


CONCO>E TŪHURA

Civil construction: A requirement for a
robust and reliable training pipeline





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EXECUTIVE SUMMARY

The problem: a shortage of skilled workers in civil construction

Shortages of skilled labour are a persistent and recurring problem in the New Zealand civil construction industry, posing constraints in periods of growth for decades. This is of pressing concern given the current infrastructure deficit and a growing pipeline of work initiated to address the shortfall. Construction accounts for around 80% of the costs to build and maintain infrastructure. When the civil and heavy construction sector struggles to expand to meet demand, projects face cost overruns, or are deferred and delayed.

This report focuses on the issues driving a shortage of skilled civil construction trades workers and heavy machine operators and provides conceptual solutions and recommendations to address the problems identified. Civil infrastructure is of vital strategic importance for New Zealand's future. There is likely to be a substantial crossover of skills between horizontal (civil construction) and vertical (building and residential) construction, so improving training provision for horizontal construction will benefit the construction sector as a whole.

While the education pathway for civil engineers is generally well serviced by the tertiary education sector, the training pipeline for civil construction workers and tradespeople is less established. This pipeline has failed to keep pace with growth in the sector, resulting in labour shortages at their highest levels in decades. This shortage will be compounded as the current workforce continues to age. Skills are concentrated in older workers and retirements are removing skills and experience faster than the next generation is being trained. Furthermore, labour productivity in horizontal construction is lagging behind vertical construction, exacerbating the infrastructure deficit. A poor training pipeline for civil construction, chronic skill shortages, and a lack of adoption of new technology may be suppressing productivity growth in the sector.

Shortages can lead to reliance on temporary, untrained, or unskilled workers to fill gaps, reducing productivity, impacting quality, and posing safety concerns. Productivity in infrastructure construction hinges on skilled personnel; it requires teams with expertise who can handle costly and sophisticated equipment. However, low worker productivity creates a negative feedback loop. It necessitates significant labour allocation to projects and justifies low wages, which incentivises long hours and significant amounts of overtime. However, these factors have been shown to further reduce worker productivity, reinforcing the cycle.

The pressing skills shortage shows that the current training provision in horizontal construction is inadequate. A number of training initiatives have taken place to address this, operated by a diverse array of government agencies, local authorities, NGOs, and industry trainers. However, these are small-scale trials, generally happening in isolation over a limited time period and heavily dependent on the motivation and energy of the individuals and organisations that initiated them. Without a comprehensive and organised system for education at scale, the majority of training for civil construction occurs on-the-job in small numbers, as most projects do not support a large proportion of trainees. Capital equipment and material costs are generally substantial and worksites are subject to a high degree of health and safety risks that are particularly exacerbated for novice employees.

The access point for new entrants to the industry is unclear, which compounds the already tight labour pool. Potential civil recruits acquire few relevant skills or experience during their schooling and there is a general lack of awareness of civil construction as a career path. Employers frequently rely on informal networks, or through trialling individuals from labour hire companies, as their most reliable methods of finding suitable new entrants. These methods can be inefficient at the industry level, and the reliance on informal networks in particular can reinforce ethnicity and gender imbalances in the construction workforce.

Low gender diversity also implies that the industry is missing out on potential employees. Although improving, the proportion of women in trades and civil construction is still extremely low. Cited reasons include inflexible and long work hours, a lack of awareness of civil construction as a career for women, and a potentially hostile or discriminatory work environment.

Migration may not alleviate the skill shortage. New Zealand companies are in an international competition to attract skilled migrants and retain domestic talent, with net outflows of construction personnel for the majority of the last 50 years. Recognition of skills obtained overseas can be difficult and current New Zealand immigration settings pose challenges for the upskilling of migrants. Construction firms tend to turn to migrants when the domestic labour supply is constrained, and in specialised civil infrastructure roles that may not exist locally. Migrants can facilitate expansion by relieving pressure on internal trainers and site supervisors during period of growth. However, COVID-19 demonstrated the vulnerability of relying on international migration to fill domestic skill shortages.



Fundamentals behind the problem: an underinvestment in training

High costs: The process of training a skilled civil construction worker is especially capital and time intensive. Equipment is generally large, specialised and expensive, and work often has high material requirements. Evidence from apprenticeship programs shows that firms are less willing to train when the payback period on their training investment is long, which is particularly the case for firms with high skill requirements. This could explain the lower uptake of apprenticeships in horizontal civil construction as compared to vertical building construction in New Zealand.

High costs also pose barriers to training for small firms, and this is exacerbated by layers of sub- contracting. Small firms are less able to spare the time or capital equipment to train recruits, while the further down the chain of sub-contracting, the lower profit margins generally become, reducing the capacity and the appetite for training. Small firms may lack the diversity of work required for apprentices and trainees to fulfil specific qualifications. These factors naturally create a shortage, as larger firms will not train an excess of workers for the small firms to draw on.

