General Practitioners September 2020 Newsletter

Welcome to our fourth newsletter to members and the final one before our first AGM. Nominations for the next committee will be open from 11 September 2020 and electronic voting papers will be sent out on 2 October. Look out for emails in your inbox in the coming days. The new committee will be introduced at the Annual General Meeting on 15 October.

In this issue we have two articles on engineering documentation for building consents. The first one is on minimising RFI's by Martin Pratchett at Engineering New Zealand following feedback he has had from various councils (Auckland, Tauranga and Wellington). The second article is from fellow EGP members Alasdair Sinclair and Don Thomson, who have been involved with consent checking in Wellington.

In this issue:

Message from the Chair

Hi all.

I have had three goes at starting these notes – there are so many issues to discuss.

However the year has caught up with us and we are now preparing for the elections of the new committee. It has been an eventful year, both in the world at large and in our SIG. We have had to cope with a worldwide pandemic and the defence mounted by New Zealand's team of 5 million. Lockdown – twice. We have done astoundingly well when we look outside our borders

and see the chaos elsewhere. There is a cost of course but one can only wonder what the cost of a less firm response might have been.

I don't know how the engineering profession as a whole has fared but the smaller companies don't seem to have suffered too much – particularly those in the building industry. Our SIG has continued to develop several themes.

With the help of Martin Pratchett at ENZ we have been able to run a number of webinars providing CPD for general practitioners and others. This program is now well established and future events are in train.

The committee is working to have our General Practice engineers' special skills recognised. There is considerable support for the term Civil Engineer to again become the field description. Civil engineers were always recognised as having structural and services skills and a good basic knowledge of geotechnical matters. Most of us involved in the construction industry left university as civil engineers and it is our contention that we continue to have wide ranging skills and knowledge. This view is gaining recognition.

As we have gone through our work this year the committee has identified a number of ways that we can improve delivery of services to our members. To that end we want to increase the size of the team slightly and look for more representation from the regions, particularly the South Island.

I want to thank the committee for their work this year. Bruce Tricker as secretary has done exceptional work, Jen Lo as treasurer, Aaron Holland working on what EGP's do, Don Thompson representing Wellington and bringing a TA perspective from his role as a council reviewer, Gordon Hughes bringing a wealth of experience and working on ways of improving our practice, Ian Watson giving support and working on the question of council relationships with engineers, particularly EGPs, and Julie Elliott furthering a presence for EGPs in the engineering community and working tirelessly in support of a number of initiatives.

I look forward to seeing where our membership goes and what we achieve in our second full year.

Pete van Grinsven

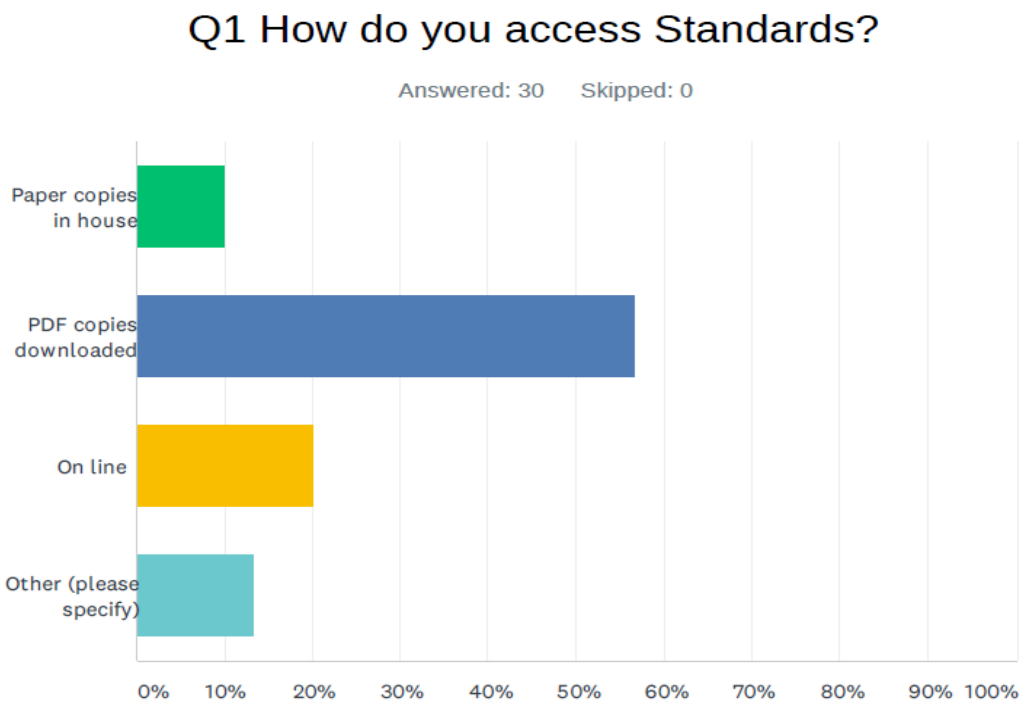
The EGP (not so one) Five Question Survey

