engineering new zealand
te ao rangahau

DISCIPLINARY COMMITTEE – UPHELD COMPLAINTS

LESSONS TO BE LEARNT

CASE STUDY
JULY 2022 – RESIDENTIAL HOUSE

INTRODUCTION

Engineering New Zealand receives around 50 concerns and complaints about Chartered Professional Engineers and members each year.

Not all complaints are upheld, but they typically relate to:

- miscommunication,
- inattention to client care,
- a misunderstanding over what the engineer has been engaged to do (or what they can't do),
- serious issues of competence, or
- ethical conduct.

Reflections on past complaints that an Engineering New Zealand Disciplinary Committee has upheld can offer valuable lessons for engineers.

We will review an upheld complaint from a past Disciplinary Committee decision every two months. The purpose of this project is not to name and shame, but to provide information so we can learn and grow. Wherever possible, we have anonymised the case.

We invite you to reflect on the lessons to be learnt.

CASE STUDY: JULY 2022

Background

The complainant engaged company A to prepare a structural design for their house. The engineer completed their design and signed off the PS1 for the structural design.

After construction began, the complainant raised concerns with the engineer about the adequacy of the framing and foundations in the design. The complainant was not satisfied with the response to their concerns and complained to Engineering New Zealand.

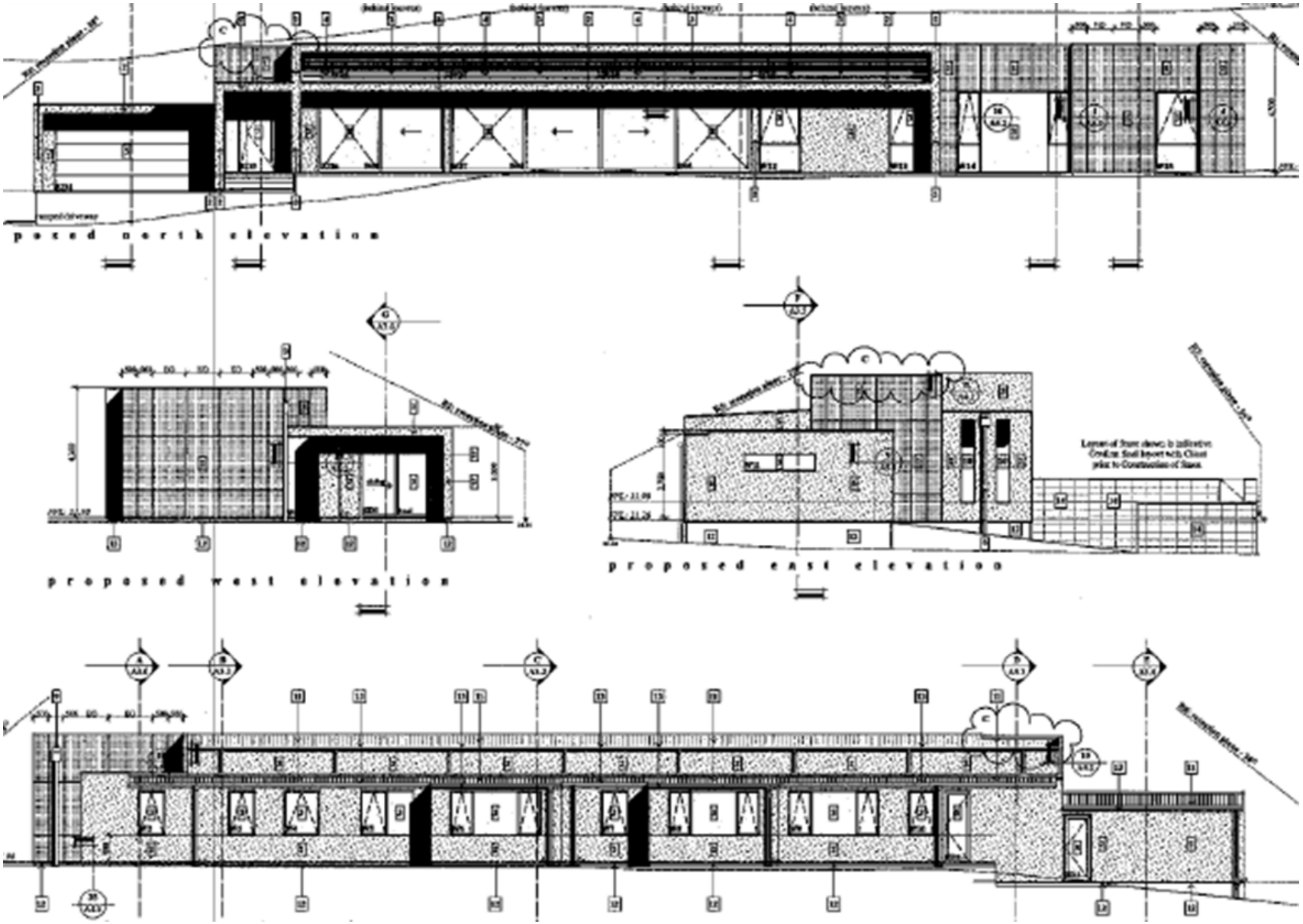
Key issues

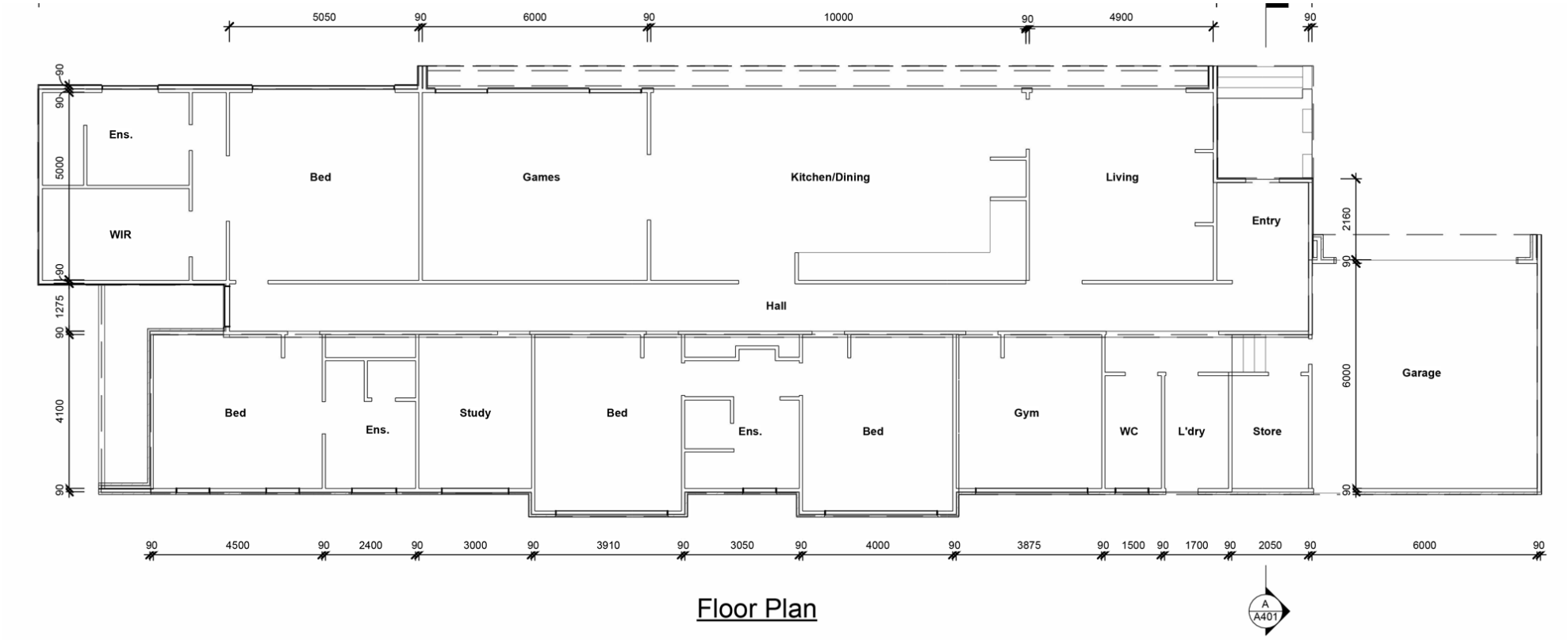
1. Whether the designs authorised (by signing the PS1) or subsequently provided by the engineer, including the initial, amended, and final designs, were adequate; and
2. If the engineer met the competency standards expected of a reasonable engineer in providing engineering services for the initial, amended, and final designs.

