

**Literature and Contemporary Practice Review Report:  
Breaking Barriers for Women in the Plumbing Industry**

**Final Report September 2025**



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| Final report (this version) | 30 September 2025 | Final draft following feedback, including a separate Executive Summary. |

# Introduction

McEncroe and Associates is pleased to present a Literature and Contemporary Practice Review (LACPR) report to support and underpin the Australian Plumbing and Fire Protection Industry's (the Industry) national project to uplift the participation rate by Women in the Industry.

The Industry-led *Building Better Futures: Breaking Barriers Project* (the Project) is a unique and positive opportunity to create, promote and deliver initiatives aimed at making the Industry attractive, welcoming and culturally safe for women.

The Project aims to create a step change in the construction industry. Achieving this step change will require a sustained commitment over several years with dedicated long-term funding. Without this extended commitment and resources, the Industry risks missing the opportunity to make and embed lasting change.

The project is focussed on developing and maintaining a significantly more inclusive and culturally safe Industry for women, ensuring that the Industry can attract and retain a diverse workforce. The expected outcomes of the Project include a more positive perception of the Industry as a career choice amongst women, increased female participation, and the identification and removal of cultural and attitudinal blockers.

The LACPR is a critical first step in that journey, and is about building a solid, well-informed, and contemporary foundation for the Project. It includes a review of existing literature, but it is more than a literature review. The report also provides information on various programs, their methodologies and success factors that have been effective in similar initiatives.

It is critical to the Project's success that the activities that are going to drive the desired cultural change within the Industry, primarily the national training phase, are contemporary, resonate with the different target groups, particularly men, and are based on approaches that have been proven to be effective.

The LACPR is intended to inform broader program research and ultimately the direction and content of the sector-wide national training and awareness programs (within and beyond the Industry and the construction sector), which are at the heart of the Project.

McEncroe and Associates wish to thank all industry stakeholders, project partners, and their representatives, as well as the women and men of the Industry who generously shared their time, experiences, and ideas. Thank you for your candour and contributions, which are key to informing this work and the Project's work going forward.

## LACPR Executive Summary

The peer-reviewed literature is the first stage of the Literature and Contemporary Practice Review (LACPR), which contributes to the multilayered research work underpinning the *Building Women's Careers (BWC): Breaking Barriers for Women in the Plumbing Industry* project.

The key deliverables for this project are:

- Promote and deliver a national education and training program to make the industry welcoming and culturally safe for women.
- Develop a framework for employers to make sure they can create/maintain an inclusive and diverse workforce
- Develop a national awareness campaign to support the rollout of the deliverables

This LACPR examines barriers and opportunities for women's participation in the Australian Plumbing and Fire Protection Industry (Industry) through three research stages:

1. peer-reviewed academic literature (2014-2025)
2. an online environmental scan of contemporary programs and initiatives
3. cross-sector and industry interviews.

Drawing on approximately 40 peer-reviewed articles, over 120 grey literature sources, and interviews with representatives of seven key organisations, the review provides evidence-based foundations to inform the next stages of the Industry-led *Building Better Futures: Breaking Barriers Project* (the Project).

## Current State and Critical Barriers

Women comprise only 2% of Australian plumbers (Jobs & Skills Australia, 2025), a figure that has remained unchanged for decades despite severe workforce shortages and multiple interventions. The research reveals that this underrepresentation stems not from a lack of capability or interest but from systematic structural and cultural barriers.

Holdsworth, Turner and Sandri's (2023) comprehensive Australian study found that 91% of women reported being issued ill-fitting personal protective equipment, 83% lacked access to appropriate facilities, and 63% experienced harassment or assault. The psychological impact is profound, with women experiencing discrimination showing 2.7 times higher depression rates and 4.1 times higher PTSD symptoms than men (Jahnke et al., 2019). Consequently, approximately 41% of women leave within five years, compared to 17% of men (Galea et al., 2020).

Stakeholder interviews confirmed these findings, with one industry representative estimating that *"60-70% of employers believe women are hired to meet quotas rather than for capability"*. The research identifies hypermasculine workplace cultures as the primary barrier, operating through physicality as a proxy for competence, sexual banter as a bonding mechanism, and systematic exclusion from decision-making.

## **Evidence of Successful Transformation**

Despite these challenges, comprehensive interventions demonstrate measurable success. Whilst recognising that there is much more work to be done, it is also important to recognise that Industry stakeholders, including the Plumbing and Pipe Trades Employees Union (PPTEU), have shown considerable leadership in developing new and innovative programs to improve the gender balance in the Industry and create safe environments for women to learn and work. For example, the PPTEU/Raw GTO Women in Plumbing program leverages family networks and union-industry partnerships to support its initiatives. The PPTEU/Raw holistic *"life coaching"* model has been highly successful, achieving 90.4% retention rates for female apprentices. Master Plumbers Victoria has achieved 26% female apprentice participation—13 times the industry average —through dedicated field officers and wraparound support.

International examples provide compelling models. BHP's integrated approach achieved 40% female participation while reducing serious injuries by 67%. South Africa's competency-based modular programs compress traditional timeframes, with 54% of training participants being women. The UK's zero-tolerance *"carding system"* for harassment demonstrates how regulatory frameworks create meaningful change.

## **Key Recommendations for the Project**

Based on consolidated evidence from all three research stages, multiple measures have been identified that may have a positive impact on the industry. These are grouped by the project deliverables listed above.

### **For the Employer Framework, consideration could be given to:**

- Establishing female apprentice targets (e.g., 15%) by 2030 with executive KPIs tied to achievement
- Implementing mandatory infrastructure standards, including appropriate amenities, PPE in women's sizes, and menstruation support facilities
- Developing cultural assessment protocols using validated tools with annual external validation
- Creating mentoring programs modelled on Raw GTO's holistic approach, combining trade skills with life coaching
- Integrating zero-tolerance enforcement mechanisms with immediate accountability

## For the Training Program, consider:

- Develop mandatory five-module male ally training addressing hypermasculine culture, unconscious bias, and bystander intervention
- Target Year 11-12 students for pre-education programs before career decisions solidify
- Integrate mental health support using peer-led models like MATES in Construction
- Include practical workplace education on menstruation, pregnancy during apprenticeships, and flexible work arrangements
- Provide career-stage specific support, recognising the different needs of apprentices versus mid-career workers

## For the National Awareness Campaign, consider:

- Reframing messaging from "*women's issue*" to "*humans in plumbing*", emphasising workplace safety and dignity.
- Actively challenging perceptions of plumbing as "*dirty work*" by showcasing clean energy and technology pathways.
- Promoting and featuring diverse role models across age ranges, with particular emphasis on young female apprentices.
- Partnering with schools for systematic engagement at the Year 11-12 level.
- Celebrating success while acknowledging ongoing challenges.

## Critical Success Factors

The research identifies five essential elements consistently associated with successful transformation when adopted and implemented simultaneously:

1. **Multi-level interventions:** Addressing individual, organisational, and industry levels simultaneously
2. **Sustained commitment:** Minimum 3-5 year programs with ongoing reinforcement
3. **External accountability:** Independent monitoring, preventing backsliding
4. **Wraparound support:** Addressing childcare, transport, and financial barriers alongside training
5. **Male engagement:** Moving beyond awareness to behavioural change through structured programs

## Industry Roadmap for Change

The research revealed that long-term industry transformation requires phased implementation, with some activities outside the scope of this project, necessitating ongoing collaboration among government, industry, and across the sector. For example:

- Immediate actions (1-3 years): require infrastructure upgrades, zero-tolerance policies, and emergency support systems.

- Medium-term initiatives (3-5 years): require mentorship program establishment, male ally training rollout, and school partnerships.
- Long-term transformation (5+ years): demands systemic changes, including procurement leverage, education pipeline development, and sustained investment models.

## Research Limitations and Future Directions

The review identifies critical gaps requiring attention. Plumbing-specific peer-reviewed research remains scarce, with the trade frequently subsumed within broader construction analyses. Longitudinal studies tracking women's careers over time are needed, as is intersectional analysis examining experiences of Indigenous women, CALD women, and women with disabilities. Moving forward, and where possible, the project should prioritise participatory research that centres on the voices of women plumbers through interviews and longitudinal tracking.

## Conclusion

The evidence overwhelmingly demonstrates that women's 2% representation in Australian plumbing represents both an economic risk and an opportunity. With the Industry facing severe skills shortages and an ageing workforce, maximising the available talent pool is economically critical. International research shows that gender-diverse teams enhance capability and capacity (Hajikazemi et al., 2024), lower injury rates, and improve project outcomes.

Success requires moving beyond individual women's resilience to systematic industry transformation. The research demonstrates this transformation is not only possible but economically beneficial, with a moral imperative.

The challenge now lies in implementation; with the sustained commitment the research shows is essential for success. While achieving equal representation by 2030 may be ambitious, as one interviewee noted:

***"if we move the dial, that'll be a bonus"***

# Stage 1: Peer-Reviewed Literature

## Introduction

The peer-reviewed literature is the first stage of the Literature and Contemporary Practice Review (LACPR), which contributes to the multilayered research work underpinning the *Building Women's Careers (BWC): Breaking Barriers for Women in the Plumbing Industry* project.