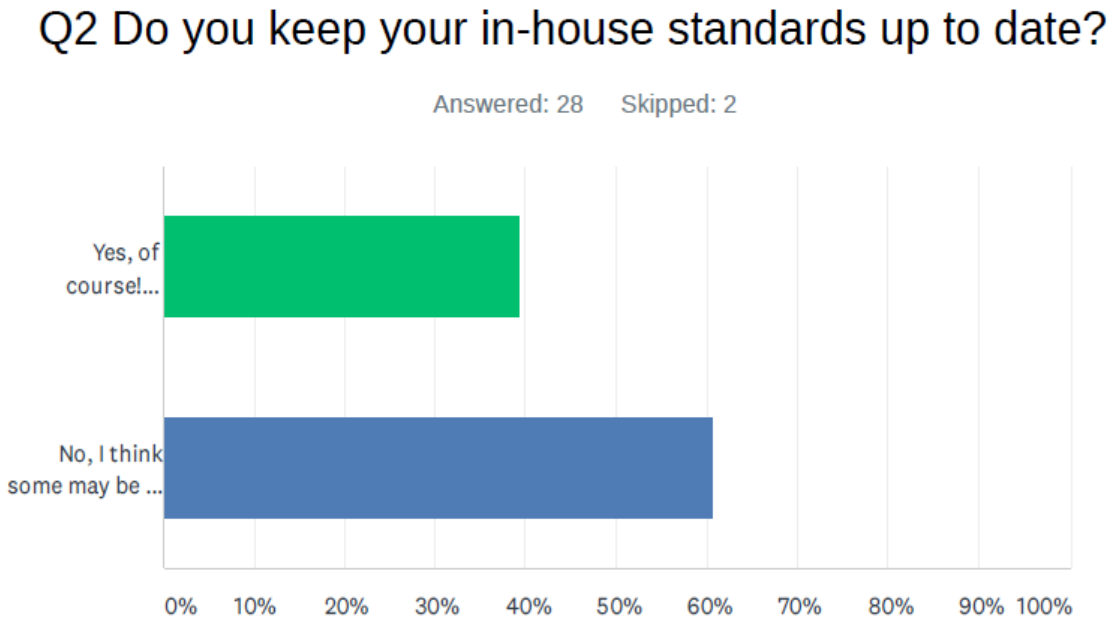
This issue we are asking:

Does your company charge extra for disbursements (printing, stationery, computer software etc)?
a) No, we allow for this in our hourly rate.
b) Only for special requests (e.g. extra sets of drawings).
c) Yes, we charge disbursements on all jobs.
d) Other _____

