

## CONSTRUCTION ENGINEERING MASTERS DISSERTATION ABSTRACT

### Exploring the teaching of structural failure cases to civil engineering students in Australia

The recent Opal Tower and Mascot Tower incidents in Australia highlight the serious consequences associated with structural failures. In both cases, the residents were urgently evacuated amidst fears of catastrophic collapse due to significant cracking in major structural elements. Given the significant financial and safety implications, it is paramount that the engineering lessons from these failures are learnt. Despite the potential educational benefits of structural failure cases, there does not appear to be any uniform approach in its use in undergraduate civil engineering degrees in Australia.

The aim of this research is to encourage the increased use of structural failure cases in the education of undergraduate civil engineering students in Australia. This research is exploratory in nature with two key research questions:

1. How do Australian structural engineers view “failure literacy” as a professional attribute?
2. What is the current state of practice of using structural failure cases in undergraduate civil engineering degrees in Australia, and how can this be improved?

A three stage mixed methods sequential research strategy was employed, which consisted of:

- Stage 1: Preliminary data collection and investigation (10 informal interviews with structural engineers and lecturers)
- Stage 2: Online survey of 100 professional structural engineers
- Stage 3: Focus groups/semi structured interviews with 7 civil engineering lecturers

The data collected in stages 1 and 2 was used to develop and validate four research propositions. These are:

- P1: As structural engineers increase in years of experience, their failure literacy also increases. This increase appears to plateau when engineers reach over 10 years of experience.
- P2: Failure literacy is relevant to the daily work of structural engineers, in particular, in detail design, design review, and site inspection and engineering.
- P3: Australian structural engineers currently exhibit a deficiency in failure literacy; the highest deficiency exists in engineers with 0-3 years’ and 7-10 years’ experience.
- P4: Undergraduate education, work experience and training, and postgraduate education can all increase failure literacy, but they are currently constrained by various factors.

The data collected in stage 3 provide more details to support and further develop Proposition 4 (P4). Overall, the civil engineering lecturers interviewed believe that there are numerous benefits associated with using structural failure cases in undergraduate education but currently use them in an ad hoc manner. They are constrained by a number of difficulties, such as the lack of readily available teaching material.

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