Decision

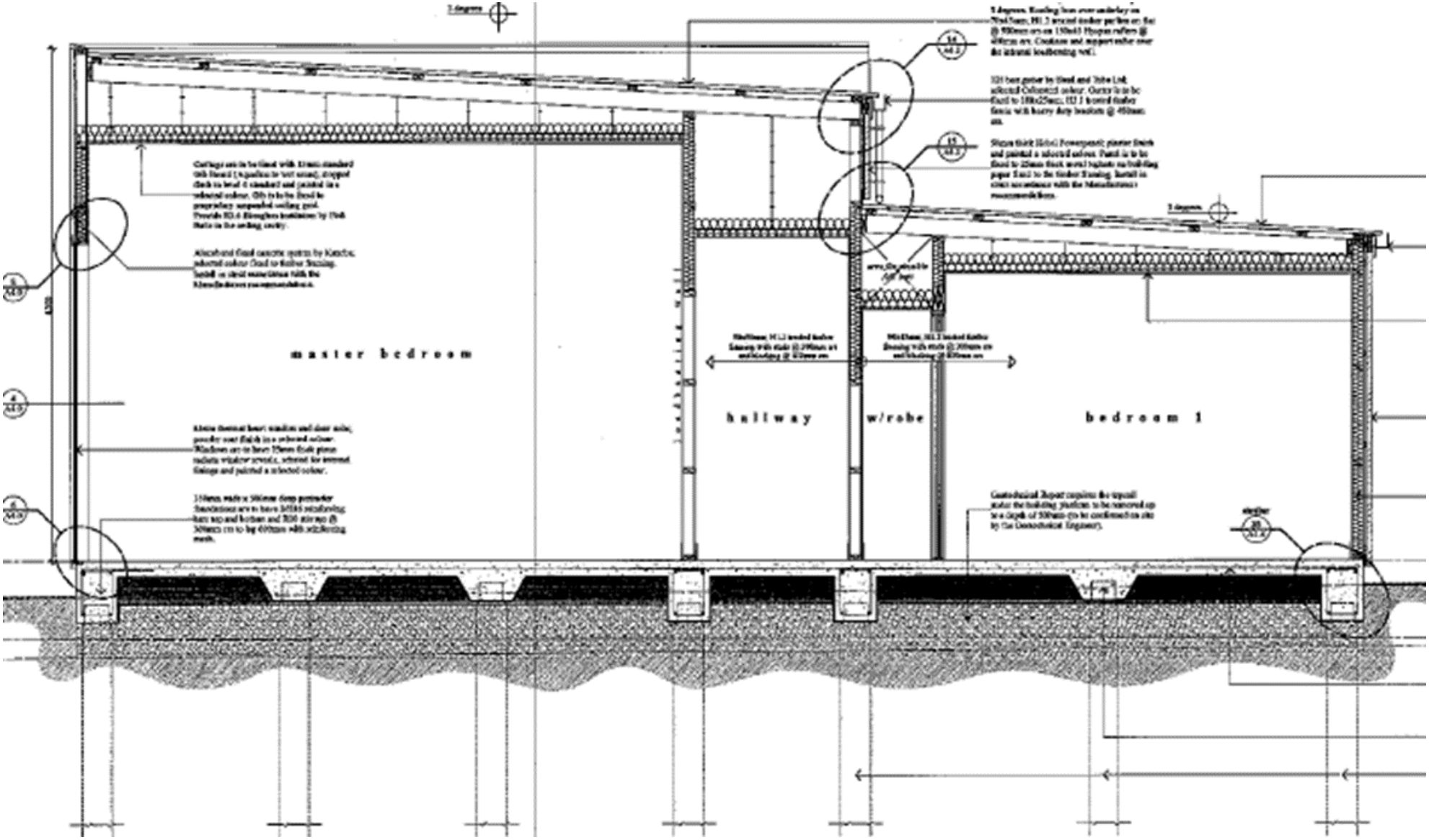
The Disciplinary Committee found the respondent engineer did not meet the competency standards expected of a reasonable engineer in providing engineering services for the initial and amended designs for the complainant's house.

