have included a further option: namely applying for a certificate of acceptance⁴⁰ to “regularise” the work already completed.

- 8.3 The remedies stated in the notice to fix included applying for a determination from the Ministry by a particular date. The remedies in a notice to fix should be limited to bringing the work into compliance with the Building Code, and any reference to obtaining a determination should have been included in the letter accompanying the notice to fix.
- 8.4 However, as I have now concluded the work to install the manufacturer’s glulam at the owners’ house is to be considered a minor variation, the notice to fix is to be reversed.

9. Further observations: the product technical statement

- 9.1 This section discusses the role of product technical statements (PTSs) and makes some general comments about what they should contain, and how they should be prepared, to help building consent authorities in decision making for building consents. It also includes some suggestions regarding the PTS for the manufacturer’s glulam.

9.2 General observations about product technical statements

- 9.2.1 I make the following observations to assist those preparing PTSs, particularly when these are for products with complex compliance pathways. These observations are drawn from some of the issues faced by the parties in this case when considering the manufacturer’s glulam, and from consideration of the various documents used to support evidence of compliance, namely:
- The product should be described in unequivocal terms.
 - The description of the intended use of the product, and limitations regarding its use, should be rigorous and unambiguous.
 - The PTS should be clear about the compliance pathway; it should refer to caveats explicit in any compliance pathway; and should state (with evidence where appropriate) that such caveats are satisfied. For example, NZS 3604 allows substitution of solid timber by engineered wood products provided certain caveats are met.
 - If the compliance pathway places obligations on other parties to provide information and mandates that this is provided (e.g. the provision of a PS1 with particular information) the PTS should include those obligations.
- 9.2.2 As noted above, PTSs can be useful for building consent authorities when considering product compliance. I make the following comments in relation to this.
- 9.2.3 As with many documents, it would be natural for errors and inconsistencies in a PTS to raise doubt about the technical statements made that support the arguments for code compliance.
- 9.2.4 It is also reasonable to expect later versions of a PTS to contain amendments (and maybe even significant amendments) to clarify or correct content from earlier

⁴⁰ Under section 96 of the Act

versions. Any such amendments should be able to be supported with relevant information or evidence.

9.3 The product technical statement for the manufacturer's glulam

9.3.1 The following comments relate to the latest version of the PTS for the manufacturer's glulam that I have seen (v3.0) and how this might have been improved to assist the authority's decision making.

Purpose and use

- The reference to specific design to AS/NZS 1170:2002 is inaccurate, as that standard only specifies the design actions and not the design capacity. It would be more accurate to specify specific design to the Verification Method B1/VM1, which in turn references both AS/NZS 1170 and NZS 3603.

Conditions

- The PTS states "manufacture of frames and trusses to be carried out by a licensed truss and frame manufacturer". For trusses, compliance with B1/AS1 (the stated compliance pathway) requires a producer statement verifying the design software and a design statement issued by an accredited fabricator including specific information – among others, identification that the timber grades used, as a minimum, are as specified in NZS 3603.
- The PTS makes no reference to a PS1 producer statement or design statement, or any of the associated requirements for the PS1 documentation. Stating these as a condition on the PTS would make them transparent to building consent authorities.

Compliance with the Building Code

- The PTS points to standards in support of the claims of compliance with particular clauses of the Building Code. The transparency of the compliance could be improved as follows:
 - For Clause B1, compliance with B1/AS1 is stated but there is no reference to how this is supported. NZS 3604 allows substitution of solid timber by engineered wood products provided certain caveats are met: same dimension members; strength and stiffness verified and marked; and for glue-laminated timber manufacture in accordance with AS 1328 parts 1 and 2. The compliance statement should refer to NZS 3604 clause 2.3.9.5 and comment that the relevant caveats are satisfied (through the standards stated).
 - NZS 3604 (at clause 10.2.2) allows for nailed-plated roof trusses, with some requirements: specific engineering design in accordance with B1/VM1; manufactured by an accredited fabricator; a producer statement verifying the design software; and a design statement issued by an accredited fabricator including specific information – among others, identification that the timber grades used, as a minimum, are as specified in NZS 3603. The compliance statement in the PTS should point to these standards and include a limitation highlighting the caveat that the design statement should specifically state the timber grade used in the design.

- For Clause B2, the compliance pathway stated was B2/VM1. This required information to support the evaluation judgement made in B2/VM1 including a comparison of the treatment requirements in NZS 3640 and the AS/NZS 1604.5, with respect to retention and penetration, with the conclusion that compliance with Clause B2 would be achieved.