Take Survey

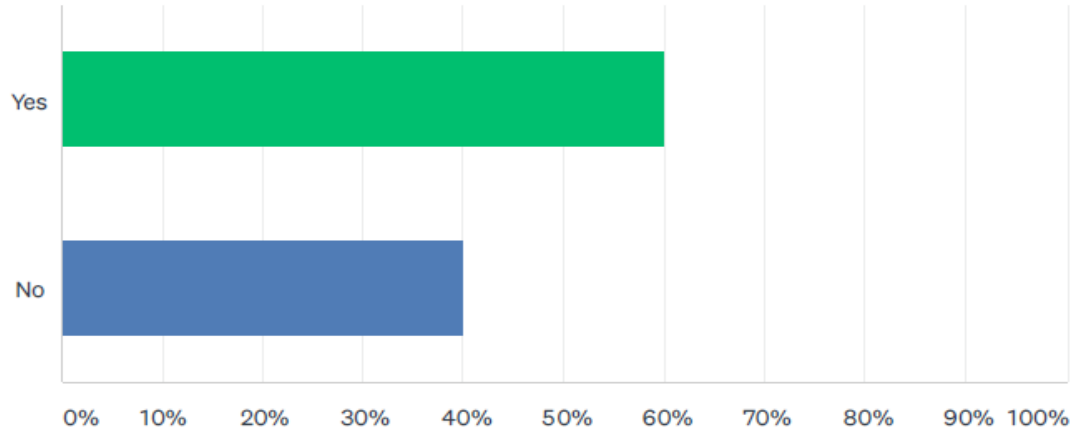
In the last issue we asked a few questions on how you use New Zealand Standards. Here are the results:





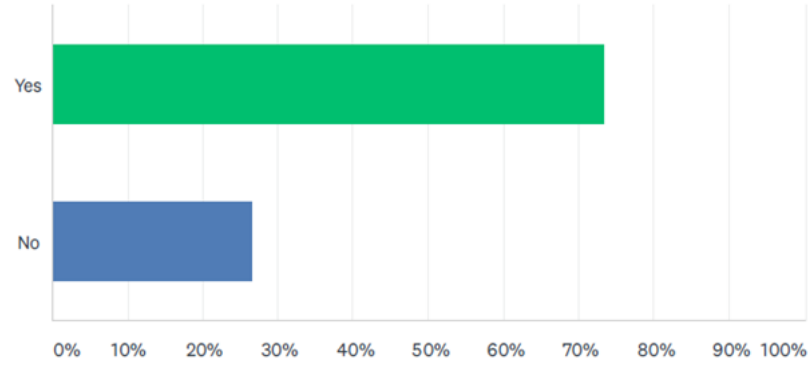
Q3 Do you subscribe to SNZ?

Answered: 30 Skipped: 0



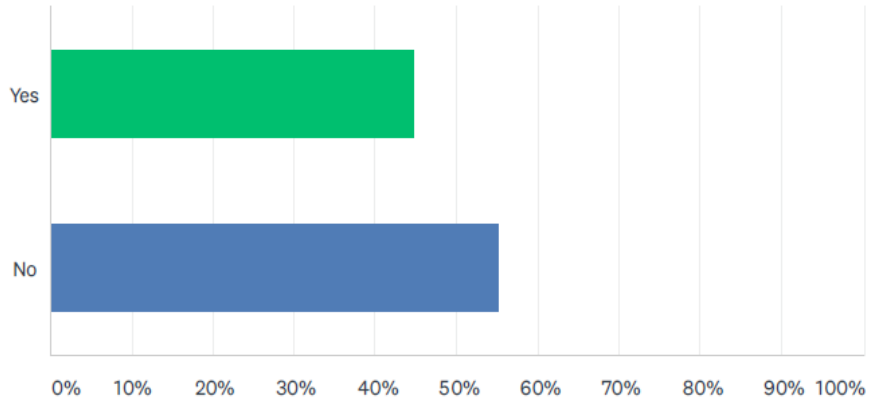
Q4 Philosophically, do you consider Standards should be free to all end users?