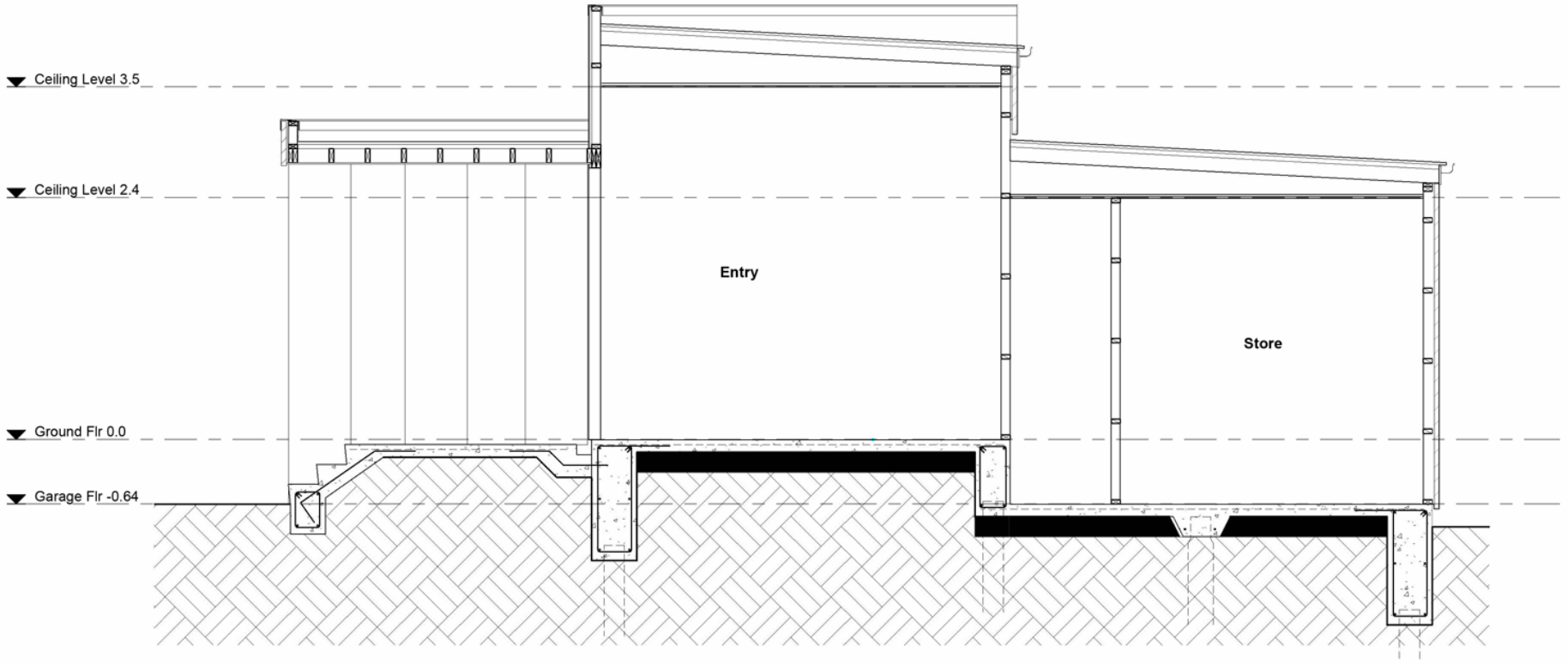
DRAWINGS


proposed north elevation
proposed west elevation
proposed east elevation


5050
90
6000
90
10000
90
4900
90
Ens.
Bed
Games
Kitchen/Dining
Living
Entry
WIR
Hall
Garage
Bed
Ens.
Study
Bed
Ens.
Bed
Gym
WC
L'dry
Store
90
4500
90
2400
90
3000
90
3910
90
3050
90
4000
90
3875
90
1500
90
1700
90
2050
90
6000
90
A
A401