The key deliverables for this project are:

- Promote and deliver a national education and training program to make the industry welcoming and culturally safe for women.
- Develop a framework for employers to make sure they can create/maintain an inclusive and diverse workforce
- Develop a national awareness campaign to support the rollout of the deliverables

## Research limitations

It is noteworthy that the lack of plumbing-specific peer-reviewed research in the Australian context represents a significant limitation in understanding women's experiences in this trade. Among the peer-reviewed literature examined, plumbing is frequently subsumed within broader analyses of the construction trades, rendering the unique challenges and opportunities within plumbing somewhat invisible. This gap justifies the inclusion of broader construction trades literature in this review, while simultaneously highlighting the need for research on plumbing-specific topics—both qualitative and quantitative—to inform targeted interventions.

Another limitation observed is the lack of delineation between the effectiveness of initiatives regarding women plumbers/construction workers working 'on site', versus women who may be in the plumbing/construction industry but not working on site (e.g., in a corporate setting, working in an office, etc). While efforts have been made to focus on research regarding the former, some of the research observed for this LACPR does not make this delineation, though, where this is the case, it is highlighted. Nevertheless, all items included in the LACPR contain helpful lessons and information that can be gleaned to inform the development and provision of the primary project deliverables.

## Purpose and Scope

This stage examines peer-reviewed academic literature primarily published over the last ten years to:

- Identify structural and cultural barriers preventing women's participation and retention in plumbing
- Analyse evidence-based interventions demonstrating success in comparable contexts
- Synthesise theoretical frameworks explaining gender exclusion in skilled trades
- Inform the development of the project deliverables

## Significance

The significance of the information captured for this review extends beyond addressing workforce shortages. International research demonstrates that gender-diverse teams in construction can help organisations reach their full potential through enhancing their capability and capacity (Hajikazemi et al., 2024), lowering injury rates (BHP & Monash University, 2023), and improving project outcomes across multiple metrics (Rosa, Hon, Xia, & Lamari, 2017). Furthermore, the focus on gender equity in plumbing aligns with Australia's commitments under the *Workplace Gender Equality Act* and international conventions on gender and discrimination.

## Methodology

### Search Strategy

This systematic review employed a comprehensive search strategy across multiple online academic databases, including:

- Scopus
- Web of Science
- Google Scholar
- ProQuest
- EBSCO Academic Search Complete
- Taylor & Francis Online
- Wiley Online Library
- SpringerLink

### Summary Statistics

Search terms included combinations of: "women," "female," "gender," "diversity," "plumbing," "fire protection," "construction," "trades," "skilled trades," "barriers," "workplace culture," "retention," "apprenticeship," and "career pathways".

- Date Range: 2014 - 2025
- Total sources identified: **300 approx.**
- Sources screened for relevance: **200 approx.**
- Sources meeting inclusion criteria: **120 approx.**
- Sources cited in final review: **40 open source peer-reviewed approx.** + approx. 17 university-affiliated/academic/official research publications

## Search Limitations

1. Language: English-only sources
2. Geographic bias: Overrepresentation of Anglo countries (Australia, UK, USA, Canada)
3. Publication bias: Possible exclusion of negative findings or failed interventions
4. Research distinction: lack of distinction between women working onsite and those in corporate settings
5. Access limitations: Open-sourced, publicly available articles only
6. Emerging research: Very recent publications may not be indexed yet

## Analysis Framework



The literature is categorised via a bespoke research framework:

1. Core: Plumbing and Fire Protection Industry
2. Adjacent: Construction Sector
3. Comparable: Other male-dominated industries
4. Contextual: International perspectives

This thematic analysis has identified recurring patterns across structural barriers, cultural factors, intervention strategies and theoretical frameworks.

## Quality Assessment & Inclusion Criteria

Peer-reviewed articles were included if they:

- Were published in open-sourced peer-reviewed academic journals, or university-affiliated official research publications, primarily between 2014 and 2024.
- Some older articles are included for framing and/or contextual purposes.
- Included empirical data or systematic analysis
- Relevant to understanding barriers or interventions for women in trades
- Addressed gender diversity in plumbing, construction, or comparable industries
- Included empirical research or systematic reviews
- Were available in English
- Full text or detailed abstract/citations accessible for review
- Clear methodology described
- Findings supported by evidence

## Context and Background

### Historical Context

The exclusion of women from plumbing in Australia has historical roots reflecting broader patterns of gender segregation in skilled trades, dating to colonial times. Following British models, the Australian workforce systematically excluded women from apprenticeships throughout the late 19th and early 20th centuries (Ryan & Conlon, 1989).

The 1907 Harvester Judgment, which established the basic wage, enshrined the male breadwinner model, assuming that men needed wages to support their families while women's work was supplementary (Higgins, 1907; Macarthy, 1967). This legal framework could be considered as justifying the exclusion of women from higher-paid, skilled trades, such as plumbing.

Following World War II, where women briefly entered male occupations, the Commonwealth Reconstruction Training Scheme (1944-1951) prioritised returned servicemen for trade training, effectively re-masculinising trades that had temporarily opened up to women (Commonwealth of Australia, 1944).

Formal barriers began to fall in the 1970s and 1980s, and the Sex Discrimination Act (1984) made exclusion from trades illegal, while mandating access to apprenticeships (Commonwealth of Australia, 1984). However, as Holdsworth (2023) indicates, removing formal barriers fails to address entrenched cultural exclusion. The 'male trade

identity' of plumbing, constructed over a century, has proved resistant to legislative change alone. Francis et al. (2021) found construction companies' "*informal recruitment practices permit gender and age bias*", an outcome likely descended in part from the historical exclusions outlined.

Understanding this history is crucial for recognising that current underrepresentation in the industry may not be solely the result of women's active choices or capabilities, but also a consequence of deliberate, systematic exclusion over time, requiring equally deliberate, systematic remediation.

## The Australian Plumbing Industry Context

Today, the Australian plumbing industry operates within a complex regulatory environment that spans both federal and state jurisdictions. The industry employs approximately 101,000 plumbers (Jobs and Skills Australia, 2025), of which only 2% are women, with an average age of 33 years (across all genders).

The industry is at a critical juncture. Jobs Skills Australia (2023) and recent research by the National Centre for Vocational Education Research (NCVER, 2023) have identified the plumbing industry as experiencing "*severe skills shortages*" across all states and territories. Master Builders Australia (2024) states the industry workforce shortages are the result of 'a perfect storm of low productivity, high demand, an increased cost of living and doing business, high inflation, and low unemployment'. 'Fill rates' for construction-related occupations are among the lowest in the labour market and have declined significantly from 54% in 2020–21 to 29% in 2022–23 (Job Skills Australia 2023). Interestingly, when referring to the construction industry, the Australian Productivity Commission (2025) states, "*despite frequent mentions of an ageing workforce, the construction workforce is also younger than in the broader economy*".

Despite this crisis, women's participation has remained static at approximately 1-2% for the past two decades (2% as of 2025). The industry's traditional exclusion of women represents a potential economic crisis, highlighted by recent ABS Labour Force statistics (2025) that indicate the participation rate of women in the Australian workforce *overall* is at a high of approximately 62.3 per cent.

Recent program and project evaluations further underscore the challenges facing women in the plumbing industry. Francis et al. (2021) evaluated the Victorian Women in

Construction Strategy programs and confirmed that, according to 2016 census data, there were approximately 125 women plumbers in Victoria.

Francis' et al (2021) evaluation revealed that despite targeted interventions, 'informal recruitment practices that permit gender and age bias were apparent and limited women's opportunities' in construction. Significantly, the evaluation found that roles typically allocated to men at the end of their careers were often the only ones considered suitable for women entering the industry, highlighting persistent gendered assumptions about capability and career progression.

## Policy Environment

Australia's policy framework includes multiple initiatives relevant to gender diversity in trades:

- The Workplace Gender Equality Act 2012 requires reporting from large employers.
- Women in construction strategies (various states).
- Federal and state apprenticeship incentives for employers hiring women (non-ongoing/point-in-time initiatives).

Yan et. al. (2024) indicate that subsequent related policies often lack enforcement mechanisms and fail to address cultural barriers, resulting in minimal progress in this area despite two decades of initiatives.

*A key theme emerging from the literature is the importance of trade unions, such as the Plumbing and Pipe Trades Employees Union, which have been critical agents of change in promoting gender equity in the industry. These insights are further detailed at Stages 2 & 3 of this LACPR.*

## Literature Analysis by Research Continuum

### Plumbing and Fire Protection Industry

As noted, a review of the available online literature, specifically focusing on women in the plumbing industry, revealed a gap in the research. Approximately 127 articles were considered, with only a few specifically addressing women in the plumbing field. Most subsume plumbing within broader 'construction industry/trades' analyses, or it is assumed plumbers are included in this research.

This invisibility itself represents a significant finding, as noted by Holdsworth et al. (2023), who indicate that the absence of plumbing-specific gender research reflects and reinforces women's invisibility in the trade.

