Study Report SR453 [2020]

Usage and uptake of engineered wood products in New Zealand

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Preface

As more timber-based construction materials are developed and made available for the New Zealand building industry, it is important to know what products are sought by designers and builders and whether any barriers exist for the uptake of these materials. This report describes the findings from an industry-wide survey conducted in February 2019 around opinions on the usage and uptake of engineered wood products in New Zealand.

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Abstract

Recent decades have seen a global increase in the use of timber products within the built environment. A substantial proportion of this increase is attributable to engineered wood products (EWPs), from large-scale structural elements through to non-structural and decorative components used on the interior and exterior of buildings. In order to better understand the EWP landscape in New Zealand, a survey was distributed to builders, architects, designers, engineers, building officials and quantity surveyors. The intention was to gain a better understanding of what EWPs are being used and for what applications across the building industry. Information was also sought on perceived barriers to the increased use of EWPs and how the uptake of these materials could be increased. This report provides descriptions of the survey used and the results obtained from each question. Data is presented graphically and numerically, including discussion on the numerous comments that were included with the results. A summary is provided of relevant issues raised along with recommendations for potential means of creating increased EWP use in New Zealand buildings. Also included are suggestions for research to best support and facilitate New Zealand's growth in EWP usage.

Keywords

Engineered wood products, EWP, timber, survey.

Contents

Figures

Tables

Executive summary

In order to better understand the engineered wood product (EWP) landscape in New Zealand, a survey was distributed to builders, architects, designers, engineers, building officials and quantity surveyors. The intention was to gain a better understanding of what EWPs are being used and for what applications across the building industry. Information was sought on perceived barriers to the increased use of EWPs and how the uptake of these materials could be increased. Occupational and demographic information was obtained to inform an understanding of those providing the opinions.

The survey for this research was developed in consultation with researchers within BRANZ and from outside the organisation. The survey consisted of 17 questions, although the total number of questions answered by a participant depended on their responses to other questions. The survey was only available online. Efforts were made to include a broad range of occupations through the dissemination of the survey so that multiple perspectives throughout the building industry could be obtained. The survey was open throughout the month of February 2019, and a total of 474 surveys were completed. The response rate was estimated to be approximately 0.6%.

The main themes that became apparent around the increased use and uptake of EWPs in New Zealand were:

- cost
- availability
- regulation
- information
- education.

These basic themes were apparent from the responses, and the rationales behind them provided in the comments were complex. Increased cost and limited availability of EWPs were related and frequently noted as barriers to using EWPs. The most significant regulatory concerns were around compliance pathways and increased prescriptive design methods. The need for more information and education were the most commonly cited ways of reducing barriers and increasing the use and uptake of EWPs throughout the New Zealand building landscape. A comprehensive understanding of the environmental impacts of EWPs is also necessary to understand the effects of including these products for building projects.

Recommendations for research and education were developed based on the survey responses and analysis. These include collecting data on the economic and environmental impacts of using EWPs throughout the building sector. Providing detailed case studies of buildings that use a significant amount of EWPs can help to develop a comprehensive understanding of how EWPs impact the design, cost and performance of these buildings. Analysis of existing standards, Acceptable Solutions and Verification Methods to determine what potential there is for including EWPs for substitution and inclusion, including currently unavailable information, is seen as a positive step forward for EWPs. It would be greatly beneficial to conduct seminars to educate building sectors on specific applications of EWPs including demonstrations of available guidance and design tools. Increased availability of online design tools and helping design practitioners, builders and consenting officials how to use and understand them would also help share the understanding of how to effectively use EWPs across the New Zealand building sector.

1. Introduction

The past two decades have seen a global increase in the use of timber products within the built environment. A considerable portion of this increase is attributable to engineered wood products (EWPs), from large-scale structural elements through to non-structural and decorative components used on the interior and exterior of buildings. This includes materials such as laminated veneer lumber (LVL), cross-laminated timber (CLT), plywood, particleboard and other composite products utilising wood. Like other countries around the world, New Zealand has an urgent need to supply new housing stock, with clear signals for significantly increased use of EWPs coming from designers and consumers who are aiming for lower-carbon construction and manufacturers and government who would like to see better utilisation of New Zealand timber resources.

The objective of this project was to gather information regarding the use of EWPs across the building landscape, from acceptance and design through to delivery of completed buildings. It was aimed at assessing both the current and future growth of EWP use in New Zealand housing and identify where research is urgently required to support increased utilisation of EWPs in building practice relevant to New Zealand.

In order to better understand the EWP landscape in New Zealand, a survey was distributed to builders, architects, designers, engineers, building officials and quantity surveyors. The questions were developed in consultation with BRANZ staff and external specialists so that a comprehensive survey including a variety of perspectives resulted. The intention was to gain a better understanding of what EWPs are being used and for what applications across the building industry. Additionally, information was sought on perceived barriers to the increased use of EWPs and how the uptake of these materials could be increased. Occupational and demographic information was also obtained to inform an understanding of those providing the opinions and how they fit within the building system.

This report provides descriptions of the survey used and the results obtained from each question. Data is presented in graphical and numerical terms, including discussion on the numerous comments that were included with the results. A summary is provided of relevant issues raised and recommendations on determining current and future areas of increased EWP use in New Zealand buildings and where research can be effectively applied to best support and facilitate New Zealand's growth in EWP usage.

2. Methodology

The survey for this research was developed in consultation with researchers within BRANZ and from outside the organisation. An introduction was included on the first page of the survey, which provided some background for the survey and information on the intent and proposed use for the data obtained. The survey consisted of 17 questions, although the total number of questions answered by a participant depended on their responses to other questions. Of the 17 total questions, 10 provided the opportunity for elaboration through additional narrative or requested non-specified responses that needed to be provided by the respondents. A copy of the survey is provided in Appendix A of this report.

The survey was conducted using Survey Monkey and was only available online. Potential participants were notified through email notifications that were sent out from BRANZ based on occupations and affiliations. An advertisement was also included in *Build* magazine and the companion email newsletter, in addition to emails sent through Engineering New Zealand (ENZ) technical groups such as the Timber Design Society. Efforts were made to include a broad range of occupations through the dissemination of the survey so that multiple perspectives throughout the building industry could be obtained.

The survey was open throughout the month of February 2019 and the data collected using tools available through SurveyMonkey. A total of 474 surveys were completed. Some questions required text responses, and not all respondents included comments for these questions. While it was not possible to track the exact number of potential participants, it was estimated that 6,000 emails were sent out and that another 70,000 readers would have seen the advertisement in *Build* magazine. This resulted in an approximate response rate of 0.6%.

3. Survey results and discussion

This section provides the responses to each question in the EWP survey and summarises the results from them. Numerical data is provided in addition to summaries and discussion on questions where comments were included. This has provided insight on opinions currently held in New Zealand on the uptake and use of EWPs and has also allowed for recommendations to be made regarding the direction of future research on these products and their application within the built environment.

3.1 Question 1: Building sector

Question 1 asked, "What sector of the building industry are you currently working in?" The answers provided and response rates are included in Table 1 and Figure 1.

Table 1. Responses to EWP survey question 1: Building sector.

	% of responses	Number of responses
Architectural design	41.56%	197
Building and construction	28.48%	135
EWP manufacturing	1.27%	6
Engineering design	14.98%	71
Regulatory/consenting	12.87%	61
Quantity surveying	0.84%	4
Total		**474**

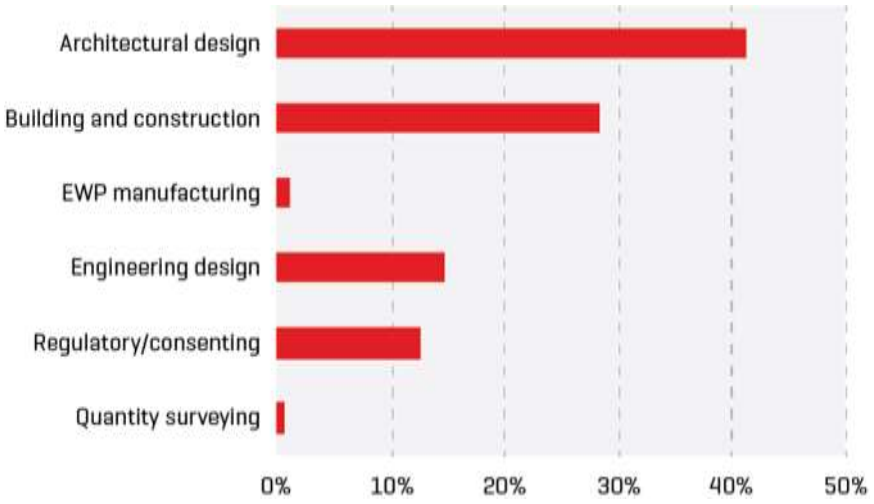

Figure 1. Responses to EWP survey question 1: Building sector.

Question 1 also included the option to specify "Other (please specify)", and there were 24 responses for this. The comments included were elaborations in that all respondents selected one of the roles listed but included some additional information in these cases, including:

- education
- building products supplier
- maintenance
- fire engineering
- combination of listed responses

- manufacturing but not EWP:
  - frame and truss
  - building prefabrication
  - building hardware
- industrial and furniture design
- building services design
- development
- council member.

Clearly, a large proportion of the responses came from those with an architectural focus, with the construction sector being the next largest contributor to the data. Engineering and regulatory sectors were significantly less represented, but still the third and fourth largest groups to respond. Manufacturing and quantity surveying interests were only minimally represented, and this would include the specific areas noted in the comments. The range of respondents is reflected in one of the questions, which indicates the success of this approach.

3.2 Question 2: Time in current sector

Question 2 asked, "How long have you been working in your current sector?" The answers provided and response rates are included in Table 2 and Figure 2.

Table 2. Responses to EWP survey question 2: Time in current sector.

	% of responses	Number of responses
Less than 1 year	0.63%	3
1–2 years	1.69%	8
3–5 years	11.18%	53
6–10 years	10.76%	51
More than 10 years	75.74%	359
Total		**474**

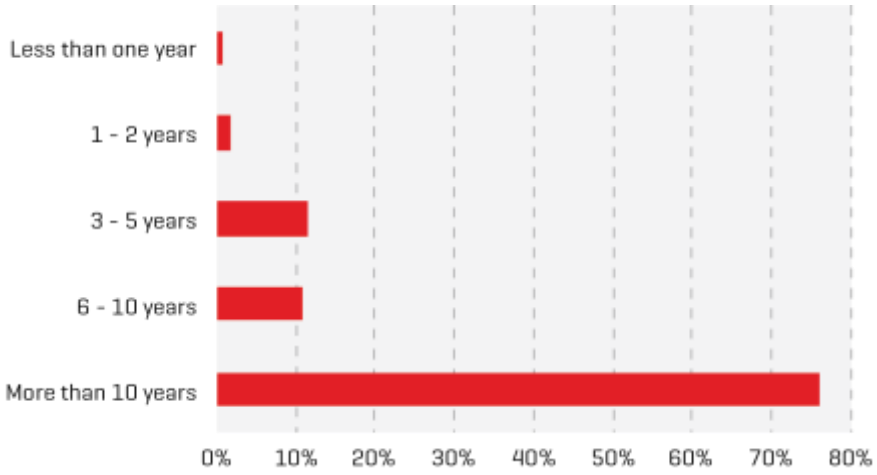

Figure 2. Responses to EWP survey question 2: Time in current sector.

There was no option to add comments in question 2. A majority of respondents have been in their sector for over 10 years, which suggests that they have the perspective of seeing what has happened in the New Zealand building sector long enough for some changes to have occurred and for some trends to be observed. In general, this is considered a positive result to have more experienced individuals involved in the

survey. The majority of the remaining participants have been in their sector for between 3 and 10 years, with less than 3% of the survey group being in the sector for less than 3 years.

3.3 Question 3: Percentage of EWPs in projects

Question 3 asked, "What percentage of your projects or work over the past 12 months have included a significant amount (at least 50% of materials used) of EWPs?" The question provided different parts of a building to be considered as main building structure, building envelope, cladding or façade system and non-structural elements. The percentage categories and responses provided are shown in Table 3 and Figure 3.

Table 3. Responses to EWP survey question 3: Percentage of EWPs in projects.

