General Practitioners April 2022 Newsletter

Welcome to our first newsletter for 2022!

Apologies for it being later than usual, things have been go go go since the start of year, trying to avoid Covid when every second person I know seems to be getting it, as well as trying to keep on top of a huge workload that never seems to dissipate. The shortage of Engineers in New Zealand is becoming more and more apparent.

In this quarter's newsletter, we have a few great articles with some issues raised by EGP members and being brought to the attention of Engineering New Zealand and other Engineering groups and which we have had some responses. This includes issues with residential hold down fixings and if they are achieving their required uplift capacities as well as a discussion on the new Peak Ground Accelerations (PGA's) released by MBIE and NZGS and, whether or not they affect us.

Martin Pratchett, Engineering Practice Manager at Engineering New Zealand, has provided us the answer to the 'thinking cap' question in the last issue as well as another article on understanding the bounds of your competence. We have two more great learning opportunities as well as articles on field observation and things to look out for as well as better understanding on the definition of 'parts' in seismic design.

Again, I would like to encourage you all to submit your lessons learned to include in our following newsletters. This is anonymous and a great tool to help other engineers to not repeat the same mistakes. We are also asking for you to submit photos that you think best describe Engineering General Practice, so that we can showcase exactly what we as EGPs do. Submissions can be sent to general.practitioners@engineeringnz.org.

Tamlyn Adams
Editor

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Message from the Chair

The committee met in February and have resolved to meet every 3rd Wednesday of the month. We are now settling in and have a full agenda planned for the year.

The main items for action are:

- A review of our purpose and establishing a wording for our vision which we will circulate soon
- A look at what our plan is for the year and to see that we are delivering on our vision
- Connecting with engineers in various centers around the country with the intention of forming small groups that will support other engineers
- We have a number of webinars of particular interest to EGPs to be delivered this year, watch this space
- Working on a discussion document around complex engineering and how it applies to EGPs
- Looking at regional representation on the committee
- An initiative to establish an award system for EGPs
- Establishing a communication channel into the groups working on the new legislation covering engineers
- We are dividing up responsibilities within the committee so that we can progress several fronts at once
- We are keeping lines of communication open to SESOC, the Geotechnical Society and the Timber Design Society. We want to work with them to extract the specifics that are important to EGPs and pass them on to our members. These groups do exceptional work but not all of it will be part of our members' daily activities

We have had some success with getting our point through on the need for recognition of EGPs and will keep applying pressure on MBIE, the government, the CPEng system and local authorities.

There seems to be no letup in the demand for our services – without us the building industry would grind to a halt. The corollary to this is that we are busier than ever and there is a real danger of overload and the pressure to get projects out can lead to things being missed. We must learn to take care of ourselves – the projects will then take care of themselves under our unstressed guidance. Mistakes are made when our main objective is to meet a deadline.

A pet project of mine is to bring engineers back to starting a project by reviewing the structure to establish load paths and becoming familiar with constraints. I personally believe that this step is the key component of a professional approach and will go a long way to eliminating errors. As the design progresses every step should be checked for critical elements that will govern the performance. By looking at these things directly rather than as a computer printout I believe you can identify the critical performance pinch points and ensure that they are well designed.

I see too many ostensibly simple projects buried in pages of pointless printouts – e.g.: a page full of numbers with none highlighted to tell me that the shear capacity of a component is 10 times the expected load is valueless when the other components that will transmit that shear to the ground are seemingly not identified. To me that is grass roots professional engineering.

Nga Mihi

Pete van Grinsven
Chair

The EGP One Question Survey

This issue we are asking Engineering General Practitioners:

In general, when does your company usually invoice for services?
a) We require payment before releasing any documents
b) We invoice when the work is completed
c) we invoice every month
d) Other/ I don't know __

Take Survey

In the last issue we asked:

Is the ability to hand draw basic details still important in modern engineering design?