Floor Plan


master bedroom
hallway
w/robe
bedroom 1


Ceiling Level 3.5
Ceiling Level 2.4
Ground Flr 0.0
Garage Flr -0.64
Entry
Store

Section A-A

YOUR REFLECTION

Based on the information provided, consider your answers to the following three questions.

What problems did you identify?

If you were engaged to resolve the identified problems, how would you do so? Sketch on the drawings and describe your thought process.

How would you have stopped this from occurring in your own company?

AN EXPERT'S VIEW

A brief discussion of the underlying principles that need to be resolved

We need to determine the type and magnitude of actions, then ensure that there are reliable and robust load paths to take these loads /actions to suitable ground. In this instance, the main problem was that the ceiling diaphragms were at different heights, which puts horizontal loading on the studs and produces a bending moment. A secondary problem was that the pile capacities weren't stated.

Issues to consider

Different floor levels

Think about the different diaphragm and wall heights when facing a building with different floor levels. Also consider that different stiffnesses could alter load paths, especially of ceiling/roof diaphragms or bracing.

Different ceiling heights

How are the loads transferred down to the foundations? With diaphragms at different heights, they likely impose additional horizonal loading on the studs. We would then need to check stud and connection capacity. We would also need to consider potential deflection issues, see previous comments about stiffness.

Pile capacity not clearly stated

It's not clear from the drawings but is mentioned in the DC comment. They are driven piles, so the engineer should provide details of design capacity or sets given for selected hammer weight and drop. Ideally, put these on the drawings so that the contractor can immediately find them.

What options do you suggest for this structure?

One option could be to break the structure into blocks with similar stiffness i.e., similar wall heights and ceiling/roof bracing or diaphragms, and brace accordingly. We must ensure that these blocks have capacity to interact (think of pounding), or you must ensure there is sufficient seismic gap to isolate them. Also, there are potential architectural issues to consider about how to achieve the separation.

Another option would be to model with a sophisticated model and brace accordingly.

Which option would you use, and why?

I would likely divide the structure into blocks and brace them individually. It's likely to be easier and simpler to do, and most likely more cost effective for the client, but architectural issues need to be addressed.

What should people watch out for in these structures?

If using Gib bracing software or data, ensure it is used correctly and within the limitations stated. A major issue here is the length of the ceiling diaphragm, even with dragon ties, looks outside of Gib software scope. Another issue where there is a sloping wall need to use average height of the wall as Gib requirements.

Another common error is not to use the full length of the wall for bracing. I always make sure that all available walls are used for some bracing (with the exclusion of wet areas – as in Gib info). If you read the Engineering Basis of NZS3604[1], one of the key characteristics is to have redundancy in structure. I believe this means I should ensure there are more bracing walls than the minimum required to provide that redundancy.

Can you give a suggestion of how to stop this from occurring in the future?