	0%	1–25%	26–50%	51–75%	76–100%	Total
Main building structure	15.91% 74	42.58% 198	18.71% 87	12.69% 59	10.11% 47	465
Building envelope, cladding or façade system	30.55% 128	43.91% 184	14.32% 60	7.40% 31	3.82% 16	419
Non-structural elements	34.84% 146	39.38% 165	15.04% 63	7.16% 30	3.58% 15	419

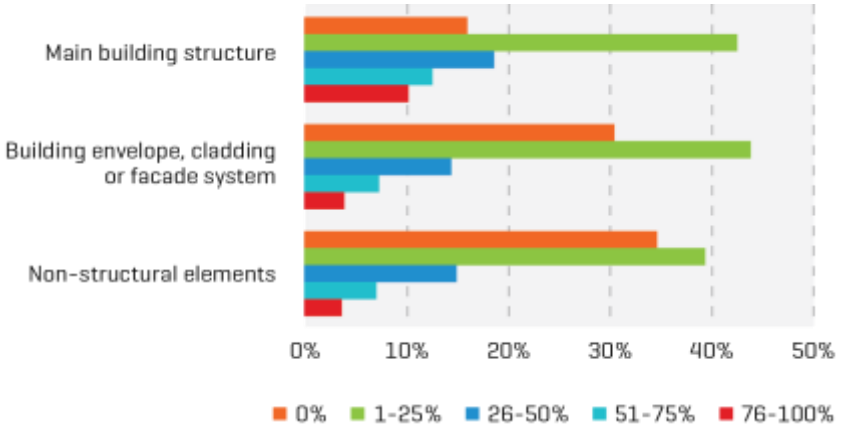

Figure 3. Responses to EWP survey question 3: Percentage of EWPs in projects.

For all three building areas where timber could be implemented, respondents indicated that over 50% of projects in the past 12 months have included timber. It is noted that the two categories building envelope, cladding or façade system and non-structural elements could easily be seen as the same since both relate to parts of buildings that are not considered part of the structure. The results for these categories were also very similar possibly for that reason. It is also seen that the 0% main building structure category had a much lower percentage than the other two 0% categories, suggesting that timber is currently a more common material for structural applications. No option for additional comments was provided for this question.

3.4 Question 4: Change in EWP volume in projects

Question 4 asked, "Has there been a change in the volume of EWPs used in your projects or work over the past 3 years?" The answers provided and response rates are included in Table 4 and Figure 4.

The responses indicate a probable increase in EWP usage, although it is acknowledged that approximately 30% of participants have observed no change and less than 3% have observed a decrease. Approximately 10% of respondents were not sure if there had been a change at all.

Table 4. Responses to EWP survey question 4: Change in EWP volume in projects.

	% of responses	Number of responses
No change	30.17%	143
Noticeable decrease in EWP use	2.32%	11
Noticeable increase in EWP use	56.96%	270
Not sure	10.55%	50
Total		**474**

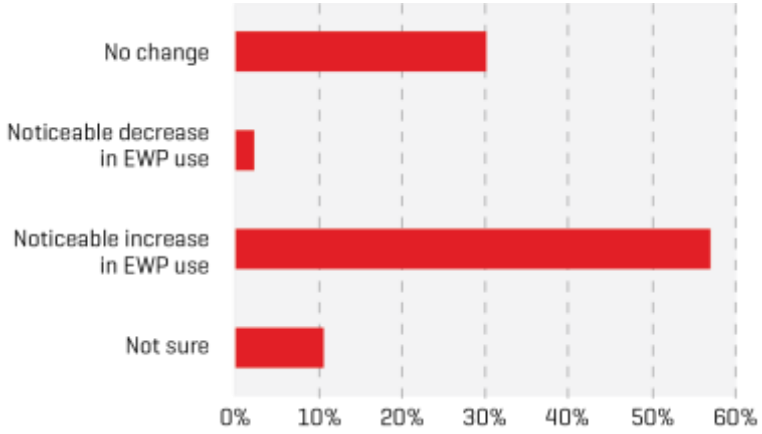

Figure 4. Responses to EWP survey question 4: Change in EWP volume in projects.

3.5 Question 5: EWPs regularly used

Question 5 asked, "Please indicate how regularly you use the following EWPs" and a response matrix was provided with various timber-based products on the vertical axis and indications of how regularly they were used along the horizontal axis. The products, answers provided and response rates are included in Table 5 and Figure 5. The data indicated that plywood and other timber-based products such as particleboard and strand board are used most often in a larger number of projects than other products. Structural LVL came in as the second most commonly used product for the most projects behind panel products. Certain products had a high percentage of never being used including structural CLT, exterior decking and windows and doors. This may be due to the relatively new introduction of CLT to the New Zealand market and the lack of guidance on and reference to CLT in the current New Zealand Building Code and standards. In recent years, material usage for windows and doors is likely to have moved away from timber, with these applications now more dominated by metal and polymer-based products. Other non-structural applications of timber-based products seem to have a mixed-use profile while structural products like I-joists and glue laminated (glulam) timber are used but only in a small proportion of projects.

For participants who chose "Others" from the list of products, a text box was provided that asked them to indicate what other EWPs were used and how often. A range of different products was included in these comments including structural insulated panels (SIPs), truss systems, recycled timber products, engineered flooring products, bamboo products and prefabricated panel systems. Some comments for this question also

noted that the participant was not part of an industry that utilised these products, such as consenting, and therefore the question was not necessarily relevant for them. The frequency of use of these products was only addressed by two of the respondents.

Table 5. Responses to EWP survey question 5: EWPs regularly used.

	Never	A small proportion of my projects	About half of my projects	More than half of my projects	Every project as much as possible	Total
Exterior cladding or façade	35.71% 165	49.78% 230	8.66% 40	4.76% 22	1.08% 5	462
Structural laminated veneer lumber (LVL)	7.63% 36	31.36% 148	24.79% 117	25.21% 119	11.02% 52	472
Structural cross-laminated timber (CLT)	47.10% 219	37.85% 176	10.32% 48	3.44% 16	1.29% 6	465
Plywood or other timber-based panel products (particleboard, strand board, etc.)	2.95% 14	19.62% 93	23.21% 110	34.60% 164	19.62% 93	474
Structural glue laminated timber (glulam)	15.07% 71	51.17% 241	19.11% 90	12.31% 58	2.34% 11	471
Exterior decking material	50.96% 240	30.15% 142	11.25% 53	5.31% 25	2.34% 11	471
Windows and doors	61.47% 284	29.00% 134	5.19% 24	2.38% 11	1.95% 9	462
Interior/decorative linings	31.28% 147	45.32% 213	13.40% 63	8.09% 38	1.91% 9	470
Timber-based I-joists	27.66% 130	51.91% 244	13.62% 64	4.89% 23	1.91% 9	470
Others	65.74% 71	22.22% 24	7.41% 8	3.70% 4	0.93% 1	108

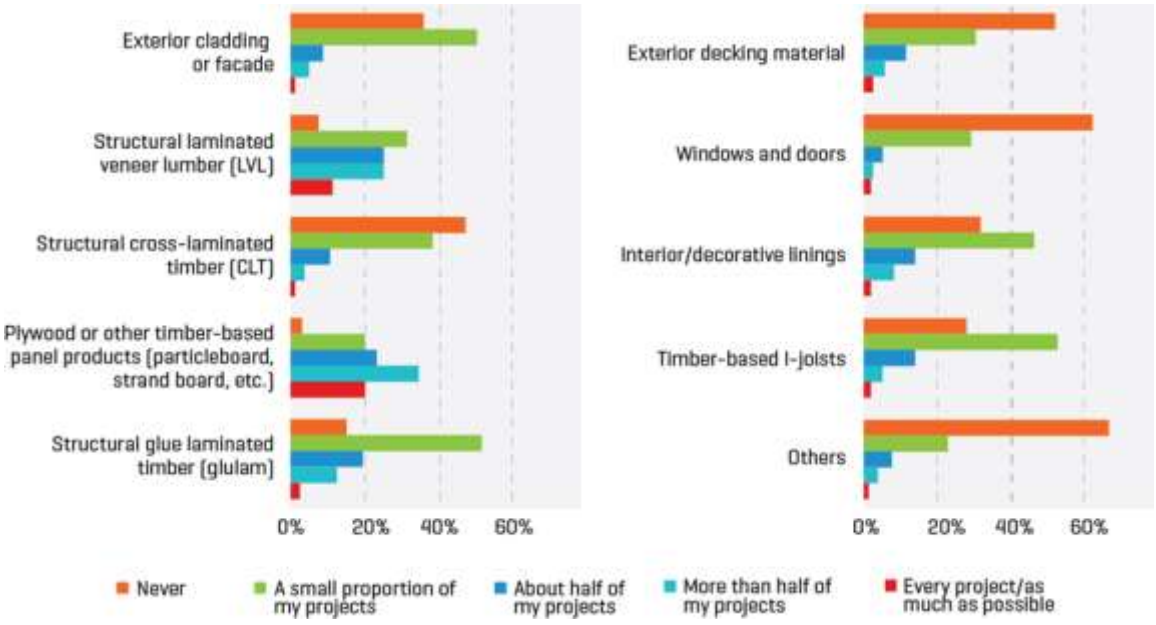

Figure 5. Responses to EWP survey question 5: EWPs regularly used.

3.6 Question 6: Top three EWPs preferred

Question 6 had some reference to question 5 and asked, "Please choose the top 3 EWPs you would like to use more often." The same products listed for Question 5 were included. The results provided in Table 6 and Figure 6 indicate that structural applications are at the top of the list for timber-based products that participants would like to use more, with LVL being the most desired. Plywood and other panel products along with glulam timber were the second most desired products, with CLT and I-joists coming in after that. The remaining non-structural product applications were distinctly less appealing.

For participants who chose "Others" from the list of products, a text box was provided that asked them to indicate what other EWPs they would like to be using more often. The responses to these comments strongly reflected the comments from question 5, including SIPs, truss systems, timber-based insulation products, engineered flooring products and prefabricated panel and floor cassette systems. It was also noted that one respondent would like to see more products with non-toxic adhesives and treatments. Another included Lockwood as a desired product. Others pointed out that they didn't necessarily want to use more EWPs and would not go out of their way to use them over other products. One response was very adamant that EWPs and prefabricated timber systems should be used in modern construction but that regulations were restrictive and not facilitating their use.

Table 6. Responses to EWP survey question 6: Top three EWPs preferred.

	% of responses	Number of responses
Exterior cladding and façade	17.02%	80
Structural laminated veneer lumber (LVL)	75.11%	353
Structural cross-laminated timber (CLT)	40.00%	188
Plywood or other timber-based panel products (particleboard, strand board, etc.)	49.57%	233
Structural glue laminated timber (glulam)	48.72%	229
Exterior decking material	10.21%	48
Windows and doors	8.09%	38
Interior/decorative linings	11.06%	52
Timber-based I-joists	26.38%	124
Others (please specify)	2.13%	10

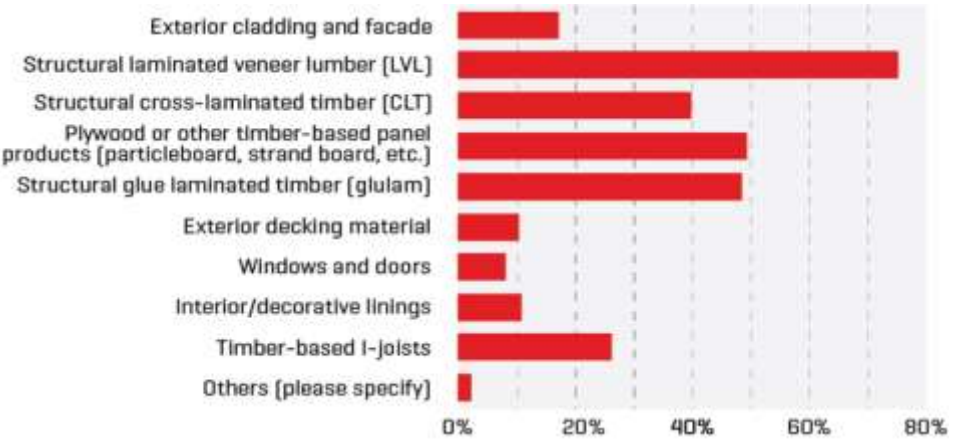

Figure 6. Responses to EWP survey question 6: Top three EWPs preferred.