We had 45 responses with 100% in agreement. We also received a few comments of note and I have compiled a summary below:

- Enables a quick assessment of options before too much detail gets in the way
- If you can't imagine the project and how it is doing its work how can you design it? Drawing details by hand helps to understand the structure being designed, how it will behave and how it will be built. If it's not clear in our head, sketch it out. Every calculation should have hand drawn sketches.
- I think some younger engineers can't seem to visualize larger HVAC system issues because they can't communicate how the primary & secondary circuits work together. They can't refer to heat source kWs to approximate the flowrates and hence size piping and buffer vessels etc - really basic stuff. Sketching is part of that. Young engineers spend too long modelling every last detail.
- Seeing my peers at larger firms look to use software packages for calculations. I am fearful for detailing as a result as it is very difficult to do sketches into these.
- We must recognise they do not need to be on paper and can be a mock up on the computer as long as they are clear, dimensioned and annotated that a draftsman has a good understanding of is required.

Put on those thinking caps

Martin Pratchett

Question from the previous issue:

You are sitting in a boat, fishing with a friend in a pond. You throw over the anchor, what happens to the water level in the pond (assuming that the anchor is sitting on the bottom of the pond)?

a) It rises
b) It stays the same
c) It goes down

Answer: c) The boat displaces roughly 8x less water than the volume of the (steel) anchor, but the lake only increased in volume (water) by 1x the volume the anchor, therefore the water goes down.

Learning opportunities

The biggest opportunities to learn from are not when things go right, but when they go wrong. The best way to learn from your mistakes is to recognise what went wrong and how you (and others) can avoid making the same mistake again.

Click on the links on the side to read some anonymous Learning Opportunities submitted by two different contributors.

Do you have a learning opportunity that would be of interest to your fellow EGP members? Download the Learning opportunities form here and send it to egp.sig.anonymous@gmail.com

Peer Reviewer Involvement

Email Attachments

Observations from the Field

Bruce Ticker

Before undertaking design work on existing buildings, it's always a good idea to make a thorough site visit. These footings were below ground once upon a time, but a previous owner has decided re-contour the lawn, which sits on expansive clays.

The photo shows the gum spear passing right underneath the footing.

When the brickwork started cracking from seasonal movement the solution was to paint it black. Following a detailed look under and around the house the new owners were advised to remove the brick as part of their planned alterations. This made the alterations simpler (and cheaper) and also resulted in more earthquake-resistant foundations.

Issues with residential hold down systems

Martin Pratchett

Bracing systems in New Zealand commonly use hold-down bolts like the MiTek screw bolt/GIB HandiBrac system. Recent conversations with engineers and designers have raised potential issues to be aware of when using them on internal bracing lines with concrete slabs and detailing for timber floors. While this article uses MiTek as an example, we primarily illustrate the need to follow a reliable load path and consider the requirements of the system specified, regardless of the manufacturer.

Concrete foundations - There are problems with hold-downs punching through slabs. When you're detailing hold-downs into a slab, how can you be sure the screw won't punch through and will have sufficient durability?

Timber floors - When detailing the bracing, consider the load path and detail for it.

As a designer, whether working in the engineering or architecture space, it is your responsibility to follow the load path, think of any potential problems and make sure the system you specify will work as intended.

Read the full article by Martin Pratchett with great examples and design considerations to think of when designing residential bracing following the link below.

Read Full Article

MBIE update to PGA's – Are you aware and does it impact you?

Tamlyn Adams

If you are a member of the New Zealand Geotechnical Society (NZGS) you may be aware that MBIE updated the Geotechnical Earthquake Engineering Practice (GEEP) Guideline Modules in December 2021. For those who are not, I have provided a brief summary below based on my understanding and how this may impact you, particularly with regards to retaining wall and bridge designs.