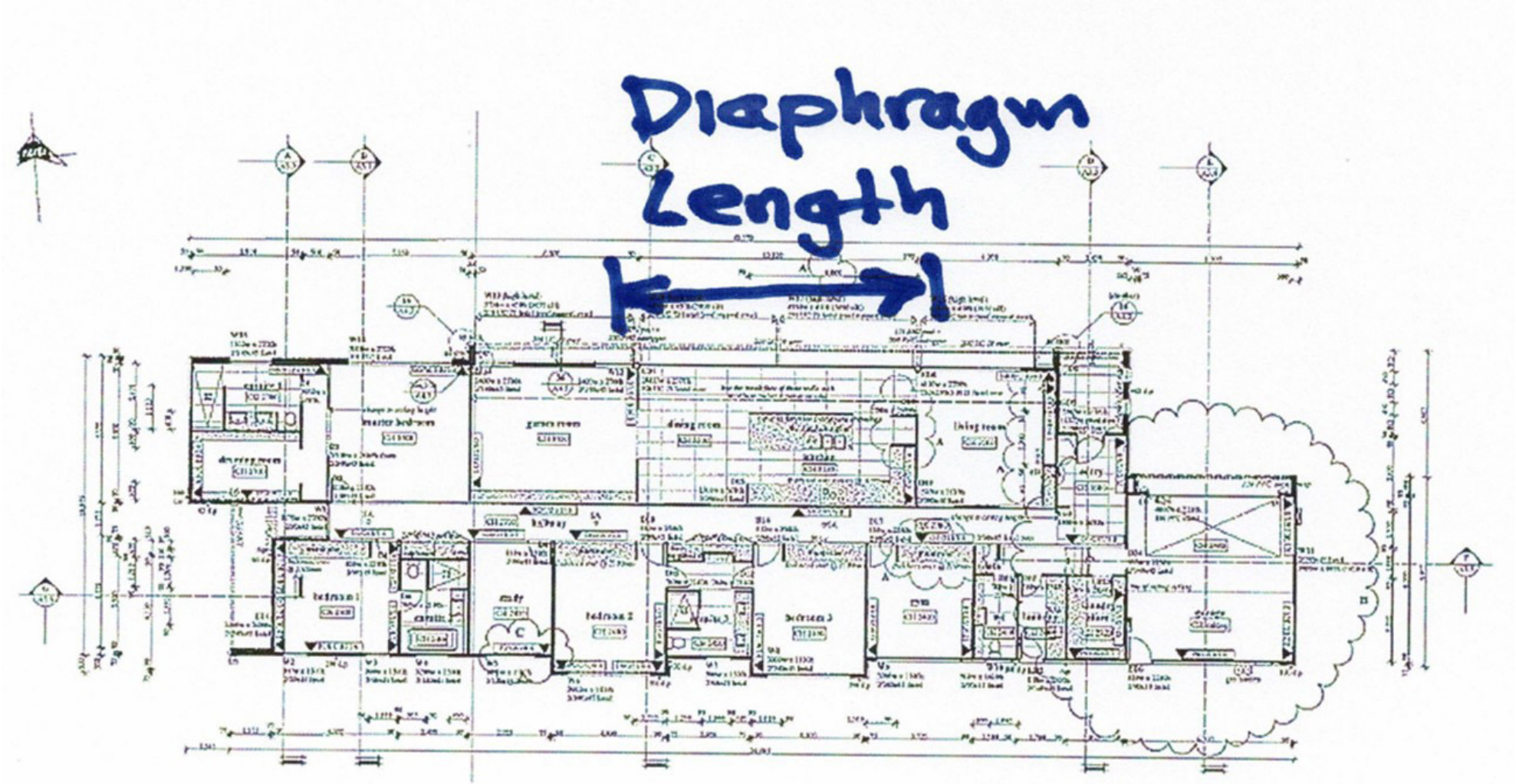
- Use sound engineering and make sure the load paths through the structure are sketched out before commencing calculations or modelling. This does not need to be hard, see my rough sketches over the architectural drawings. When you do this, you can see the load path and implications on the structure. Importantly, any checking engineer can immediately see what you're doing too.
- Focus on thorough QA especially looking holistically with checks on overall actions and structural response. Engineering New Zealand has resources that you can use in your firm. Make sure that, as a minimum, your firm follows the process set out in **Practice Note 14: Structural Design Office Practice**. If you don't have one already, you could use the checklist Engineering New Zealand have produced.