10. The decision

10.1 In accordance with section 188 of the Building Act 2004 I hereby determine that the use of the manufacturer's glulam at the owners' house for:

- the roof trusses complies with Clause B1 Structure and Clause B2 Durability
- the wall framing complies with Clause B1 Structure subject to verification of the performance of the repair to the bottom plate (refer paragraph 6.2.5), and complies with Clause B2 Durability.

10.2 In addition, I also determine that:

- the authority was correct to refuse the minor variation to BC/0130/18 for substitution of solid timber framing with the manufacturer's glulam for the roof trusses and wall framing in the owners' house, on the basis of the information it had before it at the time this decision was made. However, for the reasons discussed in this determination, I reverse the authority's decision, thus requiring the authority to treat the substitution as a minor variation
- the authority's decision to refuse to grant the formal amendment to building consent BC/0130/18 was correct and is confirmed
- the authority was correct to issue notice to fix No. NF/0003/18, but for the reasons discussed in this determination, I now reverse that decision.

Signed for and on behalf of the Chief Executive of the Ministry of Business, Innovation and Employment on 12 April 2019.

Katie Gordon
Manager Determinations

Appendix A: Standards referenced

A.1 The following table lists the standards referred to in the determination, and the Acceptable Solutions (AS) and Verification Methods (VM) that reference them. These standards were all in force at the date the building consent was issued (16 March 2018) and when an amendment to this consent was applied for (30 August 2018).

Standard	Title	Precis	Cited in AS or VM (version, effective dates)	Referenced by:
NZS 3602:2003	Timber and wood-based products for use in building	Gives the requirements for timber and wood-based products for particular uses in building.	B2/AS1* (2 nd Ed, Amd 9, effective 1 Jan 2017 to 31 Mar 2019)	NZS 3604:2011 NZS 3640:2003
NZS 3603:1993	Timber Structures Standard	Sets out in the requirements for methods of design of timber elements of buildings and applies specifically to sawn timber, glue-laminated timber, natural round timber and construction plywood.	B1/VM1 (1 st Ed, Amd 16, effective 3 Apr 2018 to 31 Mar 2019)	AS/NZS 1748.1:2011 AS/NZS 1748.2:2011 AS/NZS 2269.0:2004 AS/NZS 2269:2004 NZS 3602:2003 NZS 3604:2011
NZS 3604:2011	Timber-framed buildings	Provides methods and details for the design and construction of timber-framed structures not requiring specific engineering design.	B1/AS1 (1 st Ed, Amd 16, effective 3 Apr 2018 to 31 Mar 2019) B2/AS1*** (2 nd Ed, Amd 9, effective 1 Jan 2017 to 31 Mar 2019)	NZS 3602:2003 AS/NZS 1748.1:2011
NZS 3622:2004	Verification of timber properties	Describes quality control requirements to ensure that timber has the structural properties claimed for it.	B1/VM1 (1 st Ed, Amd 16, effective 3 Apr 2018 to 31 Mar 2019)	NZS 3603:1993 NZS 3604:2011
NZS 3640:2003 Amds 1-5	Chemical preservation of round and sawn timber	Requirements for the preservative treatment and identification of timber to provide protection from decay and insect attack in likely New Zealand exposure conditions.	B2/AS1 ** (2 nd Ed, Amd 9, effective 1 Jan 2017 to 31 Mar 2019)	NZS 3602:2003 NZS 3604:2011
AS/NZS 1328.1:1998	Glued laminated structural timber - Performance requirements and minimum production requirements	Specifies requirements for the timber used, the type of adhesive and the strength of both end and edge lamination joints. It also gives methods for establishing properties of completed structural pieces so that a product may be assigned to a stress grade.	Secondary reference in NZS 3602:2003 and NZS 3604:2011	NZS 3602:2003 NZS 3604:2011
AS/NZS 1328.2:1998	Glued laminated structural timber - Guidelines for AS/NZS 1328: Part 1 for the selection, production and installation of glued laminated structural timber	Intended for use in conjunction with AS/NZS 1328.1, this Standard provides detailed guidance for production of glulam. A set of stress grades is given for design purposes to simplify the use and installation of graded material.	Secondary reference in NZS 3602:2003 and NZS 3604:2011	NZS 3602:2003 NZS 3604:2011
AS/NZS 1604.5:2012	Specification for preservative treatment - Part 5: Glued laminated timber products	Provides a specification for preservative treatment for protection against decay or insect attack for glue-laminated timber products.	Secondary reference in NZS 3602:2003	NZS 3602:2003
AS 1720.1-2010	Timber structures Design methods	Provides a code of practice for the design and acceptance of timber structures and elements.	Secondary reference in NZS 3603:1993	NZS 3603:1993

Notes:

*B2/AS1 incorporates NZS 3602 by reference with modifications to some Tables in NZS 3602 related to level of timber treatment required for some timber components in particular hazard exposures.