3.7 Question 7: Details on top three EWPs

Question 7 referenced questions 5 and 6 by asking, "From the EWPs you chose from Question 6, please answer the following questions:

- What do you need to enable you to use these EWPs more often?
- What would be the advantages of using these EWPs more often?
- What do you currently use instead of these EWPs?
- Why do you prefer to use these EWPs?
- Any other comments on these EWPs?"

The answers provided included considerable detail, were highly qualitative and are discussed in the following sections. These fields were intentionally left blank so that respondents would not be guided towards any specific answers but would ideally draw from their own experience and perspective.

What is needed for increased uptake

Increased product information, design aids and guidance, lower cost and material specification were most often seen as critical needs in enabling the use of EWPs.

General product and design information were noted as being needed to help clients, architects and engineers to have confidence that these products will perform in the long term, be cost-effective and result in Code-compliant solutions. There were a few comments suggesting BRANZ Appraisals or CodeMark certifications would be helpful. These comments also identified the need for better understanding around regulatory acceptance and what is required by councils to ensure that specifying EWPs will be successful. Useful design information suggested by respondents included material properties, installation details and ideally online design aids, tables and calculators so that a range of professionals (not just engineers) can specify EWPs and include them in designs. Several comments specifically mentioned that more information on fire and durability performance is required to build confidence and enable increased EWP usage.

Cost was clearly seen as a primary driving factor in enabling the use of EWPs. While many cited that lower and more competitive pricing would improve uptake, it was also noted that better information on the actual costs would be useful. Information on how these products can save money due to stability, consistency and faster installation, even though the upfront costs appear to be greater, was seen as a way of justifying the greater initial costs of EWPs.

A number of respondents remarked that the uptake of EWPs is dependent on clients and architects making the decision that timber is a viable option and needs to be considered for a wide range of building projects. This came through in comments that, if EWPs are specified by architects and engineers and there is a better understanding from clients and owners that these products are viable, their use will increase.

Material availability was also noted by some as limiting the increased use of EWPs. In particular, CLT and oriented strand board (OSB) were listed as products that could be very useful in the New Zealand building industry.

Some noted that all the information they require is available if you know where to look for it. One suggestion was made specifically for case study research to provide examples of how EWPs can be used. Tables and online calculators for fast and simple designs were cited by numerous respondents as helping with increased EWP use. More

incentives to reduce carbon footprints were also cited as helping to promote and enable EWP usage.

Advantages of using EWPs

The advantages cited for using EWPs were primarily related to improved performance, cost and the environmental benefits of using these products. Numerous respondents noted that the aesthetics and appearance of timber were seen as desirable and contributing to the advantages when using EWPs. The durability and ability of EWPs to be integrated within prefabrication methods were also noted as advantages by a few respondents. Often advantages were put in the context of comparing EWPs with standard timber as well as other materials in some cases, such as steel and concrete.

EWP performance was overwhelmingly seen as the greatest advantage to using the selected products. Increased overall performance for an entire project was noted and often included elaboration about how EWPs contributed, including:

- stability and simplicity of use and installation
- dimensionally accurate
- high-quality products resulting in better-quality buildings
- increased strength and spanning ability
- increased airtightness, including the possibility of a full timber building envelope
- lighter weight of members and the overall building
- increased speed of construction and time savings
- simplification of other trades on site
- consistency of product
- ability to change things on site.

Many of these aspects were related to reduced overall project costs, particularly where time could be saved by using products that required less modification or adjustment on site. Some comments included statements that better understanding of EWPs and their applications could result in lower costs and increased availability of products.

A range of environmental benefits were cited as advantages including increased sustainability, utilising locally sourced products and reducing carbon footprints by using EWPs. Environmental advantages discussed also included reduced reliance on and use of steel. A limited number of those who compared EWPs to steel did mention environmental aspects specifically. The ability of EWPs to be installed effectively was considered a positive contribution to creating more environmentally efficient buildings.

Some other comments noted that EWPs allowed for the use of materials beyond those specified in NZS 3604:2011 *Timber-framed buildings*, and this could result in less reliance on engineers, which was seen as advantageous. Product support provided by EWP manufacturers was noted as a positive aspect, and increased requests from owners to use EWPs was noted as a step in the right direction. One respondent did comment that EWPs were better for health and safety but did not elaborate on this.

Current use instead of EWPs

This question about what is currently being used was aimed at finding out more about what opportunities exist for EWPs and where they are being used to replace or integrate with other types of building systems. The greatest majority of respondents are using EWPs to replace solid timber and often in applications for use with NZS 3604:2011. The second most common replacement was for steel members and framing. Bracing systems using plasterboard and fibre-cement panels were other

systems cited as being able to be adequately constructed using EWPs such as plywood. Façade systems and cladding such as weatherboards and bricks were other opportunities for using EWPs, and a number of respondents cited using EWPs instead of concrete, although they did not describe the parts of the building they were considering.

There was one mention of wood plastic composite products being replaced by EWPs, although the application was not specified. Some commented that they already use EWPs exclusively with others using as much EWP material as possible.

Top three EWP preference reasons

This part of the question sought more information about why respondents prefer EWPs over other building products. It also provided an opportunity for more elaboration on some of the advantages previously discussed.

Performance was clearly the most significant reason for preferring EWPs. The majority of respondents noted greater spans and strength, with stability in particular cited as the reason for using EWPs. There were numerous comments regarding on-site benefits such as hand tool use, waste reduction and the ease of connections used with EWPs. Consistency of product, benefits of being manufactured in a controlled environment and delivered to site in a dry condition were also cited.

Environmental aspects were reiterated as being important considerations and resulted in EWPs being preferred over other products.

More comments on aesthetics were included as a preferred quality in timber products.

Existing understanding of EWPs was seen as preferable with available data and design tools providing design confidence and also helping with council acceptance. With steel and solid timber, specific engineering design is often required, but with information available, this is not necessarily the case with EWPs. Lack of engineering input was seen as preferable and made possible due to provided guidance and calculators.

Some comments mentioned that respondents were not happy with EWP performance, but did not elaborate. A number of responses also noted they don't prefer to use EWPs.

Multi-storey applications were mentioned, and more common use of timber-based rigid air barriers for bracing capacity and early building enclosure were noted as preferable.

Other comments on top three EWPs

This part of the question was an opportunity for respondents to provide any additional information around the products they selected for question 6 or on EWPs in general. While some comments supported opinions provided for other parts of this question, there were several interesting thoughts articulated regarding the perceived downsides of using EWPs and some suggestions on what would be helpful for research or investigation in the future.

A number of respondents provided general support for increased use of EWPs and commented they would like to be using them more. The reasons included environmental benefits and other benefits noted previously. Specific appeals were made for design guides and methods that would ease the compliance process. Education of clients and builders was also cited as beneficial for increasing the inclusion of EWPs within building projects.

Several comments were made that EWPs are too expensive. In comparison with steel, it was also mentioned that a downside to EWPs is that the depth increases with longer spans and that steel can be used to keep beam depths more manageable. The issue of compatibility of EWPs with other building materials was raised by several respondents, particularly for building façades and envelopes with suggestions made that this is an area of interest that should be investigated further. Complexity of design required for EWPs was also noted as a concern in that it resulted in projects that are difficult to build and may potentially be more expensive.

Treatments and durability are clearly topics that require some attention, both in terms of durability provided by different treatments as well as the environmental impacts. There were also comments around how water exposure affects EWPs and questions about how effective treatments are for different products.

There were also comments around compliance, competition in the marketplace and regulation of EWPs. Government support of EWPs was noted as a suggestion to help gain momentum and develop a large-enough demand to grow the industry in that direction. More competition in the EWP space was suggested as being helpful for creating more options and increasing product availability. Some respondents mentioned a need to reduce barriers so that international products can be incorporated within the New Zealand building industry, whereas other comments indicated that local products and jobs should be an important consideration. A standard to cover the range of EWPs was cited as helpful to develop better understanding of what councils require as well as some of the limitations of these products. More compliance information was definitely seen as needed to increase uptake of EWPs in New Zealand. Inclusion within the new standard coming out in 2020 to replace NZS 3603:1993 *Timber structures standard* was noted as a positive step.

Desire to have simple enough design tools so that engaging with an engineer was not a requirement was stressed as critical because it can hold up a project if consultation is required. One recommendation was an appeal for simplicity and made mention of the steel industry, which has made efforts to keep the designs simple and not overly complex.

There were also a range of comments on matters that potentially could require some future research. CLT usage was raised, and it was suggested that more information be available on its use and durability so that consenting authorities can have a better understanding of how it should be used. Penetrations in EWPs was mentioned as a concern for their use that requires more information. Fire and acoustics were mentioned as important considerations requiring more readily available data and information.

3.8 Question 8: Effects of increased EWP usage

Question 8 asked, "Indicate how beneficial or detrimental you think increasing the use of EWPs in New Zealand construction would be in the areas listed below" and a response matrix was provided with different areas of interest on the vertical axis and indications of how beneficial or detrimental they might be along the horizontal axis. The interest areas and indication levels are shown along with the results in Table 7 and Figure 7.

The different potentially affected areas showed interesting differences in how increasing the use of EWPs was perceived. All areas had only minimal responses that suggested that increasing EWP usage would be very or somewhat detrimental.

Table 7. Responses to EWP survey question 8: Effects of increased EWP usage.

	Very detrimental	Somewhat detrimental	Neither/ neutral	Somewhat beneficial	Very beneficial	Total
The building industry	0.00% 0	2.11% 10	13.71% 65	34.60% 164	49.58% 235	474
Building end users	0.42% 2	1.48% 7	19.62% 93	42.62% 202	35.86% 170	474
Quality of New Zealand's building stock overall	0.63% 3	2.32% 11	15.19% 72	45.78% 217	36.08% 171	474
Easing the housing shortage in New Zealand	0.63% 3	3.17% 15	54.55% 258	27.91% 132	13.74% 65	473
Increasing utilisation of value-added products from New Zealand primary industries	0.63% 3	1.90% 9	18.99% 90	37.13% 176	41.35% 196	474
Reducing greenhouse gas emissions/ reducing the carbon footprint of the built environment	0.63% 3	6.75% 32	41.35% 196	23.21% 110	28.06% 133	474
Increasing the ability to provide prefabricated building solutions for New Zealand	1.05% 5	1.27% 6	19.83% 94	35.44% 168	42.41% 201	474

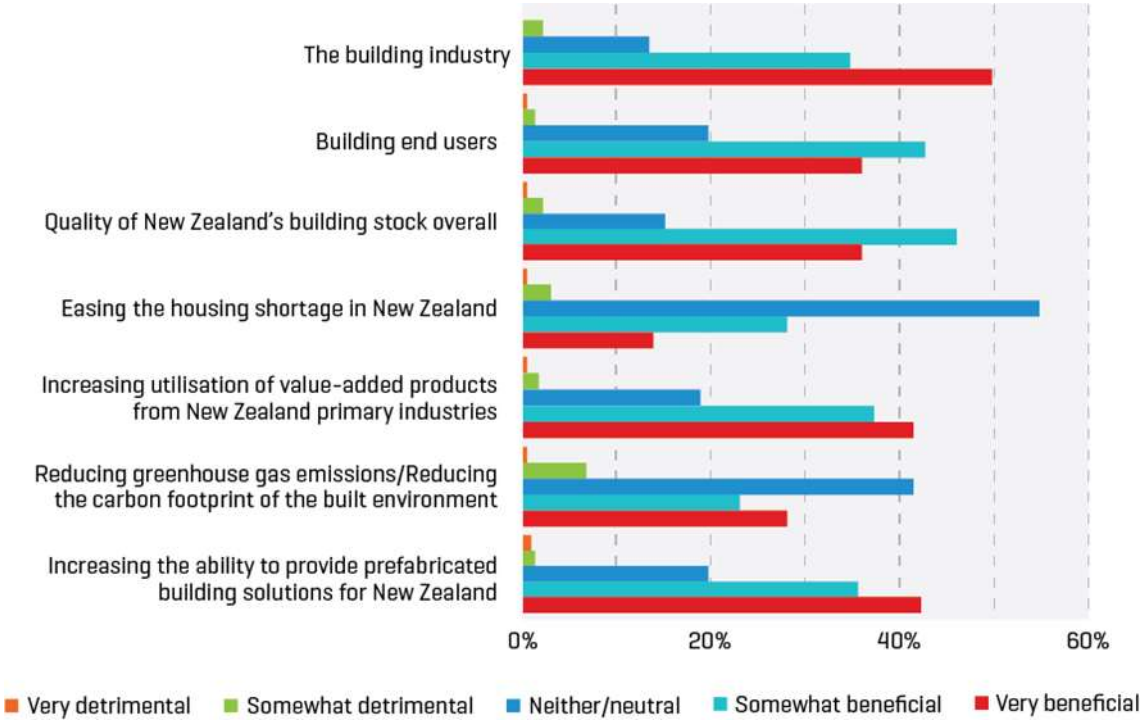

Figure 7. Responses to EWP survey question 8: Effects of increased EWP usage.