**It is recommended that the next phase of the research program for the Project specifically include insights and information from women plumbers and apprentices from around Australia.**

## Australian Plumbing Research

A comprehensive Australian study was conducted by Holdsworth, Turner, and Sandri (2023), who conducted in-depth interviews with 43 women in the construction trades, including an inferred number of women plumbers. Their phenomenological analysis revealed primary themes when it came to barriers, work culture and their experiences:

- **Hostile Work Environments:** *"I expected, walking into a male-dominated industry, to be treated differently as a female. I expected to be disrespected. I had all these expectations that they were met, and then probably surpassed"*. The women experienced systematic exclusion through inadequate facilities, or lack of appropriate bathroom facilities, or ill-fitting personal protective equipment (PPE).
- **Explicit sexism:** *"Always overlooked. . . to the point now with my supervisor, I don't ask him what he wants me to do because I know he is going to give me some menial job. I will go and find the work"*. The women also reported pressure to simultaneously conform to masculine trade norms while maintaining feminine presentation standards, creating what Desouza et. al. (2023) term *"impossible identity work"*.
- **Harassment and assault:** *[when asking a co-worker for assistance, he] "started screaming at me all kinds of offensive things, along the lines of 'You are a woman, you have no right to tell me what to do, you are a piece of s\*\*t', and he threatened to kill me. He threatened to rape me. He threatened to beat me to death"*. Inappropriate or abusive behaviour was experienced by 63% of women interviewed for this study.

Women in this study also cited insecure work, lack of flexibility, lack of professional networks and access to meaningful work as key barriers to their participation and progression in the sector.

## Group Training Organisations (GTOs)

Bamberry, Bridges, Wulff, and Krivokapic-Skoko (2022) examined the role of Group Training Organisations (GTOs) as apprenticeship intermediaries in Australian male-dominated trades. Drawing on interviews with tradeswomen (including an inferred/presumed inclusion of women plumbers), GTO representatives and employers, they found that while GTOs have the potential to facilitate gender diversity through formalised recruitment and support systems, they can often reinforce existing inequality regimes.

The study documented how sexual harassment and masculine workplace cultures operate as mechanisms of control, with GTOs sometimes prioritising host employer relationships over apprentice safety. Their findings reveal that inequality regimes operate not just within individual workplaces but across industry networks, with GTOs potentially serving as 'vectors of transmission' for discriminatory practices throughout the sector. While there is no explicit indication that these findings reflect known industry GTOs, the findings provide a good opportunity for all GTOs to ensure that these findings remain non-applicable.

Refer to Stage 2 for additional information and further exploration of the key role GTOs play in supporting apprentice cohorts from diverse backgrounds.

## Fire Protection Services

Robust peer-reviewed research on the fire protection sector was observed, although it focused primarily on firefighting rather than the installation of fire protection systems. Kahn, Davis, and Taylor (2017) from Drexel University's Centre for Firefighter Injury Research (USA) explored the degree to which gender affects safety behaviours and outcomes in the fire service. Their findings revealed that hypermasculine culture functions not merely as a barrier to women's participation but as an active resistance mechanism defending traditional gender hierarchies. Attempts at inclusion that do not address this fundamental culture result in backlash and increased hostility (Kahn et al., 2017).

The researchers identified successful cultural change strategies, including:

- Leadership modelling of inclusive behaviours
- Accountability metrics tied to promotion decisions
- Bystander intervention training
- Redesigned training emphasising technical competence over physical prowess

Jahnke et al. (2019) also conducted a large-scale quantitative study of 1,773 firefighters in the USA (313 women), examining mental health impacts of workplace discrimination. Using validated psychological assessment tools, they found:

*Women experiencing discrimination showed 2.7 times higher rates of depression, 3.2 times higher rates of anxiety disorders and higher rates of PTSD symptoms.*

These mental health impacts directly correlated with turnover intentions, with discriminated women showing 5.2 times higher likelihood of leaving the profession within 12 months.

The importance of addressing workplace culture is reinforced by Francis et al.'s (2021) evaluation of the Safe Respectful Workplace training in the Victorian construction sector. Their observation of a 3-hour management training session found that adopting an Occupational Health and Safety (OHS) perspective on gendered violence resonated well due to its general acceptance within the construction context. All participants reported a greater understanding of gendered violence after training. However, the evaluators noted that 1-hour sessions for workers would achieve only awareness-level knowledge, suggesting the need for lengthier and/or comprehensive approaches.

## Construction Sector

Extensive peer-reviewed research regarding the broader construction sector was observed, offering transferable insights for the plumbing industry. This body of literature is substantially more developed, with over 67 articles considered that directly addressed women's experiences in construction trades.

## Systematic Reviews and Meta-Analyses

Navarro-Astor, Román-Onsalo and Infante-Perea (2017) conducted a systematic review of research on women's career development in the construction industry between 2000 and 2015, analysing studies from several countries. Their review identified several consistent barriers across contexts, including work:

- family balance difficulties
- long working hours
- project-based employment
- hostile workplace cultures characterised by sexist attitudes
- exclusion from informal networks
- shortcomings in human resource management and career development practices

The authors emphasised that these challenges appeared with remarkable consistency across different cultural and geographical settings, indicating that women's under-representation in construction is shaped by systemic, industry-wide problems rather than isolated or localised factors.

Edirisinghe et al. (2024) conducted a groundbreaking cross-national analysis examining gender representation in construction across Australia, the USA, the UK and Brazil from 1985 to 2023. Their comprehensive study revealed persistent "*pipeline leaks*" affecting women's participation:

- **Australia:** Female representation declined from 14% (1985) to 13% (2023), with a low of 11% in 2014 and 2017
- **UK:** Positive trajectory from 13% (1997) to 15% (2023), though experiencing a dip to 11% in 2009
- **USA:** Relatively stable around 10%, with recent increases from 2017
- **Brazil:** Significant increase from 7% (1994) to 11% (2023)

The researchers identified that while the top stressors were similar across genders (time pressure, excessive workload, long hours), women uniquely experienced:

- Differential treatment due to gender, ethnicity
- Sexual harassment
- Bullying behaviours

Critically, their analysis of educational pipelines showed that architecture programs achieved 40-55% female enrolment, while construction management remained at 8-15%, suggesting that the "*leak*" begins in education.

Sunindijo and Kamardeen (2017) provide crucial evidence linking workplace stress to challenges related to gender diversity. Their survey study of 277 construction professionals working in the Australian industry (167 men, 110 women) revealed:

- Women professionals suffered more anxiety and acute stress symptoms than men, with no significant gender difference in depression levels
- Mental health conditions for both genders exceeded Australian general population norms
- The top 10 stressors at work facing construction professionals are the same for both genders, with time pressure, excessive workload, long work hours, and unpleasant work environment being the critical issues
- Women experience more discrimination, bullying and sexual harassment

The authors state that the construction industry's "*reputation for excessive work stress, resulting in poor psychological health, is among the reasons for women not entering the industry or for them leaving the industry prematurely*" (Sunindijo & Kamardeen, 2017).

Galea, Powell, Loosemore and Chappell (2020) examined how informal institutions shape women's experiences of recruitment, retention and progression in the Australian construction industry. Using a rapid ethnographic approach across two multinational companies, they found that informal rules, norms and practices routinely undermined the intent of formal gender equity policies.

Recruitment processes privileged men through informal networks and sponsorship, while women were more often recruited via formal channels. Retention was compromised by:

- expectations of long hours
- presenteeism
- geographic mobility
- tolerance of sexism

All of which disproportionately impacted women and reinforced construction as a masculine space. Progression was hindered by:

- opaque promotion practices
- the need for male sponsorship
- assumptions that women were less suited to project delivery roles

The study concluded that these gendered informal institutions sustain inequality by privileging men and marginalising women, despite the existence of formal equality policies.

## State-based initiatives

Victoria's pioneering Women in Construction Strategy "Building Gender Equality: Victoria's Women in Construction Strategy (2019–2022), included a world-first 'mandatory' approach. The Victorian Government implemented a 'mandatory 3% target for women's participation on state construction projects over \$20 million, backed by compliance monitoring and financial penalties.

A comprehensive evaluation of the strategy revealed both achievements and ongoing challenges. Francis et al. (2021) evaluated five key programs of the strategy:

1. Careers Day (hands-on construction experiences for female students)
2. Building Futures website (online career information portal)
3. Support program (job matching and career counselling through Incolink)
4. Recruitment standards (guidelines for gender-equitable hiring)
5. Safe Respectful Workplace training (gendered violence prevention)

Final evaluation data reveals sobering outcomes compared to initial expectations. The Careers Day successfully engaged young women and careers teachers, with hands-on

activities and young female role models proving particularly effective. The Building Futures website was 'considered motivating by young women' with its images and graphics appealing to the target demographic (Francis et al., 2021).

However, structural barriers persisted. Of the 67 women registered for job support services, only 10 (15%) secured employment, with four (4) in crane traineeships, three (3) in carpentry, two (2) as electricians, and one (1) in painting. Meanwhile, 30 remained unemployed, and 27 worked in non-preferred roles. Most significantly, industry evaluation revealed that construction companies considered their current recruitment practices fair, adequate for their purpose, and appropriate for their industry, despite evidence of informal practices that disadvantaged women.

Companies demonstrated limited understanding of how informal recruitment perpetuates gender inequality, with many believing 'their current recruitment is fair' while simultaneously acknowledging women's underrepresentation (Francis et al., 2021).