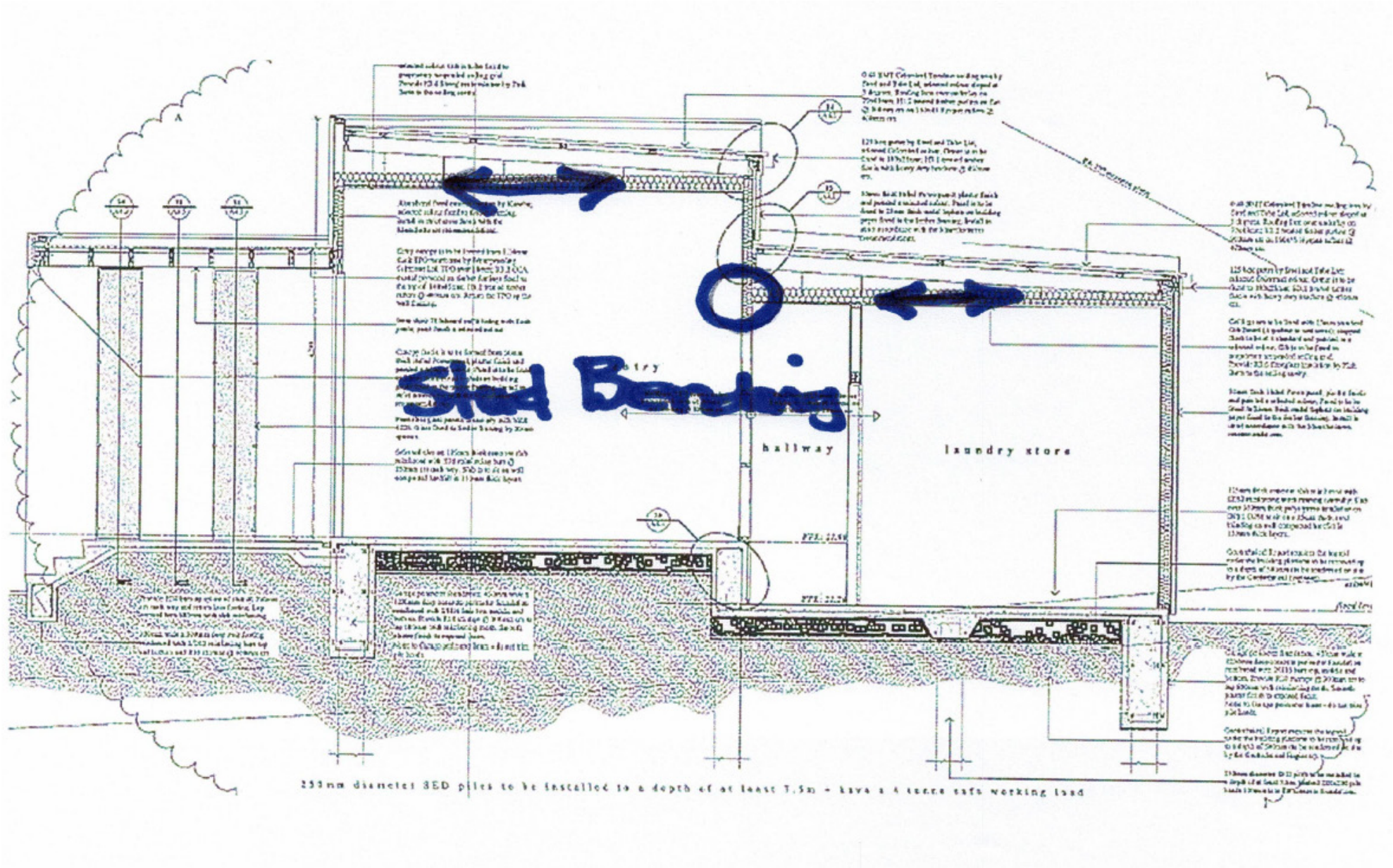
1 www.branz.co.nz/pubs/research-reports/sr168