It is worth noting that only for the building industry was there no perception of the increase being very detrimental, with all other areas having some level of detriment assumed. For reducing greenhouse gas emissions and carbon footprints, there was a slightly greater response that increasing EWP usage would be somewhat detrimental at 6.75%. This area also had a neutral response rate of 41.35%, which was the greatest proportion for that question, with just over 50% of respondents assuming it would be somewhat or very beneficial to increase EWP usage.

Responses suggest that the building industry, building end users and the quality of the New Zealand building stock would benefit either somewhat or very much by increasing EWP usage. The greatest majority of participants were neutral on whether increased EWP usage would ease the housing shortage, with a greater percentage assuming it would be beneficial rather than detrimental. Responses on the areas of increasing value-added product use and increasing the ability to provide prefabricated solutions were similar, with approximately 70% of participants thinking that EWP would be somewhat or very beneficial.

In general, these results provide a positive perception of using EWPs and suggest there is more likely to be beneficial rather than detrimental outcomes with more EWP usage. It is worth trying to understand the potential detrimental outcomes and determine whether there are ways to minimise the negative impacts. Some of these have been indicated in previous questions and require attention.

3.9 Question 9: Existence of barriers to EWP usage

Question 9 asked, "Indicate your level of agreement with the following statement: Significant barriers do exist to increasing the use of EWPs in New Zealand construction." The responses are provided in Table 8.

Table 8. Responses to EWP survey question 9: Existence of barriers to EWP usage.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	Total
2.11%	12.87%	36.50%	39.03%	9.49%	
11	61	173	185	45	474

A sizeable proportion of participants were neutral on this question with slightly less than 50% noting they somewhat or strongly agreed. Only these respondents were directed to questions 10–12, with the rest going directly to question 13. Nearly 15% somewhat or strongly disagreed. This suggests that there is the perception by nearly half of the respondents that there are some barriers, and the following questions seek to understand more about these perceived barriers.

3.10 Question 10: Top three barriers to EWP usage

This question only became available to respondents who answered that they somewhat or strongly agreed with question 9. Question 10 asked for elaboration on the barriers to EWP usage by asking, "You indicated that there are significant barriers to increasing the use of EWPs in New Zealand construction. Please describe the top three barriers that lead you to believe this."

Three text boxes were provided for the responses, and the barriers described fell into several groups.

Cost

Cost was considered by many to be a barrier to increased EWP usage. It was noted that this isn't limited to the cost of the products but also includes increased design time and costs for achieving Code-compliant designs. There was also the perception of timber buildings as being more costly, which can create resistance to including EWPs within a design. It was noted that increasing demand for EWPs would result in lower and more competitive costs for the products and designs using them. Lack of quantity surveyor knowledge was cited as well as general uncertainty around EWP costs resulting in higher cost estimates that could drive designers and clients away from EWP solutions.

Regulation and compliance

Lack of clear compliance pathways and regulatory guidance was seen as a significant barrier to increasing the uptake of EWPs in the New Zealand building industry. Comments included difficulties with different councils on accepting EWP solutions as well as unclear pathways for achieving council approval.

Fire and acoustics were specific areas mentioned where criteria were unclear or difficult to verify for compliance when using EWPs. Lack of government support to initiate programmes to incentivise the use of EWPs was mentioned along with numerous comments about lack of up-to-date standards, with the current ones being developed without EWPs in mind. An increase in Acceptable Solutions was considered a good option for reducing barriers to EWPs.

Education and knowledge

The barriers cited most often were around knowledge and understanding of EWPs, including education on their design and how to build with them. There were several respondents who noted the lack of guidance on design methods and suggested more be available both through standards and guidelines. This lack of understanding included the full range of building industry players, including building owners and clients, architects, engineers, designers and builders.

There was a distinct sense that the tradition of building using solid timber according to NZS 3604:2011 was considered good enough and that there is considerable reluctance to try "new" products and systems using EWPs that haven't stood the test of time in New Zealand. It was also noted that the building industry is very slow to make changes, even when faced with better-performing options. There was also the lack of knowledge around EWPs, and increased publicity and education were cited as possible solutions to letting more people within and outside of the building industry know about EWPs and the benefits of using them.

Availability

Supply issues around EWPs were frequently mentioned as barriers and included limited manufacturers and stocks at suppliers, along with significant lead times required for some materials. Both of these were seen as possible contributors to increased costs for EWP use and reluctance on the part of designers and clients to want to use these products. Some comments noted a lack of variety and quality with EWPs but did not mention specific products. CLT was mentioned numerous times regarding limited supply and limited knowledge around design and acceptable compliance pathways. Barriers for the introduction of overseas products were also seen as creating limitations on EWP supply.

Durability

Issues with durability and perceptions around questionable long-term performance were also included with barriers listed. Treatment standards were cited as either non-existent or unclear, which contributed to sometimes difficult compliance pathways for EWPs and led to problems with council acceptance in some cases. The history of weathertightness failures in timber buildings was also raised as a reason for some reluctance around specifying EWPs. Better understanding of the science behind different materials and their performance as well as more information about historical failures and what changes have been made to avoid these being repeated were suggestions in improving understanding of EWP durability. Understanding what has changed would allow for more confident applications of EWPs to avoid those mistakes happening again. Risk aversion was noted as having significant impact on decision making, and more knowledge on EWP durability is needed to mitigate risk to clients, designers and builders.

Other barriers

There were also some barriers described that did not fit within the categories listed above. Lack of knowledge on how to make the most of prefabricated solutions using EWPs was mentioned as potentially affecting costs. Limited knowledge around mixing materials and how to make integrated EWP systems perform as they should was cited and could have effects on durability and other building performance. While the environmental aspects of timber and EWPs are usually seen as an advantage, the potential of adhesive toxicity was mentioned by more than one respondent as a barrier to using more EWPs. A lack of regulation requiring environmental and life cycle performance was also considered a barrier in that the environmental benefits of EWPs are not necessarily included as part of the decision-making process. It was suggested there is a need to provide incentives for those trying to include environmentally preferable products over those who don't. The need for case study buildings was noted a few times as helping to reduce barriers and provide examples for how EWPs can be incorporated within building designs. While general guidance was suggested to help alleviate EWP design barriers, multi-storey timber buildings were mentioned specifically as requiring some guidance.

3.11 Question 11: EWP priorities and opportunities

This question only became available to respondents who answered that they somewhat or strongly agreed with question 9. Question 11 asked, "Indicate your level of agreement with the following statements" and a response matrix was provided with two statements on the vertical axis and levels of agreement along the horizontal axis. The statements and agreement levels are shown along with the results in Table 9 and Figure 8.

Table 9. Responses to EWP survey question 11: EWP priorities and opportunities.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	Total
Identifying solutions to address barriers to EWP use should be a priority	0.92% 2	0.46% 1	12.44% 27	47.00% 102	39.17% 85	217
KiwiBuild presents an opportunity for the New Zealand construction industry to increase its use of EWPs	6.45% 14	5.53% 12	19.82% 43	35.94% 75	32.26% 70	217

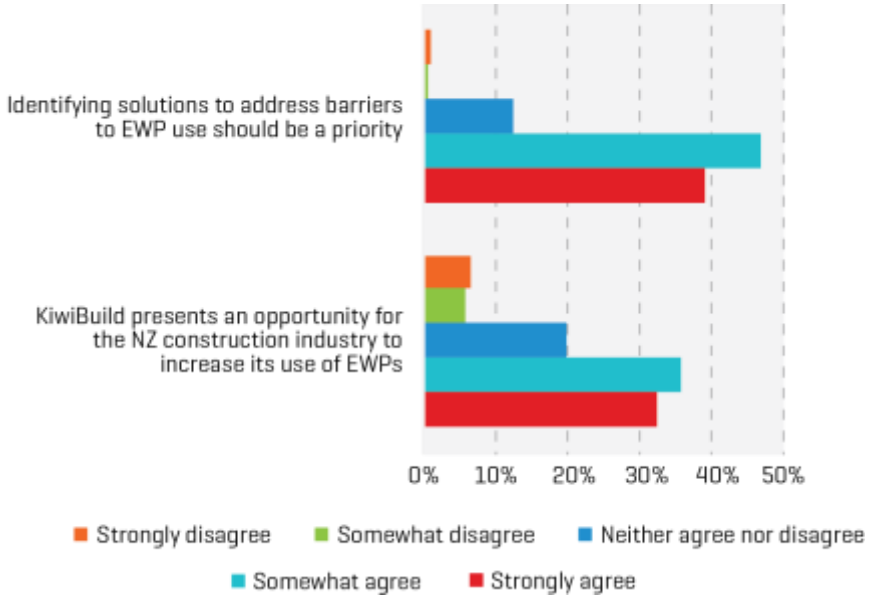

Figure 8. Responses to EWP survey question 11: EWP priorities and opportunities.

Because this question was only answered by those respondents who agreed that barriers exist, it is not surprising that there were high rates of agreement with the question on the importance of identifying solutions to resolve barriers. Nearly 90% of the responses indicated a somewhat or strong agreement with prioritising this work on eliminating barriers.

The second question was aimed at assessing opinions on whether KiwiBuild was likely to provide opportunities for increased EWP usage. As seen in the results, just over 77% of responses agreed somewhat or strongly that KiwiBuild could provide this opportunity.

3.12 Question 12: Top three EWP uptake barrier solutions

This question only became available to respondents who answered that they somewhat or strongly agreed with question 9. Question 12 asked, "Do you think you know what the solutions to the barriers to EWP uptake are? Please describe up to three of the most important solutions you are aware of." A text box was provided for qualitative responses. In reviewing the responses to this question, it was clear there was some overlap with question 10. Even though question 10 had asked for barriers, the responses included suggestions for how to eliminate these barriers as described previously and in many cases noting a lack of something as a barrier clearly indicated a perceived need or solution.

By far the greatest numbers of responses recommended education and promotion of EWPs so that more people in the building industry would understand what EWPs are, how they can be used and what using them can mean for their building projects. Lowering costs and increasing supply were the next most common suggestions. Issues around regulation, compliance pathways and government initiatives made up the other commonly mentioned issues, with a few other suggestions included on different areas where improvements could be made.

A wide range of solutions to all sectors of the building industry around education and promotion were recommended. While some suggestions were repeated in different ways, the following provide an overview of the many ideas put forth:

- Educate owners about the benefits of using EWPs and provide cost examples to foster better understanding. The building industry may be aware of EWP benefits, but it needs to be understood by clients and owners who are making decisions about materials for their buildings.
- More information on cost and cost modelling around savings through increased efficiency needs to be available.
- Much more promotion about EWPs should be done including how they can be used and integrated into Code-compliant designs.
- It is important to sell the advantages of EWPs over other materials, especially solid timber.
- Evidence-based information on the economic viability of EWPs is needed.
- Educate engineers on the Code-compliant use of EWPs that can perform well and be cost-efficient.
- Seminars and on-site assistance were seen as ways of helping gain market traction for EWPs.
- Educating government, including MBIE and councils, so that compliance pathways for EWPs can be understood by all and easily implemented.
- More promotion around award-winning projects using EWPs and general increased publicity seen as needed. Demonstration and case study projects of successful EWP buildings within New Zealand and from around the world will help educate designers, owners and builders.
- Environmental and sustainability information should be made more available and promoted extensively, even to the point of requiring it as a consideration for consenting.
- Upskill the builders because the workmanship is not acceptable in some instances.
- Design guidance requested by numerous respondents.
- More information around integrating EWPs with prefabrication methods was sought.
- Testing and compliance information around durability and treatment was seen as necessary data and also to alleviate negative perceptions around poorly performing timber materials based on historical precedents.
- More in-depth *Build* magazine articles that include benefits and cost information on EWPs were suggested.
- Many calls for prescriptive methods for using EWPs to avoid having to use "costly" engineers and including EWPs within NZS 3604:2011 along standard detailing and connections.
- Increased availability of historical information on EWPs and their use.