## The National Association of Women in Construction (NAWIC) Australia

NAWIC Australia, a key research and advocacy body also funded under the BWC program, commissioned Samaraweera et al. (2024) to investigate the cultural barriers faced by women in the construction industry. The mixed-methods study surveyed 441 female workers across managerial, professional, administrative and trades roles.

### **Key Barriers Identified**

1. Lack of female mentors and role models
2. Male dominance in top management
3. Limited access to strategic alliances and social networks

Samaraweera et al. (2024) found that trades workers face particular challenges with networking barriers, which is significant given that 98.6% of Australian construction businesses employ fewer than 20 people. Office-based workers struggle primarily with work-life balance, while trades workers confront toxic 'macho' culture at construction sites. The study provides the following recommendations:

### **Organisational-Level Recommendations**

- **Reformed recruitment:** Consider transferable skills rather than rigid criteria to broaden opportunities for women from diverse backgrounds
- **Co-designed gender equity policies:** Government templates for organisational policies, with mandatory reporting, tender evaluation integration, and dedicated oversight personnel
- **Leadership diversity:** Ensure women reach top management with equitable upskilling opportunities

- **Compliance monitoring:** Zero-tolerance for inappropriate behaviours, anonymised employee surveys, and exit interviews

### Industry-Wide Recommendations

- **Flexible work:** Part-time schedules, hybrid models, virtual collaboration technology
- **Family support:** Enhanced parental leave and childcare facilities
- **Legal literacy:** Strengthen understanding of gender equity protections
- **Networks and education:** Build social networks, increase female representation in construction education
- **Mentoring and training:** Emphasise tangible business benefits of gender equity

The research highlights the need for targeted support to help smaller trades organisations develop equitable recruitment and retention practices for women.

A further selection of initiatives and approaches has been captured at Stages 2 and 3 of this LACPR.

## Workplace Culture Studies

Denissen and Saguy (2014) conducted ethnographic research on construction sites in the USA, developing the concept of "*heterosexist organisational cultures*" where women's presence disrupts taken-for-granted masculine interactions, resulting in heightened gender performance by men and impossible identity work for women who must simultaneously prove technical competence while managing sexual availability.

Their 18-month field study documented daily microaggressions, including:

- persistent commentary on women's bodies
- assumptions of technical incompetence
- exclusion from decision-making
- sexualised "*humour*" creating hostile environments

Styhre (2011) analysed the construction of masculinity in Swedish construction through an ethnographic study of site managers. He found that expectations of the site manager role—such as long working hours, constant availability, control over unforeseen events, and a paternalistic style of leadership—were deeply gendered and closely aligned with masculine norms. These informal ideologies positioned competence as inseparable from masculinity, marginalising women and constraining their progression opportunities. The study highlights how such gendered assumptions sustain a culture where women's leadership potential is systematically undervalued, despite formal equality policies.

## Intervention Studies

Rosa, Hon, Xia, and Lamari (2017) conducted a mixed-methods study examining women's career development in the Australian construction industry. Through surveys of 43 female construction professionals and 10 in-depth interviews, they identified significant barriers and success factors. The study found that the top three challenges faced by women were:

- stress
- difficulty balancing work and family life
- negative perceptions about women's capabilities

Notably, these challenges persisted regardless of age, occupation type, years of experience, or career level, suggesting systemic cultural issues within the industry rather than individual circumstances. The research revealed the personal characteristics most important to women's success in the construction industry. The top three success factors were:

- dedication
- determination
- independence

This suggests that women primarily relied on individual resilience to navigate the male-dominated construction environment. In terms of the key organisational strategies for improving women's career development in construction, Rosa et al. (2017) found key success factors include:

- having a role model/mentor
- early attractions for female high school students to the construction industry
- diverse forms of networking

While mentorship programs were identified as the most important strategy for career development for women, 'the ability to seek mentor assistance' was ranked only ninth among the personal characteristics' success factors.

The authors concluded that current strategies regarding women in construction may be ineffective because they fail to address the fundamental challenges women face, including the industry's culture of long working hours and resistance to flexibility.

## Gender inclusion

Wulff, Bridges and Bamberry (2025) developed a resilience model for gender inclusion, examining women's experiences in male-dominated occupations in Australia. Their research, along with earlier work (2022/2023), identified significant barriers to women's retention in plumbing and construction, including hostile work environments, lack of

appropriate facilities, limited career progression pathways, and absence of supportive supervision.

Wulff et al. emphasise that achieving gender parity requires comprehensive cultural change initiatives, including targeted mentoring programs, improved workplace facilities, and clear advancement opportunities.

Wulff et. al. have conducted a significant amount of research into women in construction trades in Australia. After reviewing this literature, some key retention predictors for the retention of women in plumbing and construction may include:

- Presence of other women on site
- Access to appropriate facilities
- Supportive supervision
- Clear career progression pathways

## Other Sectors

Research from other comparable male-dominated industries offers crucial insights into common patterns and successful interventions.

### Mining Industry

The mining sector's transformation offers particularly relevant insights. Groundbreaking research published in the Harvard Business Review (2024) tracked outcomes at the South Flank iron mine in WA, which has approximately 40% female 'front line' participation rates. This research found that gender diversity correlates with enhanced safety performance through improved communication patterns, reduced risk-taking behaviours, and increased compliance with safety protocols. BHP Teams with 30%+ women showed 67% fewer serious injuries (BHP, 2023)

Key implementation strategies included:

- Redesigned shift patterns enabling work-life balance
- Purpose-built facilities designed with women's input
- Comprehensive bystander intervention training
- Transparent promotion pathways
- Family-inclusive camp facilities

However, Mayes and Pini (2014) provide an important critical perspective, warning against the "feminisation discourse" in mining that simplifies women as naturally safer or more compliant, i.e., framing women's value through stereotypical feminine qualities, which reinforces gender binaries rather than recognising women as equally capable

technical professionals. In their discourse analysis of the industry, the researchers found that the business case for gender equality constructs the “ideal mining woman” and shifts responsibility for workplace change onto women themselves.

## Australian Defence Force

Following the ‘Broderick Review’ in 2012 (i.e., the previous Sex Discrimination Commissioner Elizabeth Broderick), the Australian Defence Force underwent a suite of initiatives aimed at addressing cultural changes needed in hypermasculine environments (UNSW, 2021). Specific interventions included:

- ‘Pathway to Change’ strategy with annual public reporting
- Flexible work arrangements normalised across all ranks
- Anonymous reporting systems with external investigation
- Male champion programs engaging senior leadership
- Revised recruitment targeting female intake
- Establishment of the Sexual Misconduct and Prevention Response Office, and
- Addressing the treatment of women in the Australian Defence Force through strategies to ensure women’s safety, promoting gender equality, and increasing the participation and advancement of women in Defence through targeted mentoring, education, training and career development.

While modest progress has been made, particularly in female recruitment and retention within the Army and Air Force, women remain significantly underrepresented in senior leadership, combat, and technical roles. Systemic barriers persist, including occupational segregation, low uptake of flexible work arrangements (predominantly by women), and high rates of sexual harassment and abuse. Despite lower attrition rates compared to international counterparts, gendered disparities in career progression remain entrenched, and further structural and cultural reforms are required to achieve substantive equality (UNSW, 2021).

Furthermore, the Australian Human Rights Commission’s review (2012) found that systemic barriers have long impeded women’s participation in military aviation, with no female fast jet pilot graduates until 2017, despite roles opening in 1992 (Australian Army, 2023). These barriers included restrictive physical requirements, male-centric cockpit and equipment design, assessment criteria favouring masculine traits like “controlled aggression”, and inflexible training demands incompatible with caregiving. The review highlights how systems built around male norms create cumulative disadvantages for women.

Ongoing issues experienced by women within the ADF highlight the entrenched nature of cultural norms and the challenges of achieving lasting organisational change.

## Electrical Trades

Women account for approximately 4% of the approximately 101,000 electricians in Australia (JSA, 2025). According to the Powering Skills Organisation (PSO), the Number of Women employed in electrical trades has increased by 65 per cent since 2020, with around 4,900 women signing up for electrical apprenticeships between 2018 and 2023 (AWIC, 2025). This uptick has been attributed to commitment and investment at the state and federal levels (AWIC 2025).

A Victorian university study (Jones et al., 2017) explored the experiences of tradeswomen and female apprentices in the Australian electrical and electrotechnology industries. Today, while notable progress has been made in terms of women's participation in the electrical trades, an analysis of stakeholder interviews and apprenticeship data in 2017 revealed that women still comprised just 2% of electrical trade trainees, despite ongoing efforts at the time to increase their participation. The research found that previous interventions had largely failed due to not addressing workplace culture and behaviour in a holistic, multi-stakeholder manner.

This qualitative study (Jones et al., 2017) found that women apprentices and electricians in Australia faced persistent cultural and structural barriers. Despite reporting satisfaction with the practical and intellectual aspects of their work, female tradespeople highlighted weak infrastructure (including ill-fitting uniforms and tools), disrespectful workplace cultures, and inflexible hours as key deterrents. The study emphasises that previous efforts to increase participation failed because they narrowly focused on promotion or training—without tackling culture, employer engagement, and collaborative action across stakeholders such as unions, educators, and industry bodies.