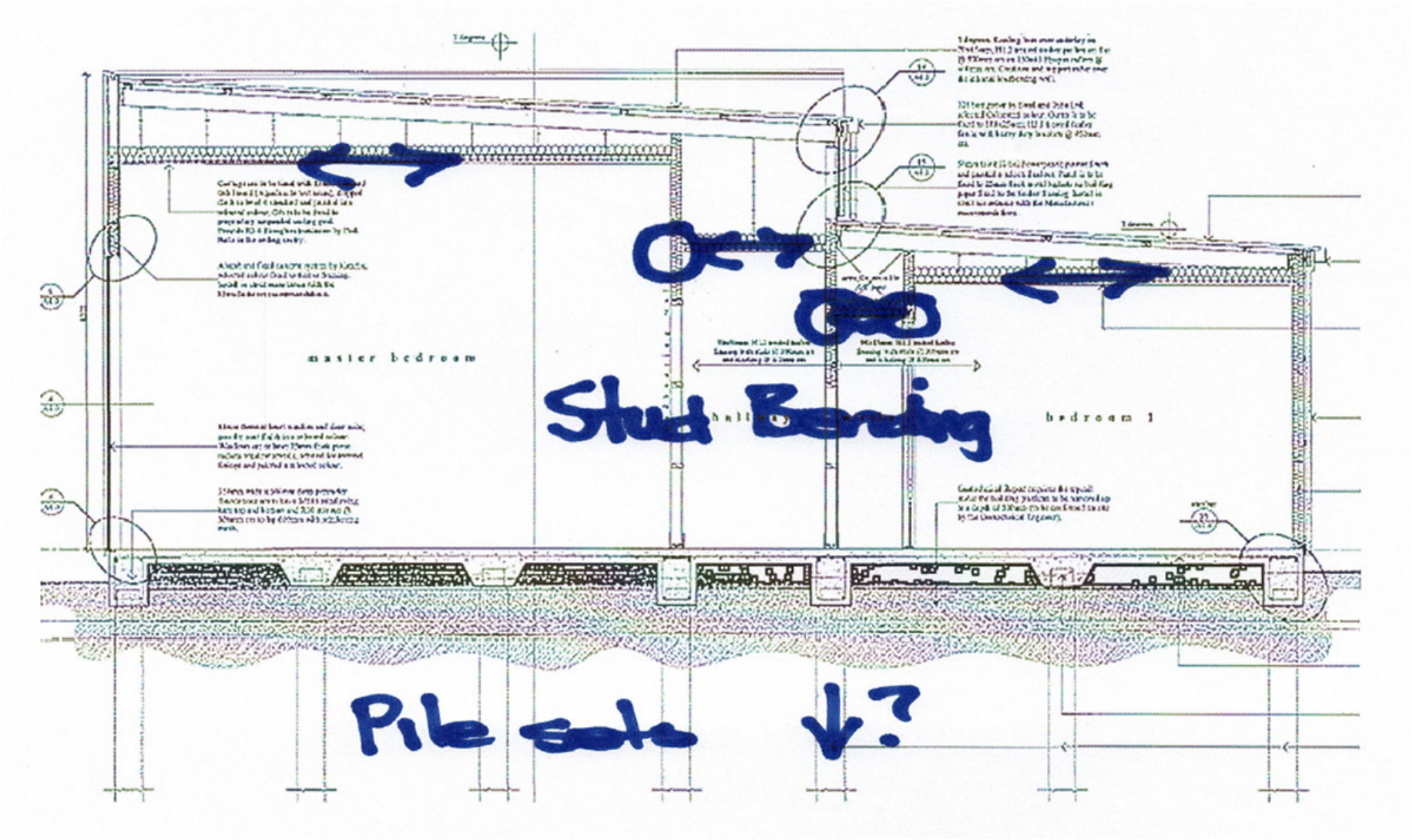
LESSONS TO BE LEARNT

What lessons can be learnt after reflecting on this upheld complaint?

EXAMPLE LOAD PATH SKETCHES




Slab Banding
hallway
laundry store
250mm diameter SED piles to be installed to a depth of at least 7.5m - have a 4 tonne safe working load


master bedroom
bedroom 1
Stud Bearing
Pile

Engineering New Zealand Te Ao Rangahau
hello@engineeringnz.org
www.engineeringnz.org
04 473 9444
L6, 40 Taranaki Street
Wellington 6011