Lower costs and availability of EWPs were seen as related by many participants, with some pointing out that design understanding, availability and cost were all interrelated and needed to be addressed simultaneously. In general, higher costs for EWPs were seen as being driven by lack of options, limited manufacturers and also limited understanding about how these products could be used. Many expressed that a lack of competition was creating problems. More collaboration among the timber industry in general was seen as a way of moving forward with EWPs and creating more effective competition for the steel and concrete sectors. Inclusion of overseas EWPs was thought to be a potential solution, so long as a robust evaluation process was undertaken to ensure compliance with New Zealand conditions and requirements.

There were many calls for government intervention and support. Government incentives for EWP usage and government partnerships to assist those who are keen to include EWPs in projects were suggested. Increased government subsidies for using more environmentally beneficial and lower-carbon products like EWPs was mentioned along with updating building standards that include EWPs. Improved and updated standards were seen as creating clear compliance pathways to ensure historical mistakes are not repeated. It was noted that even the updated timber code replacing NZS 3603:1993 does not include the full range of available EWPs. Government involvement and intervention was seen as an effort to share the risk of using new and innovative products that are value added in New Zealand and also as a government opportunity to show what can be done with EWPs in New Zealand.

While the majority of comments on codes and standards were seeking more prescriptive solutions, there were a few suggestions for increased performance-based standards that would result in sound engineering solutions.

Also included were different comments around holistic building design that incorporates EWPs and considers all aspects of building performance, not just structural. This includes details for fire and acoustic separation, which can be more expensive for multi-unit and multi-storey timber buildings. Standard detailing was suggested as a way to alleviate some of this uncertainty and the need to engineer each building. This also includes potentially reducing timber treatment levels through accurate building physics modelling.

One suggestion was that the results from this survey be considered and the issues raised addressed. Another comment was also aimed at BRANZ-provided EWP solutions done in conjunction with online tools that could be integrated with manufacturer information and design data for a range of EWP applications.

3.13 Question 13: Specific EWP advantages and disadvantages

Question 13 asked, "In your opinion, compared to other products, do EWPs offer advantages or advantages or disadvantages in the following areas" and a response matrix was provided with provided with various performance aspects on the vertical axis and levels of advantage and and disadvantage along the horizontal axis. The performance aspects, answers provided and provided and response rates are included in Table 10 and

Figure 9. A comment box was also provided, and respondents were asked, "For those Advantages/Disadvantages that you noted as "Significant" please describe the Advantages/Disadvantages".

The majority of respondents indicated that using EWPs would be advantageous for most of these aspects. Structural performance and speed of construction stood out, with over 80% of respondents finding EWP usage to have some or significant advantage for those aspects. EWP usage was also perceived as advantageous for ease of design and building aesthetics, with both rated as having some or significant advantages by approximately 65% of respondents. More than 50% of participants perceived EWP usage for fire resistance and durability as having some or significant advantages.

Very few respondents thought that significant disadvantages resulted when using EWPs, although the only aspect with 0% significant disadvantage was speed of construction. Fire resistance, durability, cost of construction and overall economics all

had at least 10% of participants rating EWP usage for them as having some disadvantage, with cost of construction having nearly 33% of respondents citing some disadvantage. Ease of design when using EWPs was thought to be some disadvantage by nearly 10% of respondents.

Table 10. Responses to EWP survey question 13: Specific EWP advantages and disadvantages.

	Significant disadvantages	Some disadvantages	Neither/ neutral	Some advantages	Significant advantages	Total
Fire resistance	1.84% 8	10.60% 46	32.95% 143	43.55% 189	11.06% 48	434
Structural performance	0.23% 1	3.67% 16	11.24% 49	43.35% 189	41.51% 151	436
Durability	2.07% 9	12.41% 54	28.97% 126	43.45% 189	13.10% 57	435
Insurance costs	0.23% 1	2.78% 12	81.25% 351	12.50% 54	3.24% 14	432
Acoustic performance	0.69% 3	7.36% 32	49.43% 215	37.47% 163	5.06% 22	435
Speed of construction	0.00% 0	2.75% 12	14.22% 62	52.98% 231	30.05% 131	436
Cost of construction	2.99% 13	32.64% 142	27.36% 119	30.80% 134	6.21% 27	435
Overall economics (such as operational or maintenance costs)	0.69% 3	10.32% 45	45.18% 197	36.47% 159	7.34% 32	436
Vibration performance	1.15% 5	5.76% 25	54.61% 237	32.26% 140	6.22% 27	434
Building aesthetics	0.23% 1	3.67% 16	28.44% 124	47.48% 207	20.18% 88	436
Ease of design	2.07% 9	9.89% 43	23.45% 102	48.51% 211	16.09% 70	435

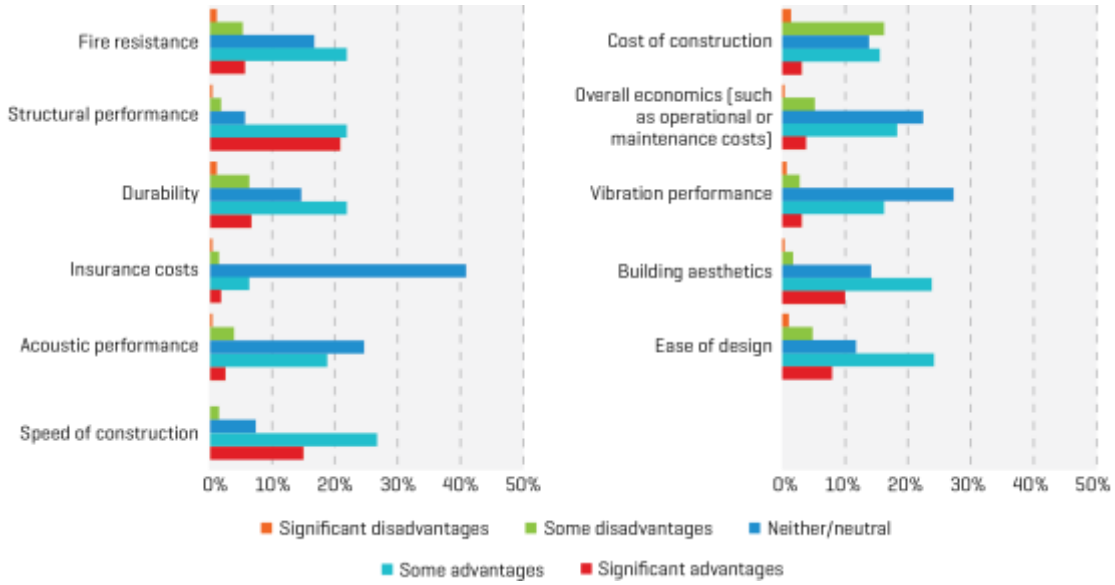

Figure 9. Responses to EWP survey question 13: Specific EWP advantages and disadvantages.

Insurance costs didn't appear to be a significant advantage or disadvantage when using EWPs, with over 80% of respondents being neutral on that aspect. Acoustic and vibration performance also seemed to be less of a concern than other aspects, with approximately 50% and 55% of respondents, respectively, citing a neutral vote for those.

The comments provided in the optional text box further supported the results provided in the previous discussion for this question. Strength, stability and ease of use of EWPs were mentioned as significant advantages when using these products. Consistency of the products and the aesthetics of timber were also discussed in very positive terms when using EWPs. Speed of construction as a result of the manufactured nature of EWPs was another advantage, which was also linked to the ability to use EWPs for prefabricated building systems. Prefabrication as a likely direction for the future of New Zealand buildings was emphasised and EWPs were seen as a good material choice for it, alongside adaptability for design for manufacture and assembly (DfMA) processes. The ability to use timber for larger buildings was noted as being more feasible with EWPs, and this included some comments on the earthquake resilience that EWPs can provide. The use of timber over steel was seen as an advantage by many on different aspects including design, installation, site modification and fire resistance.

While there weren't many comments around environmental issues, increased use of local resources and value-added products were cited as definite advantages to using EWPs manufactured in New Zealand.

Numerous comments highlighted the disadvantages perceived when using EWPs, and these provide opportunities for various players in the building industry to seek changes if EWPs are to be increasingly used. Higher costs remained as a cited potential disadvantage, although many noted that there is a strong possibility of saving money through efficiency and consistency that EWPs provide. Expert input on designs would be very helpful at this "early" stage in the use of EWPs, and there were some concerns that designers do not fully understand how to design with EWPs and timber in general. Along this line were comments on complexity of the designs required when using EWPs and how this made it necessary to use engineers for the projects, which was seen in some cases as a disadvantage. Complex detailing was seen as a disadvantage, especially regarding larger buildings with multiple residents or accommodation requiring acoustic and fire separation. Durability also continued to be a concern. Some comments noted that steel and concrete are easier to design than timber in general.

3.14 Question 14: Building sector perceptions of EWPs

Question 14 asked, "What perceptions around EWPs have you mostly encountered from people from people in the sectors below?" and a response matrix was provided with building industry industry sectors on the vertical axis and grades of perceptions along the horizontal axis. The axis. The sectors, perceptions provided and response rates are included in Table 11 and

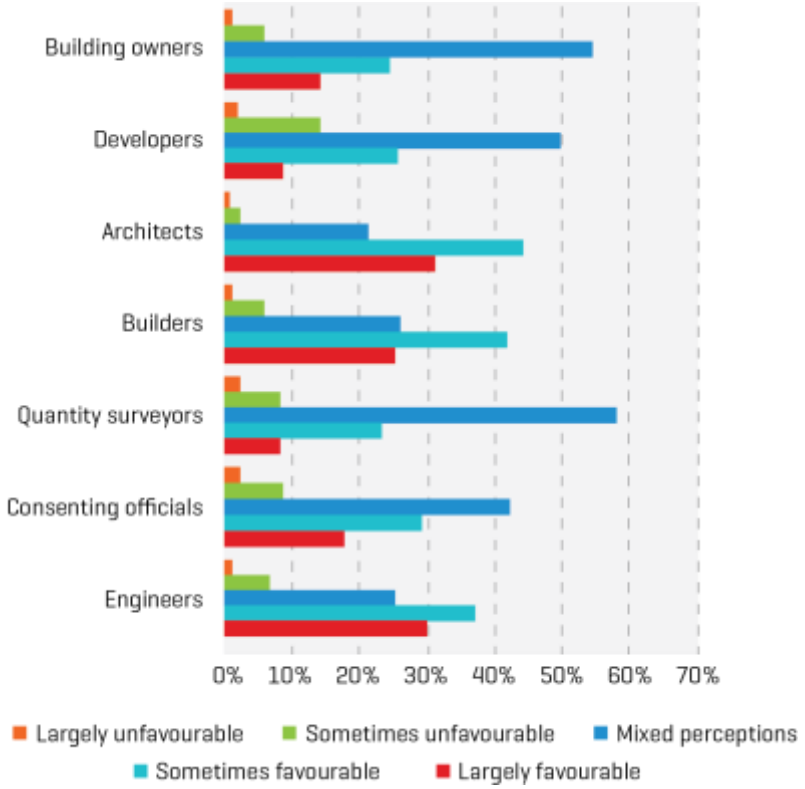

Figure 10. A comment box was also provided and respondents were asked, "If you know of others not listed here please elaborate on the group and the perceptions".

The responses in general indicate more favourable perceptions from all sectors than unfavourable, but it is worth noting that large portions of several sectors were thought to have mixed perceptions, which suggests some uncertainty by respondents. This was further supported by comments in the text box where numerous participants noted there was not an option of "Not sure" or "N/A". Building owners and quantity surveyors were both rated by over 50% of respondents as having mixed perceptions, and developers and consenting officials both had over 40% of respondents rating them as having mixed perceptions.

The largest percentage of unfavourable perceptions was attributed to developers and the smallest amount attributed to architects. This was reflected on the favourable side with architects cited as being sometimes or largely favourable by 75% of respondents. Engineers and builders were not far behind that with combined favourable perceptions rated at over 65% for both. Quantity surveyors had the lowest combined favourable perceptions and developers the second lowest.

Table 11. Responses to EWP survey question 14: Building sector perceptions of EWPs.