Signalling problems: Interacting with an individual through on-the-job training is one of the few methods available to horizontal construction firms to determine if a new trainee will be 'good' or 'bad'. With high training costs, high operating costs, and a high degree of hazards, civil construction firms face significant losses if a new employee turns out to be unreliable, unmotivated, or unsafe. An employee's attributes are generally not observable by the firm prior to the decision to hire and train. Firms must rely on 'signals' of an employee's quality, with the current focus being informal signals such as word-of-mouth referrals and trial employment through labour-hire companies to find new recruits.

While there are pathways for civil engineering recruits through tertiary education, civil trade pathways are minimal. It is notable that the 'signal' of a tertiary education qualification is generally not utilised by industry to assess the suitability

of a potential recruit. There is relatively limited engagement between polytechnics and the horizontal construction industry and employers generally do not trust the tertiary education system to deliver on their needs. Tertiary education courses are mostly used for compliance purposes and to demonstrate current competencies, rather than as a source of new labour.

Matching frictions between employers and potential employees: Significant matching frictions exist in the labour market for civil construction trainees. Industry reports that potential recruits are often not 'work-ready', and that there is a substantial disconnect between the expectations of new entrants and the expectations of employers in regards to working conditions. This could be driven by labour-intensive models of construction, relying on long and inflexible shifts, unsociable hours and six-day work weeks. This precludes a match with individuals who desire part-time work or who have other responsibilities such as caregiving.

Gender disparities also persist, with frictions on both sides of the workplace pairing. On the employee side, a lack of awareness of construction and civil infrastructure as a career for women reduces the number of women recruits who enter the search. For employers, job-sites, roles, and workplace cultures have historically coalesced around masculine stereotypes which reduces the likelihood of finding a 'match' with individuals from outside of this group.

An uncertain project pipeline: An uncertain pipeline of work is commonly cited as a reason for underinvestment in training by civil construction firms. In response to this, estimates of future building activity and workforce requirements have been developed by several government ministries and departments. However, individual firms do not know if they will be awarded these future projects, reducing their willingness to train additional employees. A multi-skilled trade professional can take more than five years to train. By the time a contract has been awarded, it may be too late to commence large-scale workforce training. Due to high costs and long training schedules, individual firms considering recruitment focus on their own project pipeline, not the pipeline of the industry as a whole.

Lowest cost procurement exacerbates this issue. On-the-job training to meet future requirements increases the costs to deliver current projects. Clients are often unwilling to bear this cost. Competitive tenders, that do not specify training requirements, result in the cutting of skill development to reduce expenses.

Poor incentives in the current education system: There is a trust gap between industry and the education system, with employers not believing that the system meets their needs. Closing the gap requires the education process to both transform unskilled individuals into skilled workers, and to filter out those individuals who are unsuitable for roles in the industry. The current system is overly focused on the former, where 'Industry needs' are translated into assessment criteria with an associated qualification awarded to any individual who passes these assessments. However, the bureaucratic nature of the education system, a focus on course completion rates, and a binding of funding to enrolment numbers and retention, has produced incentive structures that prioritise getting large numbers of students through education programs, with failure and drop-outs being minimised as much as possible, rather than been seen as part of the process of screening for suitable recruits. The education system is in a tricky position. Low failure and drop-out rates could signify that the provider is excelling in learning support and pastoral care, which are vital parts of the education process. However, it is also essential to recognise that not everyone will be suited for, or capable of excelling in, every course. Upholding the integrity of assessments is crucial to ensure that qualifications remain reliable markers of an individual's capabilities and job suitability.



There are few entry requirements for civil trades education programs, meaning that no pre-screening is taking place. However, learners are also provided potentially extreme numbers of chances to repeat assessments, meaning that minimal screening takes place as part of the education process. This can exacerbate the trust gap, as the qualification no longer becomes a useful signal of an individual's quality. Without a trustworthy external qualification, many civil construction firms rely on internal competency assessments. These can become highly firm-specific, resulting in repeated assessments every time an individual changes employer, despite significant overlap of skill requirements. This negatively impacts productivity, recruitment time, and worker job mobility.

Furthermore, the philosophy of many employers is that qualifications are to recognise skills gained through on-the-job work and training, rather than a prerequisite to employment acquired at a tertiary institution. While this perspective acknowledges qualifications as evidence of competency and suitability for employment, it also suggests a singular valid approach to skill acquisition: on-the-job training. This can exacerbate the trust gap between the industry and tertiary education, because tertiary institutions are definitionally incapable of delivering training that these employers value.