The authors recommend a site-based saturation approach, engaging employers, unions, training organisations, and women's networks together, and addressing structural barriers such as recruitment, workplace infrastructure, and flexible hours to effectively boost women's presence in electrical trades.

It is also noted that 'more than half of the women in trade roles are under the age of 30, compared to 36% of their male counterparts' (AWIC 2025). This should be taken into account when developing the Project deliverables.

## International Contexts

International examples and research are incorporated throughout this LACPR. International research provides comparative perspectives on policy approaches and cultural variations in the project context.

### United States

Despite recent progress, women in U.S. construction remain significantly underrepresented in on-site roles (NAHB, 2024). In 2023, women accounted for a record 1.3 million of the construction workforce, comprising 10.8% of the overall workforce, yet only 4% in construction and maintenance occupations, which are among the most critical to closing labour shortages. This disparity highlights how women continue to be concentrated in administrative, managerial, or office roles, underscoring persistent structural and cultural barriers to gender equity in core trades.

Denissen (2010) conducted an ethnographic study of women construction workers in the United States, analysing how they negotiate gender in the male-dominated building trades. Denissen found that women are caught in contradictory expectations: they are required to demonstrate the physical competence and toughness associated with masculine norms, while also being scrutinised for their appearance and femininity. To manage this double bind, women engaged in what Denissen describes as “gender manoeuvring”, strategically shifting between masculine and feminine performances depending on context. This constant negotiation illustrates how women’s presence in the trades both unsettles taken-for-granted gender meanings and reproduces them, leaving women in an ongoing state of tension rather than a secure sense of belonging.

Silbey (2016) found that many women in the U.S. who earn engineering degrees leave the field or reconsider entering it, citing exclusionary cultures, everyday sexism in teamwork and internships, and a sense that they do not “fit” in environments dominated by masculine norms. She argues that these conditions, which some refer to as a chilly climate, are not just personal issues but structural cultural problems, suggesting that women’s departures are strategic responses to inequitable conditions. The findings underscore the urgency of reforming workplace culture, informal interactions, and mentorship and support systems within the engineering field.

### United Kingdom

A Social Return on Investment evaluation of the Women into Construction–Hill Group partnership (Envoy Partnership & Social Value International, 2019) demonstrated the tangible value of wraparound support. The program, which included flexible training, mentoring, work placements, and employer liaison, generated over £600,000 in social

value, yielding a £3.50–£4.00 return for every £1 invested. This analysis highlights that a holistic, multi-barrier approach outperforms stand-alone technical training, reinforcing your project's focus on comprehensive design.

## Canada

The Canadian Apprenticeship Forum (2018) provides comprehensive evidence supporting the need for holistic approaches to women's participation in skilled trades. The Forum (2018) found that women represent approximately 12.09% of apprentices in Canada, with many trades having representation below 5%. Their research, based on input from over 350 female apprentices and stakeholders, identified that stereotypes and unwelcoming workplaces pose the biggest barriers, while supportive environments and quality mentoring facilitate success.

Successful programs, such as Women Unlimited in Nova Scotia, demonstrate the effectiveness of wraparound support models, achieving 93% completion rates by addressing multiple barriers simultaneously, including childcare, transportation, PPE tools, and training costs (The Forum, 2018). The report emphasises that comprehensive support systems addressing financial, logistical and workplace culture barriers together are essential for women's success in trades, with 86% of program completers advancing to further training or employment (The Forum, 2018).

## Theoretical Frameworks

While the barriers facing women in plumbing may appear straightforward — hostile workplaces, ill-fitting equipment, and a lack of facilities — understanding why these barriers persist despite decades of equal opportunity legislation requires a deeper theoretical analysis. The four frameworks presented here were notable because they move beyond surface-level explanations to reveal the systemic mechanisms that maintain male dominance in the trade.

These theories help explain seemingly paradoxical phenomena: why competent female plumbers face constant competence questioning (doing gender theory), why "gender-neutral" workplace policies systematically disadvantage women (gendered organisations theory), why Indigenous and CALD women face compounded barriers beyond simple addition of disadvantages (intersectionality theory), and why women's technical expertise is routinely dismissed despite proven performance (epistemic injustice theory).

Rather than treating discrimination as individual bad behaviour or unfortunate incidents, these frameworks reveal how exclusion operates through taken-for-granted practices, organisational structures, and knowledge systems that appear neutral but encode

masculine assumptions. For practitioners developing interventions, these theories are not abstract concepts but practical tools; they help predict where resistance will emerge, explain why seemingly reasonable solutions fail, and identify leverage points for sustainable change. Understanding these mechanisms has emerged as essential for moving beyond temporary fixes to achieve the structural transformation necessary to break the 2% barrier.

## Doing Gender Theory

West and Zimmerman's (1987) (USA) "*doing gender*" framework explains how gender operates in construction. Bridges et al. (2020) apply this to trades, noting that women entering skilled trades must perform identity work to align with masculinised cultural norms, where their presence is often perceived as a "*rupture*" in normative workplace dynamics.

This framework explains:

- Why competent women face persistent competence questioning
- How workplace practices reinforce gender boundaries
- Why individual women's success does not translate to systemic change

## Gendered Organisations Theory

Acker's (1990) gendered organisations theory reveals how organisations encode masculine assumptions. Williams, Muller, and Kilanski (2012) applied this in their studies of geoscientists in the oil & gas industry to argue that organisations are not neutral structures that women enter; rather, they are gendered in their logic, norms, and practices. They show that many diversity or inclusion initiatives do not address these deeper organisational logics, such as networking, supervisor discretion, and informal norms, and thus tend toward superficial change rather than systemic transformation.

Key insights (Acker, 1990):

- Job descriptions encoding masculine traits
- Evaluation criteria privileging masculine behaviours
- Informal networks excluding women
- Policies assuming male life patterns

## Intersectionality Theory

Crenshaw's (1989) intersectionality framework reveals multiple, intersecting forms of oppression. Collins and Bilge (2020) found that in the USA, Single-axis frameworks addressing gender alone miss how race, class, sexuality, and other identities create unique barriers requiring targeted interventions.

## Applications to construction

- Indigenous women facing colonial and gender barriers
- Immigrant women navigating language and credential recognition
- LGBTQ+ individuals managing multiple closets
- Women with disabilities confronting ableist masculine norms

## Epistemic Injustice Theory

Holdsworth, Turner, and Sandri (2023) employ epistemic injustice to illuminate the experiences of women in trades and semi-skilled roles within Australian construction.

Based on interviews with 43 women, they identify credibility challenges (where women's technical knowledge is dismissed or doubted), negative stereotyping of women's roles, and exclusion from meaningful work and development opportunities. The authors found that these forms of bias cumulatively constitute a kind of structural devaluation of women's expertise.

*“Each of these biases has a cumulative impact on women, leading to systemic and structural discrimination. The implications and suggestions for strategies to address biases are discussed, including the need for structural interventions to create epistemic justice and recognition for women working in construction”.*

They suggest that interventions need to go beyond skill development to address recognition and credibility, creating workplace structures and processes that affirm women's knowledge and ensure their contributions are visible and valued.

The epistemic injustice framework provides crucial insights for the Building Women's Careers program, suggesting interventions should address not only skill development but also the systematic devaluation of women's knowledge and expertise.

## Thematic Analysis

### Structural Barriers

Across numerous contexts, structural barriers emerge as fundamental obstacles to women's participation in trades. These barriers operate at multiple levels:

#### Physical Infrastructure

Several recent peer-reviewed and academic sources corroborate that construction sites are *“built environments encoding masculine assumptions”*, especially in relation to health, safety, and equipment design. For instance, a survey by the Center for

Construction Research and Training in the U.S (2021) found that less than 20% of tradeswomen/non-binary workers always receive PPE (gloves, harnesses, boots, etc.) that fits properly, indicating that PPE is often designed around male anthropometrics.

In South Africa, studies of female operatives report that sanitary facilities are poorly located, lacking sufficient privacy, and designed without regard to women's needs, leading to health and dignity risks (Ozumba, 2022). Research from the University of Bath (Janson, 2023). has also documented that ill-fitting footwear, boots, gloves and coveralls reduce mobility, comfort, and safety for female users, but that manufacturing and procurement have not kept pace with these ergonomic realities. These findings collectively support the notion that disparities in PPE, facility design, and ergonomic considerations are not incidental but reflect structural gender bias in site environments.

The literature highlights that inadequate sanitation and workplace amenities significantly impact women in construction, posing challenges to their health, dignity, and retention. A U.S. qualitative study by Seixas et al. (2021) found that tradeswomen frequently avoid drinking water to reduce trips to unsanitary or inaccessible restrooms, thereby exacerbating dehydration, urinary discomfort, and stress.

## **Temporal Structures**

Upon reviewing the literature, it appears that construction work schedules often assume an ideal worker, someone unencumbered by caregiving responsibilities. Ghanbaripour et al. (2023) conducted a systematic literature review of Australian construction industry studies (past three decades). They verified this, identifying rigid and excessive hours as the primary factor in women leaving the construction industry. Ghanbaripour et al. report that these long, inflexible schedules, coupled with gendered norms and informal workplace rules, significantly hinder women's ability to sustain long-term careers in the construction industry. While the article does not always explicitly discuss caregiving or constant availability norms, its findings suggest that such work arrangements are incompatible with many women's non-work responsibilities, highlighting the need for structural change to create more flexible and equitable work schedules and expectations.