The latest Peak Ground Accelerations (PGA's) are issued under section 175 of the Building Act, but have not yet been incorporated into the Building Code (expected to be completed in August 2022). Although not yet bound to accept these new values, some Building Consent Authorities

(BCA's) have mandated them already and no longer accept designs based on the previous PGA's, which can be a costly exercise if you are not aware of this.

As a structural Engineer, I have noticed in a few recent geotechnical reports that a PGA has been specified, noting the latest changes to the MBIE guidelines, and is required to be used in the structural design. My go to is usually NZS1170.5 (Structural Design Actions: Earthquake Actions) or NZTA Bridge Manual (NZTA-BM) but I was not sure how these values related to the new PGA's, so I did a bit of digging. The points below summarise how the PGA's are compared to NZTA-BM and NZS1170.5:

- NZTA-BM focuses on bridges and retaining structures which are outside of the scope of NZS1170.5. NZTA-BM provides PGA's based on a 1000 year return period coefficient $C_{0,1000}$ (PGA = $C_{0,1000}$ *R_u/1.3*f*g) and is a direct comparison to the new PGA's in Module 1 of the GEEP guidelines (assuming the same parameters are used).
- PGA's, as a simplification, with regard to NZS1170.5, are equivalent to the Elastic site hazard spectra C(T) = C_h(T)*Z*R*N using a spectral shape factor with a period of 0s (C_h(0)). It is important to note though that the elastic spectra in NZS1170 are magnitude-weighted for an earthquake of magnitude 7.5.
- It has been previously noted that NZS1170.5 and the NZTA-BM overestimate the PGAs for most parts of New Zealand, but this is not necessarily the case with the latest PGA's that have been released. In some areas the PGA's have lowered, but for the most part they seem to have increased. Some important elements to note in the new guidelines, particularly when looking at inground structures:
- The new values only consider Seismic Site Class C soils. This is a simplification as it was noted in the latest results from the hazard analysis, that the values across the different site classes were minimal.
- The latest accelerations do not consider geometry effects such as topographic features.
- The new PGA's effective magnitude earthquakes differ for each location and are based on a combination of valuations from NZTA-BM, MBIE 2014 Canterbury earthquake region guidance and the NZGS 2020 hazard study.

Following up with NZGS and Engineering New Zealand regarding how and when structural/civil engineers should be applying these new PGA's, the advice given, was that it is only applicable, for now, to geotechnical engineering analysis and retaining wall designs that follow Module 6 of the Geotechnical Earthquake Engineering Practice and are not applicable to structural design, assessment of existing buildings or design of building strengthening. Keep an eye out for the revision of the Nation Seismic Hazard Model (NSHM) expected to be released in August 2022.

Below is a link to the latest GEEP Guideline Modules, with the new PGA's found at the back of Module 1.

Latest GEEP Guidelines Modules

Understanding the bounds of your competence

Martin Pratchett & Mumtaz Parker

Do we as engineers know where our bounds of competence lie, and more importantly do we stick within them? If we work outside the bounds of our competence, we may be breaching our obligations under the Code of Ethical Conduct.

Competence refers to the knowledge, skills and attributes required for a person to undertake their work successfully. Different activities, roles and projects require different competencies. Knowing and recognising the bounds of your competence can result in the performance or success of an activity or task.

Once we have identified gaps in our knowledge, we need to develop plans to address those gaps. There are several ways to do that, and a mixture of methods can work best.

Read Full Article

Shakin' a Part

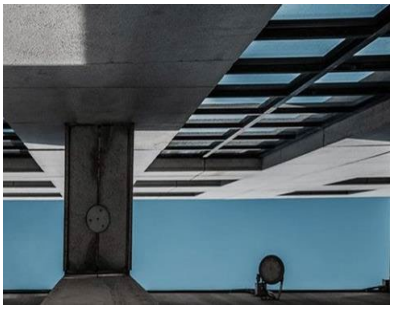
Bruce Ticker

When designing for earthquake actions we need to take into account the forces on individual parts and their connections, but what is a part?