Answered: 30 Skipped: 0



Q5 Are you/your company part of the Engineering New Zealand subscription plan?

Answered: 29 Skipped: 1



How to Minimise Those RFI's

Martin Pratchett, Engineering Practice Manager, Engineering New Zealand

Requests for Information (RFI's) are a constant source of frustration to engineers. I've managed to get RFI data from Auckland, Tauranga and Wellington Building Consent Authorities to find out what the main issues are and how we can work to resolve them. It turns out that most of them are around residential builds. Small practitioners are typically the engineers who do this work, so what RFI's, why, and how can we avoid them?

The Building Consent Authorities typically have the consents looked at initially by checkers who are rarely engineers. They can, however, generate RFI's on your work and will do so if it is hard to follow or doesn't have items such as a construction monitoring schedule or design features report. Having plenty of diagrams and setting out your calculations clearly will help you. An excellent example of clear hand calcs can be seen on the Structx website: https://structx.com/hand_calculations.html

Putting together the documentation required for jobs can take time, Engineering New Zealand has put up examples of construction monitoring schedules, construction monitoring reports and design features reports for you to use as they are or to adapt to suit you. You can download them when you log in to Engineering New Zealand. The member area is currently offline while the system is upgraded but will be back again on 16 September 2020.

We are working on a system that will auto-populate various forms for you to avoid duplication, however, these are still in the pipeline.

You can read more about what is available on this article https://www.engineeringnz.org/news-insights/better-design-documentation/

Building a Better Building Consent Bundle

Alasdair Sinclair & Don Thomson

Executive Summary
Engineers can improve the reception of their building consent submissions by treating calculations as a way of demonstrating to an external engineer that their design is adequate, instead of just proving it to themselves. There are numerous tools available to help with this, such as the SESOC Design Features Report.

When replying to a Request for Information (RFI), engineers should be specific when they explain what they've done, including citing their own work and any design standards.

By thinking about their documents as persuasive tools rather than pure calculations, they can make their calculations much easier to understand and more likely to pass through the Building Consent Authority (BCA) without queries.

Main Text

A quick review of the structural curricula at Canterbury and Auckland Universities shows a robust instruction on carrying out calculations from mathematical first principles, usually based around a fairly well-defined problem stated by the teaching staff. We leave university very confident in our ability to solve problems the same way – by stringing together the right series of numbers to satisfy what is known as "the design equation"; that strength is greater than demand. Given that most of the time we will find a solution that works, we may wonder why our calculations are so frequently queried by BCA during the consent process. We propose that a slight but important change in how we think about calculations can make a big difference to how those calculations are received. We should think about calculations as an exercise in persuasion, rather than as a rigorous mathematical proof. Thinking about how to make your calculations into a persuasive argument in favour of a specific solution suggests a general approach that can be taken to help the reviewing engineers recognise that your design meets all the criteria required by the building code.

Start by outlining the problem that your calculations are solving. Explain what facts are known, what the unknowns are, what assumptions and approximations must be made, and what limitations apply to the kinds of solutions available. It's very helpful at this stage to include diagrams explaining the problem geometry and the mechanisms that are in play.

Once the problem is defined, you can then explain the process you're going to use to solve that problem. If you're using a known means of compliance, such as a standard or the new MBIE modules for geotechnical design, you can cite that here. You may find free body diagrams useful here, to show what mechanisms are covered by which calculations to follow.

The third step is to show the typical design pattern:

1. State the applied loads, including any load factors
2. State any analytical equations
3. Show the bending, shear, and deformation plots
4. State any specific design equations
5. State the material properties and strength reduction factors
6. Compare the strengths to the demands

This general approach can scale from the design of the lateral system for a large building to the design of a moment-carrying bolted connection. Explaining the process that you're going through will make it much easier for the reviewer to understand the constraints and the solution. If you elect to skip these steps, your design may be correct but difficult to follow for the reviewer and they are likely to need to ask you questions to fill in the gaps.