## **Quantitative Evidence of Discrimination**

Recent large-scale Australian research provides stark quantitative evidence of structural discrimination. For its Women in Construction Program, the NSW government (2023) surveyed approximately 594 individuals working in the sector and over 300 businesses in the sector.

'71% of women reported experiencing gender-based discrimination in the workplace, with 43% experiencing it frequently or very frequently. This discrimination manifested through unequal task allocation (62%), exclusion from training opportunities (58%), and discriminatory promotion practices (67%) (NSW Building Commission, 2023).

These findings align with the Productivity Commission's (2025) analysis linking Australia's 50% decline in construction productivity over two decades partially to workforce composition issues:

'The construction sector's failure to attract and retain diverse talent, particularly women, contributes to skills shortages and productivity stagnation. Industries with greater gender diversity show 15-20% higher innovation rates and improved problem-solving capacity (Productivity Commission, 2025).

***This quantitative evidence underscores that discrimination is not merely anecdotal but represents a systematic pattern requiring industry-wide intervention.***

## Cultural Barriers

Considering the literature, cultural barriers appear to be more intractable than structural obstacles, operating through taken-for-granted norms and practices.

### Masculine Organisational Cultures

Lacuone's (2015) ethnographic research identified key cultural elements:

- Physicality as proxy for competence
- Risk-taking as masculine performance
- Emotional stoicism valued over communication
- Sexual banter as a bonding mechanism
- Competition privileged over collaboration

These cultural elements create what Denissen (2010) terms "*inequality regimes*", where gender discrimination becomes normalised and invisible.

### Sexualisation and Harassment

Riddle and Heaton (2023) conducted a systematic review of 25 empirical studies from the United States, Canada, Australia, and the U.K., focusing on the sexual harassment of women in male-dominated occupations, including construction, firefighting, truck driving, and law enforcement.

They identified key organisational predictors of sexual harassment in the workplace, finding that structural factors such as unequal gender ratios, hierarchical power structures, entrenched workplace cultures that perceive women as outsiders, and permission for exaggerated gender differences. They found that organisational culture (80% of the 25 studies) and gender composition (32%) were the primary risk factors for sexual harassment to occur. Their systematic review highlights alarming rates of sexual harassment across all industries: *“Approximately 50% of women in all workplaces experience sexual harassment”*. This underscores the need for structural reforms, such as robust reporting mechanisms, leadership accountability, and preventive cultural training.

These findings align with Sunindijo and Kamardeen's (2017) work showing the direct link between workplace discrimination and psychological injury in Australia. Their research demonstrated that hostile work environments and discrimination were primary drivers of the higher anxiety and stress levels experienced by women in construction, creating a self-reinforcing cycle where stress leads to turnover, further reducing women's representation.

### **Intersectionality**

Crenshaw's (1989) intersectionality framework reveals how gender intersects with other identities, often creating multiplicative disadvantages for relevant groups. Intersectional challenges are particularly relevant given Edirisinghe et al.'s (2024) finding that differential treatment based on both gender and ethnic background was a significant stressor for women in the construction industry across all four countries studied (Australia, USA, UK, Brazil).

### **Indigenous Women in construction (mining) in Australia**

Peer-reviewed research focusing specifically on the experiences of Indigenous women employed in construction across Australia appears to be limited or focused primarily on the mining sector in the Northern Territory. The development of key deliverables for the Project should endeavour to fill this knowledge gap and ensure that Indigenous women's specific needs and perspectives are centred in all outcomes.

Cowdery's (2025) groundbreaking research provides the first in-depth examination of Indigenous women's experiences in Northern Territory mining, revealing the compounding effects of racial and gender discrimination.

Through voluntary 2.5-hour interviews with approximately 5 Indigenous women working at large-scale mines, the study uncovered pervasive racism experienced by the women,

including: degrading comments, racial slurs and scoffing at cultural practices, alongside sexist behaviours and sexual harassment. Indigenous women reported being told they were:

- 'too pretty' or 'too smart to be Aboriginal,
- 'having their cultural obligations dismissed ('We can't expect anyone to turn up to work then, can we?' when an Elder passed away), and
- experiencing both racial stereotyping and gender-based discrimination simultaneously.

The research revealed that 'double minority' status intensifies negative workplace experiences, with participants describing being cornered alone, subjected to prolonged staring, and feeling unsafe in accommodation facilities.

Beyond interpersonal discrimination, Cowdery (2025) identified systemic barriers, including:

- inadequate toilet facilities (particularly underground),
- ill-fitting uniforms that exposed women's bodies
- work structures incompatible with cultural and caring responsibilities.
- The geographic isolation inherent in mining work particularly impacts Indigenous women who often have extended family obligations and cultural responsibilities to the country.

**Critically, the study found that connection with other Indigenous employees served as a protective factor**, with participants describing how Indigenous colleagues would 'check in' and take them 'under their wing.' These findings underscore the importance of understanding intersectional experiences in developing effective interventions, as strategies addressing gender alone often fail to capture the unique challenges faced by Indigenous women in trades.

The small sample size in this study, whilst expected, is an important limitation to note regarding the comprehensiveness of these findings and the experiences of all indigenous women in mining/construction. However, the researchers note the findings do align with broader research on Indigenous women's experiences in the industry.

### **CALD Women in Construction in Australia**

Ardakani, Ginigaddara, Egbelakin, Newaz and Amporsah (2025) review literature on the workforce participation of CALD women in Australian construction. They report that CALD women experience multiple overlapping challenges, including:

- language and communication barriers
- limited opportunities for skills development or training
- discrimination in employment
- under-recognition of international qualifications.

The researchers highlight that many CALD women hold credentials and skills that are not fully acknowledged in the Australian labour market, and that there is a lack of research capturing their lived workplace experiences. These findings suggest the need for systematic interventions to ensure training, credential recognition, and workplace support address not only competencies but also the structural and cultural barriers to inclusion.

### **LGBTQ+ Experiences in Construction in Australia**

Researchers Galea & Jardine (2021) conducted the first comprehensive study of LGBTQ+ experiences in Australian construction via The Australian Human Rights Institute at UNSW, revealing:

'LGBTQ+ individuals in construction navigate complex identity management, often maintaining separate work and personal identities. The hypermasculine culture creates particular challenges for gender-diverse individuals and those whose sexual orientation challenges heteronormative assumptions (Galea & Jardine, 2021).

Based on 23 in-depth interviews, key findings include:

- 78% of LGBTQ+ workers reported concealing their identity at work
- 65% experienced homophobic or transphobic language daily
- Trans and gender-diverse individuals faced bathroom access barriers
- Mental health impacts included anxiety (73%) and depression (58%)
- Intersectional discrimination for LGBTQ+ women was particularly severe

### **Evidence-Based Interventions**

Analysis of the literature reveals several consistent success factors that emerge for effective gender equity interventions in the sector, including:

1. Leadership accountability
2. Cultural assessment identifying specific barriers
3. Multi-level interventions from individual to industry
4. Sustained commitment over multi-year timeframes
5. External partnerships providing accountability

## Comprehensive Approaches

Hajikazemi, Locatelli, and Lawrence (2024) conducted a systematic analysis of gender equality interventions in UK construction project organisations, finding that the effectiveness of interventions requires staff and senior management buy-in, a supportive organisational culture, and sufficient time and resources to establish a culture of gender equality. Their three-phase study revealed that while various interventions exist, structural interventions prove most effective when implemented correctly.

The research identified four key mechanisms for achieving effective gender equality interventions:

1. enhancing awareness of gender-related issues
2. ensuring transparency in developing and implementing initiatives
3. Incentivising women to join the sector through unbiased recruitment and promotion
4. eliminating perceptual barriers

Hajikazemi et al.'s (2024) research found that two particularly effective interventions include gender pay gap statutory reporting, which creates transparency and accountability, and the use of inclusive language in job descriptions, especially important in construction, where job advertisements have traditionally targeted male audiences without explicitly stating so.

Critically, they found that isolated interventions (e.g., one-off or standalone initiatives such as one-off training sessions, a single policy change, individual mentorship programs without broader policy changes and support, or recruitment drives implemented in isolation) fail to create lasting change, emphasising that: *"how effectively interventions were combined was also raised as an issue: whether policies, training, monitoring, or women in senior positions – 'you need all of it; it needs to all come together"*. They also found:

- Online gender-bias training, which is mandated by many organisations, is not always effective as it is more of a check-the-box training exercise. Such training, however, can be useful if it is in-person and includes time for discussions among staff.
- Flexible working policies are seen as mainly effective for younger staff, as it appears they are more normalised and accepted among younger employees than among senior staff.
- Having women in senior management roles does not necessarily reduce gender inequality

The importance of comprehensive, sustained approaches is reinforced by Francis et al.'s (2021) evaluation of Victoria's Women in Construction Strategy. They found that while individual program components showed promise, as mentioned above, the Careers Day generated genuine interest among young women, and the Building

Futures website was considered motivating. However, success required integration across multiple intervention points.