**B2/AS1 incorporates NZS 3640 by reference with modifications to limit the use of some preservatives, and make normative durability requirements.

***B2/AS1 incorporates NZS 3604 by reference with modification to give effect to the modifications to NZS 3602 and NZS 3604 where these standards are referenced in NZS 3604.

Appendix B: The relevant legislation, Building Code Clause and Verification Method

B1 The relevant sections of the legislation, Building Code, and the Verification Methods include:

B1.1 Building Act 2004:

19 How compliance with building code is established

- (1) A building consent authority must accept any or all of the following as establishing compliance with the building code:
- (a) compliance with regulations referred to in section 20:
 - (b) compliance with an acceptable solution:
 - (ba) compliance with a verification method:
 - (c) a determination to that effect made by the chief executive under subpart 1 of Part 3:

...

B1.2 New Zealand Building Code, Clause B2 Durability:

B2.3.1 Building elements must, with only normal maintenance, continue to satisfy the performance requirements of this code for the lesser of the specified intended life of the building, if stated, or:

- (a) the life of the building, being not less than 50 years, if:
 - (i) those building elements (including floors, walls, and fixings) provide structural stability to the building, or
 - (ii) those building elements are difficult to access or replace, or
 - (iii) failure of those building elements to comply with the building code would go undetected during both normal use and maintenance of the building.

...

B1.3 The Verification Method for Clause B2, B2/VM1 includes:

1.3 Similar materials

1.3.1 For the purposes of evaluation, a building element may be considered as similar to another building element with proven performance, if both are subject to the same controls for composition and overall performance. Examples of such controls are Approved Documents or Standards. Where such a direct comparison is not possible, the building element shall be independently assessed to determine the degree of similarity.

1.3.2 Assessment shall take into account but not be limited to:

- a) Product composition,
- b) Method and quality assurance of manufacture,
- c) Degradation mechanisms,
- d) Local environment,
- e) Conditions of use,
- f) Required maintenance, and
- g) Performance in use.

...

Appendix C: Excerpts from the relevant standards

C1 The relevant clauses (excluding commentary) from NZS 3604 include:

2.3.9 Engineered wood products

2.3.9.1

Engineered wood products shall be either laminated veneer lumber (LVL), or glue laminated timber manufactured using Radiata pine or Douglas fir.

2.3.9.2

LVL shall be manufactured in accordance with AS/NZS 4357 (Parts 0 to 4).

2.3.9.3

Glue laminated timber shall be manufactured in accordance with AS/NZS 1328 (Parts 1 and 2).

2.3.9.4

The preservative treatment for engineered wood products shall comply with NZS 3602 provided however that where engineered wood products are not already specified, the level of treatment shall be the same as that required for kiln-dried Radiata pine *structural grades* to comply with NZS 3602.

2.3.9.5

Engineered wood products may be used as a direct substitute for SG 6, 8 or 10 provided that they are of the same finished size as the member to be substituted and that the strength and stiffness properties have been verified and marked in accordance with NZS 3622 and are no less than the strength and stiffness properties of the grade to be substituted.

2.3.9.6

Proprietary grades and sizes of engineered wood products may be used for *framing* members in this Standard providing that:

- (a) The *framing* member is within the scope of this Standard;
- (b) The loadbearing reaction of the *framing* member shall not exceed 16 kN in a downwards direction or 16 kN in an upwards direction; and
- (c) The selection charts or software used for the selection of the engineered wood product have as a minimum been engineered in accordance with B1/VM1.

Supporting documentation shall be provided by the author of the selection chart or software package to demonstrate compliance with this clause.