Several tools have been published to help with this general approach to preparing a calculation bundle.

1. The most important is the *Design Features Report* published by SESOC. This document steps through the most common parts of the calculations for building design, providing an essential summary of the design for the reviewer.
2. Worked examples have been published by CCANZ for design to NZS3101. While this shows the calculations in more detail than typical for real-world practice, the basic

framework of outlining the design, including diagrams of the structure and sketches to illustrate specific design items, is a generally good approach to presenting calculations.

3. The Construction Industry Council has also published a series of design check-lists and design guidelines, though those are more focused around ensuring the completeness of the information rather than on how easy it is to digest.

Inevitably, you will get an RFI sooner or later. BCA reviewers are asked to check that the calculations and drawings submitted demonstrate compliance with the building code; this is a lesser scope than a collegial peer review because there is no expectation that the TA reviewers will have positive suggestions for improving the design. Their brief is to make sure that the design is complete and safe. The question is not personal and is not intended to cast any aspersions on your abilities as an engineer. Mostly, questions reflect a difference in history and expectation.

There are two main types of questions that get asked:

1. Ensuring the completeness of the calculations. This means checking that all load cases and load-paths have been considered, and that all elements have been checked.
2. Asking for a design process to be more explicitly stated. This means unpacking assumptions, helping guide a reviewer through a thought process, or understanding a constraint.

It is very common for engineers working in different offices to have a different view on the priority of different loading conditions. For example, in our office we don't usually check the ultimate limit state for window lintels and mullions for face loading, since the serviceability criteria govern almost all window framing design. This may not be the expectation of a checking engineer, and they are entitled to ask for ultimate limit state checks if they feel there's any doubt. When we're asked for this information, the BCA reviewer is just ensuring the completeness of the calculations for demonstrating compliance – they're not questioning whether the design is appropriate.

Phrasing an RFI is challenging, because the reviewer wants to ensure that the building is safe but doesn't want to tell the engineer how to do their design. This can mean that questions can seem either overly vague or overly specific while the reviewing engineer tries to find a concise way of ensuring that the design adequacy is demonstrated. Usually a question can be answered by taking some time to explain more elaborately what you're doing and why.

When responding to an RFI, it is useful to be specific and to ensure broad coverage in your answer. For example, if the question asks you to demonstrate that a specific check has been carried out and your calculations already show that check, it is useful to give the reviewer a page reference. "Please refer to page PP of the calculations, which show the calculation carried out in accordance with NZSXXXX; we have assumed Y & Z in this calculation".

Along similar lines, good quality control over your design document can make it much easier to review and much easier to close out those RFI:

- Are the pages numbered?
- Are there clear headings showing what is being designed?
- Is there a clear summary showing the design actions and strengths?
- Are the calculations legible?
- Have you submitted a complete document bundle with the changes in the documents indicated?

When preparing documents for building consent, we're used to thinking about preparing drawings and calculations. In practice though, the most important part of the "calculations" may not be the actual numbers, but the surrounding information explaining which numbers have been chosen and why, and explaining the thought process behind the design. By thinking about the supporting documents as a persuasive argument rather than as a purely mathematical exercise, you can help the reviewer understand the design and recognise how it demonstrates compliance with the building code.

Common Checking Comments

1. The SESOC Design Features Report
    1. This is a template that steps the reviewer through the calculation approach and key parameters
    2. This document provides a prompt for the structural engineer to provide a lot of information that we are routinely asking for
        1. Means of compliance
        2. Referenced documents
        3. Geotechnical parameters
        4. Seismic parameters

1. SLS checks
    1. Most weathertightness problems stem from inadequate consideration of service level deflections

1. Geotechnical design
    1. The MBIE guidelines provide a robust general overview of geotechnical design problems for the structural engineers.
    2. Structural engineers should cite Geotechnical reports specifically and double-check that they have followed its recommendations and parameters closely
    3. Structural engineers are relying solely on equations for retaining wall loads but they need to also think about how much soil is being mobilised and what movements that entails.
    4. Often wall elements are being designed without considering how they fit into the context of the design as a whole.