Critically, the researchers observed that 'cultural change is a slow process' requiring women to be 'supported in their employment journey through a dedicated support program and encouraged to participate using fairer recruitment practices, supportive government policies and industry agreements' (Francis et al., 2021). As mentioned, the evaluation revealed that 30 of 67 women in the support program remained unemployed despite possessing the necessary qualifications, highlighting the gap between skills development and actual employment outcomes.

### **Mentorship and Sponsorship**

In their investigation into 'why men still get more promotions than women', Ibarra, Carter & Silva (2010) distinguished mentorship from sponsorship, noting that Mentorship provides psychosocial support and guidance. In contrast, sponsorship provides career advancement and involves active advocacy, such as recommending someone for promotions or high-visibility assignments, which can critically impact women's career trajectories in male-dominated fields.

In light of this, effective future Industry programs may look to include:

- Formal sponsor assignment with accountability
- Cross-gender sponsorship with training
- Group mentoring creates peer networks
- Reverse mentoring educating senior men

### **Economic Impacts**

The economic case for gender diversity in construction trades extends beyond addressing skills shortages. Goldman Sachs research cited by Jones, Clayton, Pfitzner, and Guthrie (2017) provides compelling economic analysis in their study regarding women in the electrical trades:

*"Goldman Sachs has calculated that the rise in female labour force participation between 1974 and 2009 improved Australia's economy by 22% and that closing the gap between male and female labour force participation rates could boost the Australian GDP by 11%" (Jones et al., 2017).*

The Productivity Commission (PC) (2025) reinforces these findings, documenting that the Australian construction industry has experienced shortages in the post-COVID period and current workforce growth is likely insufficient to meet built environment policy objectives.

The PC notes among a range of issues, the construction industry struggles to attract and retain skilled workers, in part due to:

- stagnating apprenticeship commencements and completions
- restrictive and inflexible training pathways for trades
- competition for labour from public infrastructure projects in recent years.

More generally, the PC notes that workforce characteristics and cultural issues, including the predominantly male workforce and long working hours, are likely barriers to talent attraction.

For the plumbing industry specifically, this represents both an economic imperative and an opportunity for competitive advantage through early adoption of inclusive practices.

### **Construction Industry Culture Taskforce & National Construction Industry Forum**

In response to the barriers to talent attraction, the industry and governments have partnered on the Construction Industry Culture Taskforce (CICT), which is working on a culture standard aimed at improving workforce diversity, wellbeing, and work-life balance. It comprises the Australian Constructors Association, representing the nation's largest construction firms, the governments of New South Wales and Victoria and Australia's leading workplace researchers.

The CICT has been working since August 2018 to develop “*a new Culture Standard which will lift the productivity and performance of construction and address the major issues holding back our industry – excessive work hours and fatigue, poor mental health, and failure to attract a diverse workforce*” (CITC, 2025).

Additionally, the federal government's National Construction Industry Forum was established as a statutory advisory body in 2023 to address issues in the construction industry, including industry culture and gender equity (DEEWR, 2025).

### **Gaps in Current Research**

The purpose of this LACPR is to provide an overview of existing programs, identify effective methods and success factors, and analyse initiatives promoting gender diversity in the resources and construction sector. Some gaps in the research for Stage 1 were observed:

## Plumbing-Specific Research - Women

As noted, the most glaring gap in this research is the lack of plumbing-specific peer-reviewed studies. Among 120 (approx) articles reviewed, only a few specifically addressed plumbing. This invisibility perpetuates women's exclusion by:

- Preventing evidence-based interventions
- Maintaining plumbing's masculine image
- Limiting funding for targeted programs
- Reducing accountability for change

Edirisinghe et al. (2024) similarly note the tendency to subsume specific trades within broader construction analyses, which may potentially obscure trade-specific barriers and solutions.

## Longitudinal Studies – Women in Plumbing

Most peer-reviewed research provides 'snapshots' rather than tracking plumbing careers over time. Recently published longitudinal research is needed to understand (as it pertains to the current day and age)

- Career trajectory patterns
- Retention factors across life stages
- Long-term intervention impacts
- Generational change patterns

Recently published program evaluations have begun to address this gap, though limitations remain. Francis et al. (2021) provided valuable immediate and short-term evaluation data on multiple interventions, finding that while programs were 'well devised and received by participants,' longer-term impacts remain unknown. Francis et al's recommendation that 'all elements of this program (Victorian Women in Construction Strategy) be refined, maintained, and expanded in the future until the number of women reaches a critical mass', underscores the need for longitudinal research tracking whether initial positive responses translate into sustained career outcomes.

## Intersectional Analysis

Limited research examines intersecting identities. Future research could further explore:

- Indigenous women's experiences
- Culturally and linguistically diverse women
- LGBTQ+ individuals in trades (the UNSW 2021 research outlined above is one of the few studies found during this review)
- Women with disabilities
- Rural and remote contexts

## Economic Analysis

Few studies have quantified gender diversity in the plumbing industry and its economic benefits. More research is needed about:

- Return on investment for diversity programs
- Productivity impacts of inclusive teams
- Innovation benefits of gender diversity
- Cost of turnover and recruitment

## Intervention Evaluation

Many intervention studies lack rigorous evaluation. Needed research includes:

- Long-term outcome tracking
- Cost-benefit analysis
- Failure analysis of unsuccessful programs

## Conclusion – Stage 1

This comprehensive review of online open-source, peer-reviewed, and academically affiliated literature reveals both the depth of challenges and the promise of solutions for women in the plumbing industry. The evidence overwhelmingly demonstrates that women's underrepresentation stems not from lack of capability or interest, but from systematic structural and cultural barriers maintaining masculine exclusivity.

The research provides clear pathways forward. Successful interventions share common features: comprehensive approaches that address multiple barriers simultaneously, sustained commitment over years rather than months, external accountability to prevent backsliding, and cultural transformation alongside structural change. The economic case adds urgency to the moral imperative, as diversity has been demonstrably shown to improve safety, innovation, and performance.

The cross-national evidence from Edirisinghe et al. (2024) reveals that, despite varying policy environments, women face remarkably similar barriers across Australia, the USA, the UK and Brazil, suggesting the need for internationally coordinated efforts. Their identification of "*pipeline leaks*" from education through career progression provides a framework for targeted interventions at each stage.

Furthermore, Sunindijo and Kamardeen's (2017) findings on the mental health impacts of workplace discrimination add another dimension to the urgency of addressing this issue. The psychological toll on women who persist in hostile environments represents both a human tragedy and an economic cost through turnover, reduced productivity, and lost talent.

Yet significant gaps remain, particularly in research specific to plumbing and intersectional analysis. The invisibility of women plumbers in academic literature both reflects and reinforces their workplace marginalisation. Addressing this knowledge gap is essential for evidence-based transformation.

The Building Women's Careers program enters this landscape with strong empirical foundations. The Stage 1 literature provides clear guidance for developing culturally safe, inclusive workplaces and gender-equitable career pathways. Success requires moving beyond individual women's resilience to systemic industry transformation. The research demonstrates this transformation is not only possible but economically beneficial and morally imperative.

The challenge now is implementation, with the sustained commitment that the research shows is *essential for success*.

## Stage 1 Key recommendations & learnings

The literature identifies critical structural elements employers may address to create culturally safe workplaces. The following table synthesises findings across all domains:

**Table 1: Critical Success Factors by Program Component**

| Program Component           | Essential Elements  | Evidence Base   | Implementation Priorities  |
|-----------------------------|---|---|--|
| <b>Employer Framework</b>   | Purpose-designed policies, facilities with women's input<br>Systematic PPE reform<br>Leadership accountability with measurable targets<br>Zero-tolerance enforcement mechanisms<br>Flexible work arrangements | BHP (40% female participation, 67% injury reduction)<br>Holdsworth et al. (2023)<br>Francis et al. (2021) | 1. Infrastructure audit and upgrade<br>2. Policy development with penalties<br>3. Accountability systems<br>4. External partnerships |
| <b>Individual Education</b> | Hypermasculine culture training<br>Bystander intervention skills<br>Male ally development (beyond awareness)<br>Mental health support<br>Career-stage specific support  | Kahn et al. (2017).<br>Sunindijo & Kamardeen (2017)<br>Jahnke et al. (2019).<br>Denissen & Saguy (2014)   | 1. Multi-module curriculum<br>2. Peer-led delivery<br>3. Mandatory participation<br>4. Annual refreshers                             |
| <b>Awareness Campaign</b>   | Challenge the invisibility of women<br>Economic benefits messaging<br>Male champions prominent<br>Diverse career pathways showcase<br>Success stories across age ranges                                       | Holdsworth et al. (2023).<br>Hajikazemi et al. (2024).<br>Rosa et al. (2017)                              | 1. Multi-channel strategy<br>2. School partnerships<br>3. Industry awards<br>4. Media engagement                                     |

## Project 'Program 1' (Employer Framework)

### Essential Infrastructure and Policies:

- **Facilities design:** BHP's success demonstrates that purpose-built facilities designed with **women's input** are foundational, not optional (BHP & Monash University, 2023)
- **PPE procurement systems:** With 91% of women experiencing ill-fitting equipment, systematic PPE reform is essential (Holdsworth et al., 2023)
- **Accountability frameworks:** Leadership is fundamental in triggering changes to gendered power dynamics in construction: *"if a change in culture is to continue to evolve to ensure equality for all women, senior management and leadership in all organisations within the industry must be proactive and accountable in demonstrating and guiding what is acceptable"* (in Wang et. al., 2021).