From NZS 1170.5:2004 a part is:
An element that is not intended to participate in the overall resistance of the structure to horizontal displacement under earthquake conditions, for the direction being considered.

Examples include:

- Verandas
- Parapets
- Chimneys
- Concrete panel transom beams
- Partitions and ceilings
- Shelving
- Cladding
- Plant and machinery



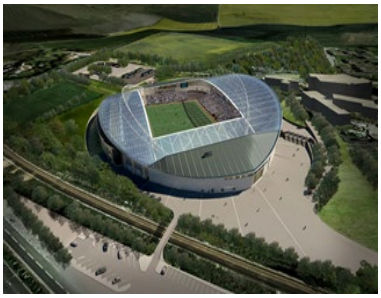
In general, portal frames and other bracing elements would not be considered to be parts as they contribute to the overall stability of the building.
Section 8 of NZS 1170.5 goes through the methodology for calculating the forces on parts and they are typically much higher than the structure as a whole, so it is important to check your design.
A deck attached to the outside of a building should arguably be designed as a part unless it is independently braced. Currently, NZS 3604:2011 does not require any bracing for decks less than 2m wide as bracing is assumed to be resisted by the building as a whole.
In this case it may be pragmatic to include the deck in the floor area of the building when calculating the overall bracing demand. The deck will have higher demand than the floor due to its lower ductility but will not usually have the additional demand from walls and a roof. The connections between the deck and the building should be robust enough to resist the higher forces associated with this being a part of the building... or should that be apart from the building?

Get to know some of your committee members

Nick Calvert
Committee Member

I graduated from the University of Canterbury in 2001, achieved CPEng in 2006 then spent 4 years in the UK travelling and designing significant buildings including the Brighton and Hove Albion Football Stadium (I led the design of the two main stands excluding the roofs. Go Seagulls!).

I have recently joined Hadley Consultants as Christchurch Director, tasked with growing Hadley's presence in Christchurch.



Graeme McMillan

Committee Member

Graduated 1977 University of Canterbury and was Registered in 1980 and entered Private Practice in 1982, McMillan Consulting Engineers Ltd at 28 years old, after first establishing myself at the Southland District Council as a roading and bridging design Engineer. I head other businesses ventures, with a wholesale global distribution company based in London, undertaking sales and marketing with manufacturing undertaken in Ukraine.

My more leisurely interests extend from growing cherries at Trophy Ridge Orchards, to enjoying an active social life in the Invercargill Rotary Club, with a specialist interest in C3 classic cars, while spending valuable time with family and grandchildren."

Life is having time for grandkids, weekends away, camping on tour while travelling, biking, and long walks each morning with my wife Flo.

Kelly Pilkington

Secretary

I am a Chartered Civil (Structural) Engineer based in Hamilton with over 15 years' experience on a wide range of design projects. My main interest is in industrial, and commercial projects. I enjoy getting involved in projects early at initial concept design stage and working with clients through the full duration of the project, coordinating with the client and the design team across all disciplines, so that the design solutions are practical, code compliant and fit for purpose.

Aaron Holand
Committee Member

I am a chartered engineer, based in the LDE Warkworth office, which has grown in the last 3 years from a small 20 persons staff size into a medium sized company of about 120 staff. I am experienced in multiple engineering fields including civil works, structural work mainly around infrastructure and foundations, infrastructure design, subdivisions, geotechnical engineering including landslides and project management.

I have designed, and managed numerous geotechnical, structural and civil design projects in the North Island including slip repairs and a lot of coastal infrastructure for Auckland. The coastal engineering is a personal favourite of mine due to my ocean-based hobbies and love of that environment, along with slip repairs due to the complexity and variability of New Zealand geology.

In my spare time I enjoy, sailing, fishing and scuba diving, and have recently taken up cycling, using the leisurely modern way of an E-bike to avoid hills. I live in the rural Warkworth area and have three children, one of which is studying engineering, with the other two still at high school.