	Largely unfavourable	Sometimes unfavourable	Mixed perceptions	Sometimes favourable	Largely favourable	Total
Building owners	1.15% 5	5.99% 26	54.38% 236	24.42% 106	14.06% 61	434
Developers	1.86% 5	14.15% 61	49.65% 214	25.75% 111	8.58% 37	431
Architects	0.69% 3	2.30% 10	21.38% 93	44.37% 193	31.26% 136	435
Builders	1.15% 5	5.76% 25	26.04% 113	41.94% 182	25.12% 109	434
Quantity surveyors	2.38%	8.08%	58.19%	23.28%	8.08%	421

	10	34	245	98	34	
Consenting officials	2.32% 10	8.58% 37	42.23% 182	29.23% 126	17.63% 76	431
Engineers	0.92% 4	6.67% 29	25.29% 110	37.24% 162	29.89% 130	435

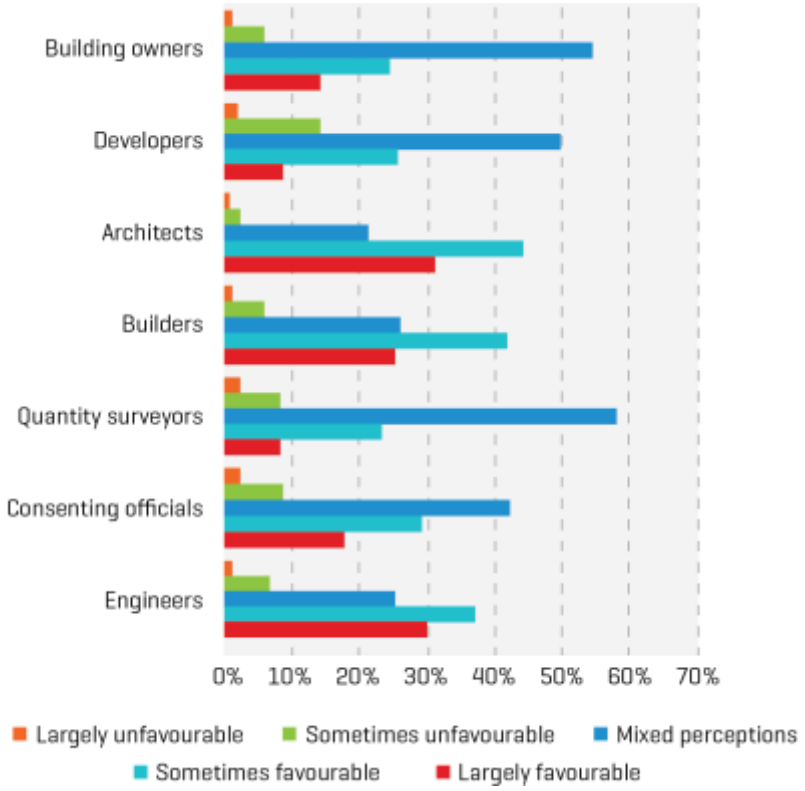

Figure 10. Responses to EWP survey question 14: Building sector perceptions of EWPs.

All sectors were cited as having less largely favourable perceptions than somewhat favourable perceptions, which was a trend mirrored on the unfavourable side.

The comments provided did not provide much additional information, although several respondents did note that either they had no interactions with some of the sectors listed or felt that the question should have options for acknowledging the fact that they were not sure. A few comments noted that consenting officials who understood EWPs and design methods tended to be favourable in their use. There was also the qualification that builders had a tendency to shy away from timber products over fears around movement and potential call-backs.

3.15 Question 15: Recommending EWPs

Question 15 asked, "Would you be more likely to recommend or work with EWPs if there was more information available on designing and building with them?" The answers provided and response rates are included in Table 12 and Figure 11.

Table 12. Responses to EWP survey question 15: Recommending EWPs.

	% of responses	Number of responses
No, I already regularly recommend/work with EWPs	16.97%	74
No, I prefer not to recommend/work with EWPs	1.38%	6

Yes, more information would make it easier to design/work with EWPs	58.72%	256
Yes, I already know what I need to know, but having that information for others would be helpful	19.50%	85
Unsure	3.44%	15
Total		**436**

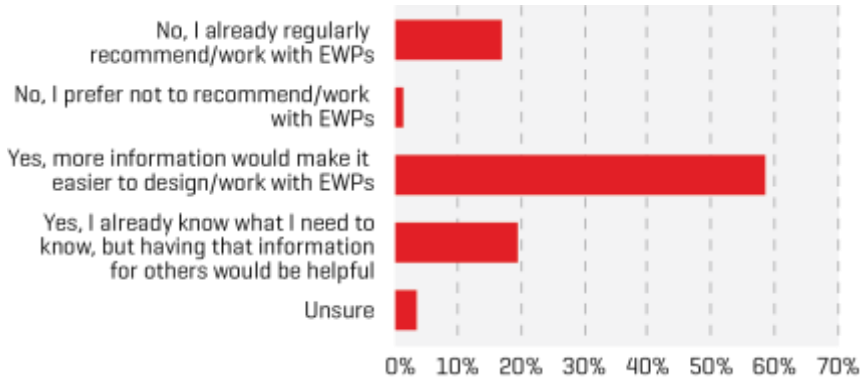

Figure 11. Responses to EWP survey question 15: Recommending EWPs.

The majority (nearly 60%) of respondents who answered this question cited that more information would make it easier to work with and design using EWPs. Another nearly 20% responded they had enough information, but increased information would be helpful in educating others about EWPs. Another nearly 17% already use EWPs and did not feel that more information was needed. Only a handful of respondents (less than 2%) would prefer not to work with EWPs and subsequently did not think more information was required.

3.16 Question 16: EWP incentives

Question 16 asked, "In your opinion, how much incentive would the following provide in encouraging the use of EWPs across the building sector?" and a response matrix was provided with incentives on the level of incentive (none, some or huge) along the horizontal axis. The incentives and response rates are included in Table 13 and

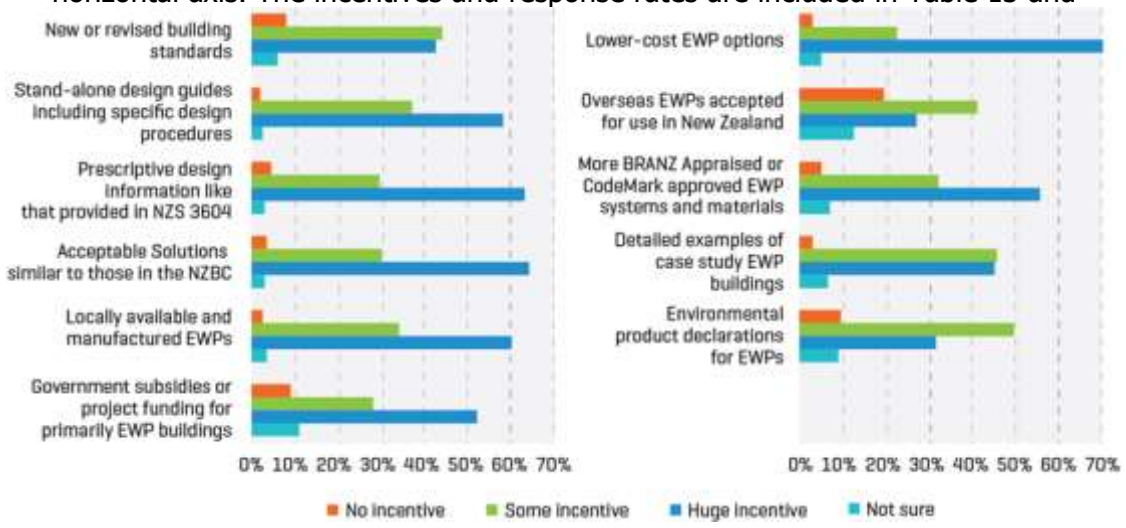

Figure 12. A comment box was also provided, and respondents were asked, "Do you know of any other incentives that would encourage the increased use of EWPs throughout the New Zealand building sector?"

Table 13. Responses to EWP survey question 16: EWP incentives.

	No incentive	Some incentive	Huge incentive	Not sure	Total
New or revised building standards	7.82% 34	43.91% 191	42.30% 184	5.98% 26	435
Stand-alone design guides including specific design procedures	2.06% 9	37.16% 162	58.26% 254	2.52% 11	436
Prescriptive design information like that provided in NZS 3604	4.36% 19	29.59% 162	63.07% 254	2.98% 11	436
Acceptable Solutions similar to those in the NZBC	3.24% 14	29.86% 129	64.12% 277	2.78% 12	432
Locally available and manufactured EWPs	2.52% 11	33.94% 148	60.09% 262	3.44% 15	436
Government subsidies or project funding for primarily EWP buildings	8.94% 39	28.21% 123	52.06% 227	10.78% 47	436
Lower-cost EWP options	2.75% 12	22.48% 98	69.95% 305	4.82% 21	436
Overseas EWPs accepted for use in New Zealand	19.59% 85	40.78% 177	27.19% 118	12.44% 54	434
More BRANZ Appraised or CodeMark approved EWP systems and materials	5.05% 22	32.11% 140	55.73% 243	7.11% 31	436
Detailed examples of case study EWP buildings	2.76% 12	45.75% 199	45.06% 196	6.44% 28	435
Environmental product declarations for EWPs	9.40% 41	49.77% 217	31.65% 138	9.17% 40	436

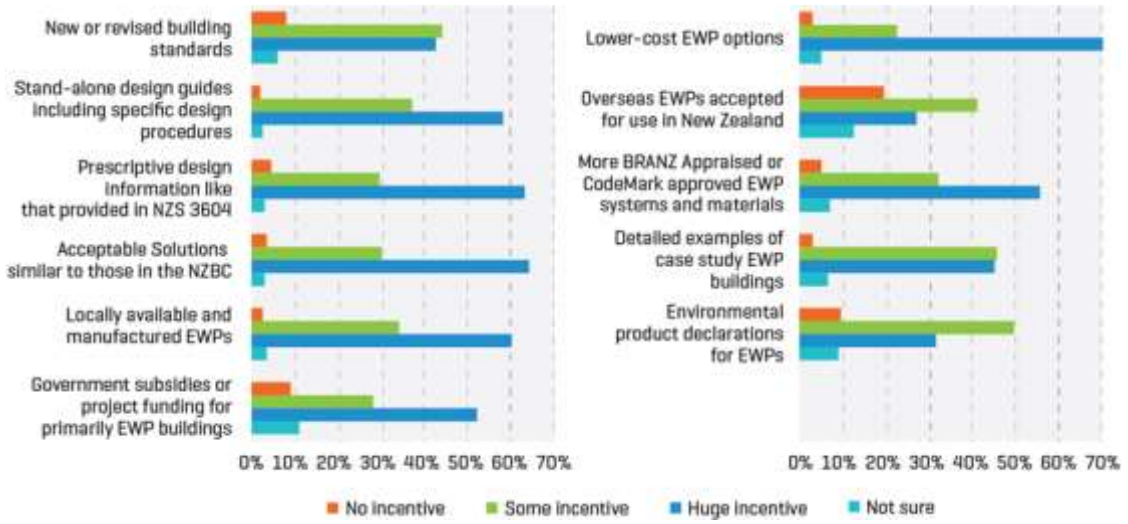

Figure 12. Responses to EWP survey question 16: EWP incentives.

Because many of these incentives had already been mentioned throughout the survey, it was not surprising that there was considerable input that many would likely be successful in increasing uptake and use of EWPs. Lower cost, locally available and manufactured EWPs and providing prescriptive methods and Acceptable Solutions were all cited by more than 60% of respondents as providing huge incentives for increasing

EWP uptake. Stand-alone design guides, government subsidies including project funding and more BRANZ Appraised and CodeMark certified EWP systems were not far behind, with all seen as providing huge incentives for EWP uptake by over 50% of participants.

New or revised building standards were rated a combined some and huge incentive by over 85% of respondents, split relatively equally between some and huge. It is presumed that Acceptable Solutions might overlap some with this incentive. Reponses on overseas EWPs were more mixed and evenly distributed across the incentives, with the greatest category being some incentive with just over 40%. Environmental product declarations also had a mixed response rate, but nearly 50% of respondents felt they could provide some incentive and over 30% rated the incentive as huge.

The comments provided in the text box further supported the information in the incentives matrix and some additional information was included. Government interventions were cited as potentially having an effect on EWP uptake, but the direction of these came from different perspectives, with different objectives and results noted. Increased treatment level availability for EWPs was seen as a positive incentive along with more products that were prefabricated and ready for installation. Having more EWPs that can be used externally was mentioned several times. Cost was cited numerous times along with education for the range of architects, designers and engineers working with EWPs.