CONCEPTUAL TRAINING SOLUTIONS

This report outlines some conceptual approaches to civil construction training. These cover formal and informal learning with both theoretical and practical skill development. This training can take place on- the-job, in campus settings, and through experience in simulators and virtual reality. The training can be part of a commercial construction operation or can be undertaken solely for the purpose of education. Each method has its advantages and disadvantages and a training schedule may encompass multiple modes of learning.

Of particular note is a large off-site campus for hands-on training in civil construction equipment and heavy machinery. The aim is to provide a controlled environment for trainees to learn and practice using techniques and machinery in a safe and repeatable manner. Students can undertake intensive courses with the freedom to make mistakes and learn from experience, facilitating greater skill acquisition in a shorter time. Significant agglomeration benefits exist, with scale allowing advanced facilities and support that would not be economically feasible in smaller or more dispersed operations. Such a site can also provide the base and resources for portable teaching options that provide pop-up training close to where services are desired.

However, a campus requires a high degree of capital investment and ongoing operational funding. The lack of an existing large-scale commercial operation in New Zealand suggests that it is unviable to meet these costs from course fees alone. Civil construction firms in New Zealand, unacquainted with this method, may need reassurance about the capability of educational campuses to replicate an actual worksite accurately. Investigation of the significant employment of such facilities overseas can help provide a suitable template for New Zealand.

RECOMMENDATIONS

There is unlikely to be a one-size-fits-all approach to solving the current skills shortage and skill development of a civil worker is a long-term, ongoing process. However, this report has identified four key areas to target:

- 1. Significant and ongoing engagement with industry.** Industry voices need to be amplified and integrated with any proposed solution to the skills shortage. Effective and ongoing communication and collaboration between industry stakeholders, training institutions, and policymakers is crucial to address the industry's needs, especially considering the changing expectations of the workforce regarding working hours and work-life balance.
- 2. Substantial and sustained funding at scale to develop multiple training options.** The significant public benefit justifies public funding, either through a transfer from taxation, or an industry-wide levy. Industry involvement in directing these funds towards effective uses is vital. Educational performance should be assessed based on post-study outcomes and employability, to align education outcomes with industry requirements.
- 3. A large campus for training at scale on civil construction equipment and heavy machinery.** High capital costs have been a barrier to investment in education in the industry, and one or more dedicated campuses can help address this issue. They are considered a standard component of training structures in other countries. Industry needs better options for civil training and there is a clear gap in the programs offered by the tertiary sector that misses education on large and complex equipment.
- 4. An integrated training pathway. The large campus would sit inside of an integrated training pathway.** Education should move away from isolated projects and disjointed training and focus on civil construction education as a cohesive whole. A pathway is needed which can onboard recruits to civil

construction from a variety of sources, backgrounds, and skill levels, and progress these recruits through to the competencies and skills that are in high demand in industry. This could involve several stages:

- **Initial Exposure:** Showcasing high-engagement drivers like simulators and heavy equipment at schools, career events, and community gatherings. Expanding recruitment programs for marginalised communities and emphasising the nature of construction work and potential career trajectories.
- **Work Readiness:** Providing basic skills, experience, and induction courses for individuals with limited skills or those transitioning to employment. This includes site awareness, health and safety, and support for acquiring driver's licenses if necessary.
- **Entry-Level Training:** Offering entry-level training for work-ready individuals either through education providers or on-the-job training. This training would focus on basic skills, teamwork, and health and safety.
- **Skill Development:** Providing ongoing skill growth and development for skilled and semi-skilled individuals. This can involve intensive off-site programs, simulators, on-site education, and apprenticeships.

Engagement and buy-in from industry is necessary at each step of the pathway. Part of this will require screening to take place for individuals not suited to the roles in industry. While this must be sufficient for industry to value and engage with the qualification process, it must not be overly strict or subjective. It should accommodate various learning environments, individual circumstances, and life challenges. Developing multiple pathways for success can help in this regard.

Gender diversity and support for individuals with caring responsibilities should be addressed, along with cultural and social barriers to progression within the industry. Structural remedies should be developed to ensure workplace training progresses efficiently for all individuals, regardless of their background or circumstances.

CONCLUSION

This report emphasises the pressing need to address the skills shortage in New Zealand's civil construction industry, which poses significant challenges to growth and infrastructure development. Despite industry concerns about skills shortages persisting for years, little progress has been made. To tackle this issue, effective communication and collaboration between industry, policymakers, and training institutions are essential.

Key recommendations of this report include an integrated training pathway and the establishment of large training campuses dedicated to civil construction equipment. These campuses should align intake capacities with industry pipeline needs. Sustained funding from sources such as taxation or industry-wide levies, should be directed toward effective training programs using significant industry input. By implementing these measures and fostering strong industry partnerships, the civil construction sector can overcome its challenges and ensure a skilled workforce for the future.