1. Calculation presentation
    1. Ensure that it is clear what the calculation is for by including diagrams and
    2. illustrations

        1. BlueBeam makes it easy to take a snapshot of the architectural or structural drawings and over-mark any forces or constraints
    3. Check that your spreadsheet is intelligible to a reviewer by making sure it has
        1. Clear citations of the relevant NZ standards,
        2. Clear naming conventions for variables,
        3. Explanatory diagrams showing the actions being calculated.
    4. Check that your hand calculations are intelligible to a reviewer by making sure they
        1. State an equation, including citation,
        2. List all of the variables
        3. Write out the equation with the numbers filled in
    5. Ensure that a hand calculation is appropriate; for example when hand-calcs are used for checking reinforced concrete sections, they often over-state bending capacities and neglect to check shears.

An Ethical Question for a General Practice Engineer

Here is an interesting ethical question which came from one of our members recently:

An engineer was engaged under the standard SFA to investigate structural defects on a dwelling. The investigation and report discovered a number of significant defects which could affect safety. These were described in a written report.

Several months after the report has been submitted to the property owner the Engineer happened to drive past the dwelling and discovered that the property was for sale. The Engineer had previous dealings with and knew the real estate agent handling the sale. The agent advised that there was one offer conditional only on finance and another unconditional back up offer. The date for the offers to go unconditional was the same day as the Engineer discovered that the property was for sale.

The Engineer was concerned that the defects that they had discovered and reported on may not have been remedied or disclosed by his client, the vendor of the dwelling. The Engineer discussed the matter with a colleague which resulted in the Engineer seeking legal advice as to whether the Engineer should disclose details of the defects to the real estate agent.

The legal advice given was that the Engineer should not advise the real estate agent. This advice relied on several factors including client confidentiality and the possibility that the client may have carried out remediation works in the relatively short period since the report was submitted. The Engineer believed that it was unlikely that the vendor would have carried out remediation works. This belief was based on previous interaction with the client.

The Engineer was uneasy about following the legal advice but was concerned that if he advised the real estate agent it could cause collapse of the sale and further that it was possible but unlikely that remediation works may have been carried out.

What would you do if you were the Engineer concerned?

Design Guides and Spreadsheets

The Engineering General Practitioners in collaboration with Engineering New Zealand are interested in developing guides for common design elements which would be available to all EGP members, but we need your help.

Do you have a really good spreadsheet or standard format for designing something? Send them to general.practitioners@engineeringnz.org. They don't have to be perfect. The spreadsheets will be reviewed and formatted to a common standard, but you will get name recognition as a contributor when published or if we use them for the basis of a future design guide.

The first design guide *Residential Portal Frames – An Engineer's Perspective* was written by Martin Pratchett and has just recently been completed. It will be accessible on our website – look out for a link in the next newsletter.

Editor Role Available

The Engineering General Practitioners group is seeking an editor to produce the newsletters and other correspondence. If you would like to put your name forward, please email general.practitioners@engineeringnz.org.

COVID-19 Business Advisory Funding

The Government has allocated additional funding for expert advice and support, administered through the Regional Business Partner Network. For details go to https://covid19.nzte.govt.nz/page/regional-business-partner-network

Continuing Professional Development

Coming up on 16 September is another of our popular free webinars *Weld Specification – Tips for the Design Engineer*. To register go to https://www.engineeringnz.org/courses-events/event/weld-specification-of-steel-structures-tips-for-th/

If you missed attending the recent webinars on structural steelwork compliance, feedback on B2 guidance etc you can go to our website https://www.egpnz.org/past-event-resources