10.2.2.3 Drawings and specifications

Roof truss layouts and fabricator statements shall be provided for all *roof* truss systems. These shall be location/site specific showing issue date and shall contain information relating to the specific design as well as all necessary information to install the trusses in accordance with their specific design and shall specifically include:

- (a) A producer statement (design) issued by a chartered professional engineer verifying the design software;
- (b) A design statement issued by an accredited fabricator including the following information:
 - (i) Identification that the timber grades used, as a minimum, are as specified in NZS 3603 or AS/NZS 4357;

C2 The relevant clause from AS/NZS 1604.5 says:

1.9 USE IN NEW ZEALAND

When used in New Zealand in situations where treatment to hazard class H1.2, H3.1 or H3.2 is required as specified in the New Zealand Building Code and/or in NZS 3602, glued laminated timber products shall be treated to the preservative retention requirements for hazard class H1.2, H3.1 or H3.2 as set out in NZS 3640.

Preservative penetration shall be in accordance with this Standard (AS/NZS 1604.5).

Characteristic values, as defined in NZS 3640, shall apply to both penetration and retention.

Appendix D: The submissions made at the hearing

The following summarises the submissions made at the hearing on 29 January 2019 following the issue of the first draft, as well as discussions held with the expert at that hearing (refer paragraphs 4.1 and 4.2).

D1 The agent for the applicant

D1.1 The agent provided a written submission which she spoke to. The agent's position (in summary) was that:

- Glulam is a “well-known commodity product that has been used for structural framing for decades” notwithstanding that the manufacturer has endeavoured to create a different perception in the market for the product. The first draft has consequences for other users of engineered timber and the relevant LBPs.
- Compliance with Clause B1 is established through AS/NZS 1328 and the compliance pathway is B1/AS1. Compliance with Clause B2 is established through B2/VM1.
- Five other glulam manufacturers were identified, and the agent compared the varying levels of information provided to the authority, saying only two had third-party verification showing compliance with the relevant Building Code clauses.
- The agent considered and compared the regulatory decisions that need to be made for substituting solid timber for LVL with that for a substitution to the manufacturer's glulam. The LVL approval relies on a Codemark certificate and third-party certification as a “special product”. The LVL is readily comparable with the manufacturer's glulam and it was reasonable to assume the approval of the manufacturer's glulam would be treated in a similar manner.
- The first draft, in effect, said that glue-laminated timber was “not a known product” and accordingly warranted careful assessment.
- The expert's report compares the H1.2 treatment requirements of NZS 3640 with AS/NZS 1604.5, verification by the certifying body and analysis confirms compliance has been achieved.
- The application for amendment constitutes the substitution of a comparable product with a consented product. The manufacturer's glulam uses the same fixings, has the same dimensions, is treated the same, uses the same design standards, and consequently there was no decision for the authority to make.
- A site and product-specific PS1 had been provided to the authority with the building consent amendment for the trusses manufactured with the manufacturer's glulam.
- In issuing the first draft the Ministry has ignored section 19 of the Act, verification by the certifying body, the documentation supplied, and its own guidance.
- The determination needs to contemplate both the compliance of the manufacturer's glulam and the “compliance pathways” – the latter setting out the relevant standards to be applied for both Clauses B1 and B2.

D2 The owners

D2.1 The owners' legal adviser provided a written submission which he spoke to. This reiterated many of the points made by the applicant's agent which are not repeated here. In summary the owners' position was that:

- The conclusions in the first draft about the substitution from solid timber to the manufacturer's glulam were disputed.
- The legal adviser referred to the legislation and Ministry guidance on variations as it applied to this case. A minor variation was "quick and easy" when compliance was able to be shown, the variation amounted to "a line [text] on one plan" and was an "insignificant departure" from the consented work.
- The documentation presented to the authority included statements from the certifying body, the agent's PTS and the statements from the truss manufacturer, and that glulam is a product known to the authority. Eight houses in this area plus a house across the street had had framing substituted from solid timber to LVL⁴¹ without comment from the authority and consistency was being looked for. A past determination had accepted the compliance of LVL.
- A certificate of acceptance was "very far" from being a code compliance certificate and the value of a certificate of acceptance will depend on the extent to which the work is able to be inspected. A certificate of acceptance may well pose problem for the owners in the future and impact on insurance, the mortgage, and future sales. The issue of a certificate of acceptance is at the discretion of the authority as it is for the issue of the minor variation.
- The first draft and the expert's report are inconsistent. More than sufficient information had been provided to the authority to show compliance would be achieved.
- The owners had been made aware that the manufacturer's glulam was a more stable product and had delayed the construction of the house until it was available for use. The manufacturer would not release the product from the plant until after it had "certification" on 15 June 2018.
- The owners believed they were following the correct process and dealing with a glulam product that could be directly substituted.