The education aspect was multi-faceted, and suggestions were made to include marketing and communication around EWP usage to show what societal, environmental and economic benefits could be possible with increased use of EWPs, as opposed to sending New Zealand logs to be processed overseas. Additional case studies for the full range of possible building types possible with EWPs were mentioned, along with suggestions for increasing visibility about successful projects already built. Education of those merchants selling EWPs was also seen as necessary in bridging the gaps between specifiers and builders who want to use EWPs where possible. More life cycle costing information and training of designers and builders were seen as critical parts of education around EWPs.

Environmental benefits of EWPs as providing incentives were cited several times, along with comments that improved education on these benefits could certainly provide some incentive across the building industry if a broader range of people understood EWPs. It was noted though that the environmental aspects need to include the processes and adhesives used with EWPs in order to comprehensively understand the impact of using these materials, particularly when compared to solid timber products. More information on how to properly detail EWP building systems so that excessive treatments are not required in order to provide healthier buildings from more than one aspect was also suggested as an incentive.

Along with education, general knowledge sharing and promotion of EWPs were seen as providing understanding to those making choices about materials and, therefore, increasing EWP proliferation. More exposure in the mainstream media to show more people what is possible with these systems was suggested as a means of informing a more general portion of the population who might not be as familiar with what is possible with EWPs.

More options and information on fastening systems and up-to-date online design tools were seen as important incentives for using EWPs. Better alignment with overseas building standards that already include EWPs and have done so for many years was

mentioned as a possible way of including more EWPs within the New Zealand regulatory system without having to develop completely new standards.

There was a call for more inspiring information to be included in BRANZ outputs that should include information on innovation and exciting moves in the timber building sector. CLT was specifically mentioned and thought to be something New Zealand should be using. Some criticism of overseas products as not being suitable for New Zealand was noted, along with some reluctance to trust BRANZ Appraised materials due to past failures.

3.17 Question 17: Additional EWP comments

The final question was an open-ended request for additional comments or information that had not already been shared or brought forth during the survey. A comment box was provided, and respondents were asked, "Please share with us any additional information that would better help us understand how EWPs are being used and what can be done to increase the uptake of them throughout the built environment in New Zealand." Of the total number of respondents, 188 (40%) responded to this question.

As expected, a number of the responses elaborated on the comments and sentiments mentioned throughout the previous survey questions, although there were some different applications mentioned as well as thoughts on what would be incentives for increased EWP use in New Zealand. While not universal, the majority of respondents were encouraging about increasing the uptake of EWPs in New Zealand and indicated areas of potential improvement.

On the positive side, suggestions and perceived benefits for increasing use of EWPs included:

- more Acceptable Solutions and prescriptive design methods
- increased use of timber as a visible and aesthetic building element
- continued research to evaluate long-term performance of EWPs
- providing examples of known compliant designs using EWPs
- providing better understanding of cost implications when using EWPs
- including options for allowable substitutions when using EWPs
- using more timber to decrease carbon footprint
- providing more information on case studies, including not just buildings but the design process
- increasing availability and manufacturers in New Zealand
- increasing use with the hope to reduce costs
- better understanding of how EWP stability and consistency can offset additional costs
- increasing ability to use EWPs without engineering input
- increasing options for using EWP within prefabricated elements
- increasing the use of plywood as bracing elements
- providing some non-proprietary options for using EWPs
- providing information on detailing for durability rather than chemical treatments.

Not everyone is comfortable with increasing EWP usage and some comments included the following:

- EWP use is limited due to treatment options and more information on durability is needed.
- Is increased EWP use needed?

- How will EWPs improve the building industry?
- Cost can be prohibitive.
- More information on environmental impact is needed.
- Is timber supply a limiting factor?
- Safe treatments are required.

Framing systems including beams were mentioned by several respondents as a significant EWP application where additional resources could be very useful. Others noted dissatisfaction with EWP framing systems and were not encouraged by their use.

As noted in the responses to previous questions, there was a major emphasis on education as a means of increasing understanding and thereby use of EWPs throughout the New Zealand building sector. Suggestions included that more and better information is needed at all levels such as training on the products, how to use them and how to effectively use the provided design aids. Increased information across the building sector, including for designers and builders, was repeatedly noted. Additionally, it was mentioned that it would be ideal to bring the information provided down to a level that can be understood by more than just engineers so that more people can make informed decisions.

There were also a few responses on acoustic issues, CLT and providing a better rationale for using overseas EWPs. Multi-storey and larger buildings were seen as potential applications for increased EWP uptake. It was suggested that BRANZ could be key in providing information that would help increase understanding and use of EWPs.

4. Summary and recommendations

This survey has provided extensive information on how EWP usage and uptake by the New Zealand building industry is perceived and what changes could potentially help to reduce barriers and increase EWP use. As with many surveys, there is the need to ask questions in different ways in order to tease out the views of the participants. While some of the questions did overlap and provided similar answers, it was encouraging to see the same messages being reiterated in different ways. While there was only minimal articulation by survey participants that they were being asked the same questions, a few did note they felt they had already answered some questions. Some also made comments that the survey was too long and got somewhat tiresome by the end, which was also reflected in the fact that response numbers decreased for questions closer to the end of the survey.

As expected and considering the number of responses, there were some conflicting opinions and none of the results would be considered absolute or universal across all respondents.

4.1 Survey summary

The previous sections of this report have provided a detailed analysis of the survey responses, and a summary is provided here. The majority of respondents were from the architecture and building sectors and had been in these jobs for over 10 years. A significant number of respondents were involved in projects including timber, and many observed increases in the amount of EWPs being used over the 12 months prior to the survey. Panel products were most often used, with LVL structural elements also used with some regularity. Following on from this, it became apparent that structural applications were the most sought-after applications in terms of what respondents would like to use, and this included both panel products and LVL along with other structural EWPs.

Once an understanding was established around the EWPs being used and which EWPs respondents would like to be using more, there were several questions around advantages, barriers, incentives and recommendations for increased EWP usage across the building sector. In some ways, these were interrelated, and a number of themes emerged that were repeated and articulated in different ways for different questions. There was also a question related to perceptions of EWPs from different sectors in the building industry. This provided indications of mostly positive perceptions throughout the sectors, with some differences noted and a certain degree of neutrality and uncertainty around the question.

The main themes that became apparent around the increased use and uptake of EWPs in New Zealand were:

- cost
- availability
- regulation
- information
- education.

While these basic themes were simple enough to extract from the responses, the reasoning behind whether they were considered barriers or opportunities for growth were complex and required additional information provided in comments. Many

respondents provided extended explanations, and this helped to better understand the perceptions put forth.

Increased cost and limited availability were frequently noted as barriers to using EWPs. These aspects tended to be related, and it was suggested numerous times that, if more products were available by more manufacturers, it would bring down costs and thus result in increased EWP use. Increased costs around using EWPs not only included the materials themselves but the additional costs of designing using these products that were often not included in Acceptable Solutions and prescriptive building methods. Interestingly, it was also noted that, with enough information about the appropriate use of EWPs, higher initial costs could potentially be offset by increased building efficiency. This building efficiency was noted as coming from the consistency and straightness that EWPs could provide over solid timber products. Efficiency on site was also attributed to the lighter weight and ease of connections that EWP use allowed over steel products. EWPs were often seen as high-performance materials that could provide benefits if used properly. Suggestions were made that it would be highly beneficial to have more information around the actual costs of using EWPs including the cost of designing with them and the results on the final building cost where time and ease of construction were included.

There were questions that sought to get information on what the perceptions were around increasing the availability of EWPs in New Zealand by importing more products from overseas. There were different ideas about how this could be implemented, and while there were certainly respondents who were in favour of increasing EWP imports, there were also opponents to this. Some cited lack of regulation and certification that would ensure these products were fit for purpose in New Zealand.

Regulation was noted throughout the survey as having an impact on the uptake of EWPs in New Zealand. The most significant concerns were around compliance pathways and prescriptive methods. There were numerous comments noting that a clear pathway for using EWPs and having an understanding of how to develop Code-compliant designs that would be accepted by consenting authorities would go a long way in increasing EWP uptake. This includes knowledge and education for the designers as well as the consenting officials and territorial authorities so that they are clear around what is required for durable and resilient structures. This includes all aspects of EWP usage such as fixings, durability, strength, stiffness and interaction of other materials with EWPs to create successful building systems.

The other aspect around regulation that was cited as critical is the proliferation of Acceptable Solutions and other prescriptive methods for using EWPs. Possibly because a significant proportion of the respondents came from the architecture and building sectors, there was a strong sentiment that there should be more options for using EWPs that do not require specific engineering design. The current version of NZS 3604:2011 only has limited options for using EWPs, and this was seen as limiting their use because it was difficult for non-engineers to have confidence in substituting EWPs for solid timber specified in NZS 3604:2011. This was also likely to raise issues during consenting. The need for engineering input was also seen as increasing the cost of using EWPs and was often perceived negatively. More inclusion of EWPs within existing Acceptable Solutions and also the revised NSZ 3603:1993 were welcomed and seen as creating more opportunities for EWP use.

The need for more information and education were the most commonly cited ways of reducing barriers and increasing the use and uptake of EWPs throughout the New

Zealand building landscape. These are highly interconnected issues in that education is provided through information, and there are many facets to both that were raised throughout the survey. The basic notion that rose to the surface was that more information was required about EWPs and how they could be effectively used, but also that education of those designing with, building with and accepting for use EWPs was equally important. Both were seen as being required for the New Zealand building sectors to increase the uptake of EWPs, and both needed to be considered from several different angles.

More information on EWPs will need to come from multiple sources in order to address the various concerns raised from the survey. EWP manufacturer information is needed for mechanical properties, durability evaluations, comprehensive environmental assessments and requirements for Code-compliant installation and maintenance. Many manufacturers already provide this information, but having it easily accessible and in an easily understandable format have been suggested to increase greater exposure and acceptance of EWPs. It is also important for designers, builders, engineers, building owners and compliance officials to have adequate information on EWPs so that substitutions and informed decisions can be made when choosing between different materials and products.

Providing more information in different formats would not sufficiently address the barriers as noted during the survey. This is where education becomes critical. Education on EWPs is required across the range of building sector participants from the suppliers of EWPs to the owners and developers of buildings who are making decisions about what materials should be used for their projects. Education would need to include specific data on the costs of designing and building using EWPs. This would need to include potential cost increases from the design and materials as well as potential savings from using EWPs where consistency, dimensional accuracy, stability, strength and overall ease of handling can be incorporated. Data on EWP durability and treatments that can be directly applied within the New Zealand building and environmental contexts would need to be included as part of this education. Engineers and designers need to be made aware of the correct use of online design aids that will result in efficient and Code-compliant designs. Similarly, consulting officials need to understand the outputs from manufacturer-supplied tools to be able to make suitable determinations about EWPs and their applications.

A comprehensive understanding of the environmental impacts of EWPs is also necessary in order to determine the effects of including these products for building projects. This combination of information and education would need to include the carbon benefits of using more timber as well as the potential detrimental aspects of manufacturing processes, treatments and adhesives and end-of-life impacts. Minimising waste could be another benefit, but this would require a full life cycle analysis for all EWPs and possibly environmental product declarations, which some New Zealand suppliers have developed.[1]

Numerous mentions were made of providing case studies for buildings using EWPs that would provide extensive information and also help to educate the range of building sector players. These case studies could include data on how to design with EWPs, the costs associated with using EWPs and the Code compliance pathways required. Ideally, these case studies could include data on the environmental impacts of using EWPs,

[1] https://epd-australasia.com/epd/solid-finger-jointed-and-laminated-timber-products-including-timber-preservation-options/

how the durability aspects were addressed and subsequently how these products performed over the long term. A range of buildings could be considered, with some being built more recently and others having been constructed long enough ago to have some perspective on the ability of the buildings to reach their intended lifespan.

Because of the frequency with which education and information were recommended, those are areas of improvement that could potentially result in increased EWP uptake. Suggestions were made for seminars and site visits where discussions could be had between various building sector participants, resulting in a sharing of information on EWPs and their use. More cost information was suggested and in general more promotion of EWPs, their benefits and the tools available for designing with them along with cost comparisons with more traditionally used materials. There were calls for more prescriptive standards, tools and design methods for a broad range of products and applications so that a range of designers, not just engineers, can specify EWPs. Structural performance, speed of construction, the aesthetics of EWPs and ease of design were all seen as advantages for using EWPs and should be the kind of positive characteristics used to promote EWPs.

In addition to the major themes discussed above, a few topics that were brought up are worth mentioning. CLT was one product that was repeatedly cited as requiring more information, better understanding by councils and improved supply. Multi-storey timber buildings and the need for guidance on their design was mentioned in a few different questions, and since the survey, there have been some publications on the use of EWPs in multi-storey construction.[2] Education on fire standards and how EWPs perform in fires were noted numerous times as being a necessary part of the understanding around Code compliance and efficient use of EWPs.

4.2 Recommendations

A number of recommendations have been developed in response to the perceptions from the survey participants. Some recommendations are initiatives that must be led by manufacturers or government agencies, so while they have been cited here, it is beyond the scope of this project to explore these topics further. Providing information is dependent on specific EWPs, so it is the responsibility of the product manufacturer to develop and disseminate as they see most appropriate. This includes software and online tools for design. Based on the survey, it seems there is significant room for increasing the available information on EWPs and promoting them based on the benefits discussed. It is worth noting that the Wood Manufacturers and Processors Association of New Zealand in conjunction with NZWood is currently involved in developing a series of guides[3] aimed at providing additional information for the use of timber in buildings, which will include a significant amount of information on EWPs.

While a large number of respondents felt that lower-cost options for EWPs would create a significant incentive for increased use, it is not within the scope of this report to make such recommendations. There were also numerous suggestions for either lowering costs of projects when using EWPs or for developing a better understanding of costs for an EWP project, both of which are seen as beneficial.

Regulatory changes are most often driven by government but typically involve a significant degree of input from end users and practitioners who either use or are

[2] For example, Carradine, D. (2019). *Multi-storey light timber-framed buildings in New Zealand – engineering design*. Judgeford, New Zealand: BRANZ Ltd.
[3] https://nzwooddesignguides.wpma.org.nz/

affected by changes in building standards and practices. Therefore, in order to increase the potential for EWPs to be included in future versions of standards, Acceptable Solutions and Verification Methods, it is recommended that interested individuals and organisations get involved in the writing of these documents and contribute as much as possible to their development.

The following recommendations for research and education have been developed as a result of the survey responses and analysis:

- Collect data on the economic impacts of using EWPs throughout the building sector and assess the current state of EWP usage in New Zealand.
- Collect comprehensive life cycle and environmental impact data on using EWPs including embodied and operational energy and carbon sequestration.
- Provide detailed case studies of buildings that use a significant amount of EWPs in order to develop a comprehensive understanding of how EWPs impact the design, cost and performance of these buildings.
- Provide analysis of existing standards, Acceptable Solutions and Verification Methods to determine what potential there is for including EWPs for substitution and inclusion, including currently unavailable information.
- Conduct seminar series to educate building sectors on specific applications of EWPs including demonstrations of available guidance and design tools and sharing findings from case studies mentioned above.

These recommendations are a starting point for developing a deeper knowledge and understanding of the potential for use of EWPs across the New Zealand built environment. In conjunction with increased education and information provided by manufacturers and regulators in New Zealand, they can serve to raise awareness and foster appropriate applications of EWPs. This will result in increased value-added timber products being utilised in New Zealand.

Appendix A: EWP survey

Introduction

BRANZ researchers and external stakeholders have identified that there is a need for more current and relevant data on engineered wood products (EWPs) within New Zealand as uptake and acceptance of these materials increase rapidly. EWPs include the full range of structural and non-structural building materials made from timber and timber fibre. This includes things like laminated veneer lumber (LVL), cross laminated timber (CLT), plywood, particleboard and other composite products utilising wood. We need your input to help understand where and how EWPs are being used across the New Zealand built environment, from acceptance and design through to supply and delivery of completed buildings. Your feedback will help determine what research is needed to support current and increased use of EWPs in New Zealand homes and buildings.

With this information New Zealand can be an earlier adopter of technologies that are already showing great promise around the world for high performance, high quality and environmentally sound buildings. The resulting data will help deliver key information that can feed into development of new guidelines for innovative structural and non-structural uses of EWPs. Building designers, developers and building and consenting officials will benefit from understanding more about EWPs, and where innovation is required to be able to integrate these modern materials within buildings.

The information provided by you will be reported anonymously as part of the research project.

All participants who complete the survey before 1 March 2019 are eligible to go into a draw to receive one of three $250 Prezzy cards. The draw will be made on 15 March 2019. Terms and Conditions apply.

* 1. What sector of the building industry are you currently working in?

- ◯ Architectural Design
- ◯ Engineering Design
- ◯ Building and Construction
- ◯ Regulatory/Consenting
- ◯ EWP Manufacturing
- ◯ Quantity Surveying

Other (please specify)

* 2. How long have you been working in your current sector

- ◯ Less than one year
- ◯ 6 - 10 years
- ◯ 1 - 2 years
- ◯ More than 10 years
- ◯ 3 - 5 years

* 3. What percentage of your projects or work over the past 12 months have included a significant amount (at least 50% of materials used) of EWPs?

	0%	1% - 25%	26% - 50%	51% - 75%	76% - 100%
Main Building Structure	○	○	○	○	○
Building Envelope, Cladding or Facade System	○	○	○	○	○
Non-Structural Elements	○	○	○	○	○

* 4. Has there been a change in the volume of EWPs used in your projects or work over the past 3 years?

- ○ No change
- ○ Noticeable **decrease** in EWP use
- ○ Noticeable **increase** in EWP use
- ○ Not sure

* 5. Please indicate how regularly you use the following EWPs:

	Never	A small proportion of my projects	About half of my projects	More than half of my projects	Every project/as much as possible
Exterior Cladding or Facade	○	○	○	○	○
Structural Laminated Veneer Lumber (LVL)	○	○	○	○	○
Structural Cross-Laminated Timber (CLT)	○	○	○	○	○
Plywood or Other Timber-Based Panel Products (Particleboard, Strand Board, etc.)	○	○	○	○	○
Structural Glue Laminated Timber (Glulam)	○	○	○	○	○
Exterior Decking Material	○	○	○	○	○
Windows and Doors	○	○	○	○	○
Interior/Decorative Linings	○	○	○	○	○
Timber-Based I-Joists	○	○	○	○	○
Others	○	○	○	○	○

If you chose "Others" please let us know what EWPs you use and how often

* 6. Please choose the top 3 EWPs would you like to use more often?

- ☐ Exterior Cladding and Facade
- ☐ Structural Laminated Veneer Lumber (LVL)
- ☐ Structural Cross-Laminated Timber (CLT)
- ☐ Plywood or other timber-based panel products (Particleboard, Strand Board, etc.)
- ☐ Structural Glue laminated timber (Glulam)
- ☐ Exterior decking material
- ☐ Windows and doors
- ☐ Interior/Decorative Linings
- ☐ Timber-Based I-Joists
- ☐ **Others (please specify)**

If you chose "Others" please let us know what EWPs you would like to be using more often

* 7. From the EWPs you selected from Question 6, please answer the following questions:

What do you need to enable you to use these EWPs more often?	
What would be the advantages of using these EWPs more often?	
What do you currently use instead of these EWPs?	
Why do you prefer to use these EWPs?	
Any other comments on these EWPs?	

* 8. Indicate how beneficial or detrimental you think increasing the use of EWPs in New Zealand construction would be in the areas listed below:

	Very Detrimental	Somewhat Detrimental	Neither/Neutral	Somewhat Beneficial	Very Beneficial
The building industry	○	○	○	○	○
Building end users	○	○	○	○	○
Quality of New Zealand's building stock overall	○	○	○	○	○
Easing the housing shortage in New Zealand	○	○	○	○	○
Increasing utilisation of value-added products from New Zealand primary industries	○	○	○	○	○
Reducing greenhouse gas emissions/Reducing the carbon footprint of the built environment	○	○	○	○	○
Increasing the ability to provide prefabricated building solutions for New Zealand	○	○	○	○	○

* 9. Indicate your level of agreement with the following statement: Significant barriers do exist to increasing the use of EWPs in New Zealand construction.

Strongly Disagree	Somewhat Disagree	Neither Agree Nor Disagree	Somewhat Agree	Strongly Agree
○	○	○	○	○

EWP Use in New Zealand

* 10. You indicated that there are significant barriers to increasing the use of EWPs in New Zealand construction. Please describe the top three barriers that lead you to believe this.

Barrier 1	
Barrier 2	
Barrier 3	

* 11. Indicate your level of agreement with the following statements:

	Strongly Disagree	Somewhat Disagree	Neither Agree Nor Disagree	Somewhat Agree	Strongly Agree
Identifying solutions to address barriers to EWP use should be a priority	○	○	○	○	○
KiwiBuild presents an opportunity for the NZ construction industry to increase its use of EWPs	○	○	○	○	○

EWP Usage in New Zealand

* 12. Do you think you know what the solutions to the barriers to EWP uptake are? Please describe up to three of the most important solutions you are aware of.

Moving Forward with EWP in New Zealand

* 13. In your opinion, compared to other products, do EWPs offer advantages or disadvantages in the following areas:

	Significant Disadvantages	Some Disadvantages	Neither/Neutral	Some Advantages	Significant Advantages
Fire Resistance	○	○	○	○	○
Structural Performance	○	○	○	○	○
Durability	○	○	○	○	○
Insurance Costs	○	○	○	○	○
Acoustic Performance	○	○	○	○	○
Speed of Construction	○	○	○	○	○
Cost of Construction	○	○	○	○	○
Overall Economics (Such as operational or maintenance costs)	○	○	○	○	○
Vibration Performance	○	○	○	○	○
Building Aesthetics	○	○	○	○	○
Ease of Design	○	○	○	○	○

For those Advantages/Disadvantages that you noted as "Significant" please describe the Advantages/Disadvantages

* 14. What perceptions around EWPs have you mostly encountered from people in the sectors listed below?

	Largely Unfavourable	Sometimes Unfavourable	Mixed Perceptions	Sometimes Favourable	Largely Favourable
Building Owners	○	○	○	○	○
Developers	○	○	○	○	○
Architects	○	○	○	○	○
Builders	○	○	○	○	○
Quantity Surveyors	○	○	○	○	○
Consenting Officials	○	○	○	○	○
Engineers	○	○	○	○	○

If you know of others not listed here please elaborate on the group and the perceptions

* 15. Would you be more likely to recommend or work with EWPs if there was more information available on designing and building with them?

- ○ No, I already regularly recommend/work with EWPs
- ○ No, I prefer not to recommend/work with EWPs
- ○ Yes, more information would make it easier to design/work with EWPs
- ○ Yes, I already know what I need to know, but having that information for others would be helpful
- ○ Unsure

* 16. In your opinion, how much incentive would the following provide in encouraging the use of EWPs across the building sector?

	No Incentive	Some Incentive	Huge Incentive	Not Sure
New or revised building standards	○	○	○	○
Stand-alone design guides including specific design procedures	○	○	○	○
Prescriptive design information like that provided in NZS 3604	○	○	○	○
Acceptable Solutions similar to those in the NZBC	○	○	○	○
Locally available and manufactured EWPs	○	○	○	○
Government subsidies or project funding for primarily EWP buildings	○	○	○	○
Lower cost EWP options	○	○	○	○
Overseas EWPs accepted for use in New Zealand	○	○	○	○
More BRANZ Appraised or CodeMark approved EWP systems and materials	○	○	○	○
Detailed examples of case study EWP buildings	○	○	○	○
Environmental Product Declarations for EWPs	○	○	○	○

Do you know of any other incentives that would encourage the increased use of EWPs throughout the New Zealand building sector?

17. Please share with us any additional information that would better help us understand how EWPs are being used and what can be done to increase the uptake of them throughout the built environment in New Zealand.

Thank You - Please Leave Your Contact Information for a Chance to Win One of Three Prezzy Cards!

Your input has been greatly appreciated and will help us understand EWP usage in New Zealand.

Your information will only be used by BRANZ to contact the winners of the Prezzy card competition and will not be shared with anyone outside of BRANZ. BRANZ adheres to the Privacy Act.

18. Would you like to be in to win one of three $250 Prezzy cards? Please enter your preferred contact information here to enter!