D3 The manufacturer's technical expert

D3.1 The manufacturer's technical expert's position (in summary) was that:

- The manufacturer was "relatively new" to the market but its products are not. The manufacturer had taken all reasonable steps to ensure the product was "fit for purpose" and that it complied with the Building Code. The product documentation has been prepared in accordance with Ministry guidelines and the manufacturer met the requirements of section 14G.
- The manufacturer had the required verification of the product by a certifying body. The manufacturer's glulam exceeded the testing requirements of AS/NZS 1328. The structural adequacy of glulam timber was understood to be roughly twice that of solid timber.

⁴¹ The meeting confirmed that the specific product being referred here had a "Codemark" certificate issued under section 269 of the Act.

- The appropriate information was provided to the authority on 24 August 2018 (the second PS1, certification by the certifying body, a revised PTS, and care and maintenance and installation information) which was to “to address the ambiguities” identified by the authority. Correspondence to the authority following this appears to have been ignored and the authority notified its refusal to issue the amendment.
- The manufacturer’s glulam falls within the Acceptable Solutions and Verification Methods and the authority had not followed section 19 of the Act in refusing the amendment.

D4 The authority

D4.1 The authority’s position (in summary) was that:

- Decisions on minor variations can be made by authority staff onsite and a note would be made on an inspection checklist. A minor variation should not need detailed correspondence, but it may require revised drawings where appropriate.
- “We have a new product here that we have never seen before.” The authority was told this was the first time it was being used and that the authority was the “guinea pig”. The authority’s site staff was not in a position to make a compliance decision as was normally the case for a minor variation. The authority was familiar with glulam used in other situations, such as beams and posts, but not as the entire framing to a house.
- The change was not considered a minor variation. The framing was a significant part of the house and the variation was treated “very seriously”.
- The delamination was observed in two small sections in the bottom plate where water was ponding (believed to be in the garage and ensuite) and thought to be an isolated issue.

D5 The manufacturer

D5.1 The manufacturer’s position (in summary) was that:

- The glulam standards are comprehensive and provide very detailed procedures describing glulam manufacture.
- A Phenol-formaldehyde (PF) Service Class 3⁴² resin is used in manufacture and not Resorcinol as stated in the first draft. PF resin is heat-cured.
- A GL8 grade glulam member has to have better characteristics than an equivalent SG8 grade in terms of bending, tensile, and compressive strengths. Each finished length of the product was measured for stiffness and bending strength. When GL grade glulam is used designers can take advantage of the better characteristics; that was not done here as it was a direct substitution.
- The certifying body covers treatment to both NZS 3640⁴³ and AS/NZS 1604.5. The manufacturer took a conservative position and sought verification of treatment to both standards.

⁴² Service Class 3 as described in AS 1328; this is the most severe service class for use in outdoor exposed conditions.

⁴³ This statement is later clarified by the certifying body, refer paragraph 4.3.10.

- The original truss supplier could not design trusses using glulam and a second supplier was found that did; the manufacturer's glulam had been shipped to that supplier. The PS1 submitted with the consent amendment was provided by the second supplier.
- With respect to the delamination, both areas of delamination are from the same piece of glulam (each piece of glulam having a unique manufacturing number). The delamination was in the outer lamina only.
- There was concern that the same arguments about compliance will be raised by other authorities throughout New Zealand. The manufacturer was of the view it did not need product certification, but was mindful of significant issues within the industry about related matters.

D6 Discussions with the expert

D6.1 As noted in paragraph 4.2 the expert joined the hearing by phone during the latter stages of the hearing. The matters discussed with the expert are summarised below.

- There are a number of compliance pathways using the Acceptable Solutions and Verification Methods, and no real need to use an alternative solution route.
- The way the timber treatment standards apply to glue-laminated timber is complex and they deal with glulam in a convoluted way. The expert believed there was an effective compliance pathway via NZS 3604 and the secondary standards it referenced; and also via B2/AS1 and the standards it referenced, being NZS 3602 and NZS 3640. However, the B2/AS1 pathway by reference to NZS 3602 and NZS 3640 does not apply to hazard class H1.2. A pathway through B2/VM1 is also available by considering equivalence.
- Arguing these pathways is more complex than the normal Acceptable Solution/Verification Method pathway, and it is not unreasonable to expect that these should be laid out very clearly in a building consent application. This pathway information was not provided.
- If it was intended that NZS 3604 should not include compliance with Clause B2 then it would not have referenced any timber treatment standards.