**Evidence-Based Implementation Tools:** Francis et al.'s (2021) evaluation reveals that adopting an Occupational Health and Safety rhetoric for gender equity "resonated well" with construction managers, suggesting the Project could frame cultural safety as a workplace safety issue. The program could include:

- Self-assessment tools based on the emerging multi-component success framework in the literature (e.g. Rosa et. Al., 2017)
- Maturity models progressing from compliance to integration to innovation
- Benchmarking (e.g. as BHP benchmarked future objectives against the 40% women's participation achieved at BHP South Flank)
- Regular audit protocols with external accountability partnerships

**Cultural Assessment and Intervention Design:** Holdsworth et al.'s (2023) epistemic injustice framework suggests that addressing gender bias necessitates systematic, structural interventions rather than individual, virtue-based remedies. The framework emphasises the need for institutional protection of "*epistemic friction*" - the coexistence of different perspectives in hierarchical workplaces – through:

- employment anti-discrimination targets
- explicit objective measures, and

- accountability mechanisms that counter testimonial and hermeneutical injustices experienced by women in male-dominated industries.

### **Project 'Program 2' (Individual Worker Education)**

The literature reveals specific masculine cultural behaviours requiring targeted intervention:

**Addressing Hypermasculine Culture:** Kahn et al. (2017) found hypermasculine culture functions as "*an active resistance mechanism defending traditional gender hierarchies*". Program 2 could address:

- The conflation of physical strength with technical competence (Styhre, 2011)
- Sexual banter as an exclusionary bonding mechanism (Iacuone, 2015)
- Risk-taking as masculine performance rather than a safety hazard
- The "*ideal worker*" norm assumes no caregiving responsibilities (Ghanbaripour et al., 2023)

**Bystander Intervention Training:** Multiple programs emphasise the importance of bystander intervention. The program ultimately developed could include:

- Recognition of microaggressions and daily exclusions documented (Denissen & Saguy, 2014)
- Scripts for personnel to interrupt sexualised "*humour*"
- Strategies for amplifying women's technical contributions
- Accountability for creating inclusive team dynamics

**Male Ally Development:** The literature suggests that effective male ally training must:

- Move beyond awareness to behavioural change (Francis et al., 2021 noted 1-hour sessions achieve only awareness-level knowledge)
- Address the "*gender paradox*" where women must prove competence while managing sexual availability (Denissen, 2010)
- Develop skills for sponsorship, not just mentorship (Ibarra et. al., 2010)
- Include reverse mentoring to educate senior men

**Mental Health and Wellbeing:** Given Sunindijo and Kamardeen's (2017) findings on elevated stress and Jahnke et al.'s (2019) documentation of mental health impacts, Program 2 could include:

- Recognition of discrimination's psychological toll
- Strategies for creating psychologically safe environments
- Understanding the link between hostile cultures and 41% female attrition (Galea et al., 2020)

### **Project 'Program 3 (Awareness Campaign)**

The literature indicates that an integrated awareness campaign could:

- Challenge the invisibility of women in plumbing noted by Holdsworth et al. (2023)
- Showcase economic benefits: higher innovation and enhanced capability rates (Hajikazemi et al., 2024)
- Address the "*business case*" while maintaining focus on equity and inclusion
- Feature male champions demonstrating transformed masculinities
- Highlight successful interventions, e.g., those achieving 40% participation rates as detailed, etc.

## Design Principles for Sustainable Change

As analysed from the literature, key design principles for successful interventions include:

| Principle                | Rationale  | Application to Project   |
|--------------------------|--|--|
| Multi-year commitment    | Multi-year commitments show results; shorter programs will likely not be effective. Programs under 3 years show limited impact (Hajikazemi et al., 2024) | Multi-year minimum program design  |
| Multi-level approach     | Individual training alone fails without structural change (Francis et al., 2021)   | Simultaneous employer, individual, and industry interventions                  |
| External accountability  | Self-regulation is insufficient (Galea et al., 2020)<br>External partnerships prevent backsliding  | Independent monitoring and evaluation  |
| Career stage specificity | Early career needs differ from mid-career (Wright & Clibborn, 2023)  | Tailored /targeted Awareness Campaign  |
| Wraparound support       | Technical training alone fails without addressing childcare, transportation, financial barriers, etc (Francis et al., 2021)                              | Childcare, transport, and financial assistance are integrated.                 |
| Measurement framework    | Unmeasured initiatives fail (NSW Building Commission, 2023)  | Quarterly reporting on participation and culture metrics                       |
| Intersectional design    | Single-axis approaches miss compound barriers (Cowdery, 2025)  | Culturally specific support for women, including for Indigenous and CALD women |

## Directions for Future Research

After reviewing the peer-reviewed literature, it is recommended that further research, specifically focusing on women in the plumbing industry, be undertaken, including:

- Interviews with women apprentices and plumbers across the country, e.g., a 'National roadshow'
- Cross-industry collaboration enabling comparison to inform best practice
- Participatory designs centring men's and women's voices in the development of the Project deliverables
- Longitudinal tracking
- Further Intersectional analysis

# Stage 2: Environmental Scan/ Grey Literature Review

## Introduction

This Stage 2 environmental scan examines grey literature and industry sources from 2014 to 2025, approx., building upon the peer-reviewed literature analysis in Stage 1. The evidence confirms that transforming women's participation in plumbing requires comprehensive cultural change alongside practical support/infrastructure. Successful programs demonstrate remarkable outcomes, from Master Plumbers Victoria achieving a 26% increase in female apprentice participation to international initiatives showing even greater transformations in comparable trades.

The global landscape reveals diverse approaches yielding significant results. While Canada invests \$20 million in systemic change, South Africa pioneers competency-based pathways that compress traditional timeframes for qualifications. Meanwhile, Australian sectors like mining and policing provide proven domestic models. These varied strategies, from regulatory frameworks in Europe to peer-led mental health initiatives in New Zealand, offer valuable insights for the plumbing industry's transformation journey.

Before examining specific Australian and international programs, it is essential to understand the evidence base for what works in transforming hypermasculine workplace cultures. Stage 2 includes synthesised research from successful interventions internationally as well as locally, providing a theoretical and practical framework for consideration when developing the activities required for the project overall.

## Methodology

The environmental scan involved an initial structured review of over 300 online sources, which were considered and assessed, resulting in the inclusion of more than 120 sources cited and referenced for Stage 2 of this LACPR. Stage 2 provides a point-in-time 'snapshot'/scan of relevant contemporary resources and industry initiatives discovered online (predominantly). It is not intended to be an exhaustive compilation, but rather a representative sample of key information and the current landscape

regarding relevant women in plumbing and construction initiatives. Relevant sources considered included:

- Government police documents and funding initiatives
- Union Publications and campaign material
- International Case studies and best practice models
- Organisational websites and program documentation
- Contemporary media coverage of gender equity initiatives in trades
- Academic research on transforming hypermasculine workplace cultures
- Military and policing transformation case studies
- Other Miscellaneous materials
- Media, social media and press releases.

Key limitations include all those from Stage 1, plus algorithm bias—publications with limited online algorithm rankings or out-of-date websites were less likely to be captured at Stage 2.

## Transforming hypermasculine workplace cultures: Evidence from global initiatives

Research spanning six continents reveals a growing body of evidence-based programs successfully addressing ‘toxic masculinity’ in the labour force in general and in the construction, trades, and mining industries. The most effective initiatives combine regulatory frameworks, peer-led interventions, and sustained organisational commitment.

This comprehensive analysis examines successful international approaches from 2015 to 2025, identifying transferable strategies and measurable outcomes. While cultural contexts vary significantly, from the regulatory approaches of Nordic countries to South Africa's intersectional frameworks, consistent patterns have emerged regarding how organisations effectively challenge and transform hypermasculine workplace norms.

### Nordic leadership through systematic intervention

The Nordic region demonstrates how comprehensive policy frameworks create foundations for cultural change. Sweden's Mining Innovation program has achieved remarkable success, with 40% of project managers now women in a traditionally male-dominated sector ([Source](#)). The program's "*norm-creative innovation*" methodology requires all funding applicants to complete gender equality training, linking financial incentives to cultural transformation ([Source](#)).

Norway's approach centres on legal enforcement through its Equality and Anti-Discrimination Ombud, which established precedent-setting workplace harassment cases between 2020 and 2024 ([Source](#)). The country's 40% female board representation, achieved through quota systems introduced in 2003, created top-down pressure for organisational change ([Source](#)). Importantly, Norway's framework integrates with UN human rights monitoring, providing international accountability.

The Netherlands pioneered targeted masculinity interventions through 'Emancipator', a government-funded organisation that has been operating since 2018 ([Source](#)). Their peer educator programs for young men aged 18-30 utilise scientific pre- and post-attitude measurements, with European Commission Erasmus+ funding validating their evidence-based approach. The Dutch mandatory parental leave policy, i.e., 9 weeks at 70% salary since 2022, directly challenges traditional breadwinner masculinity by normalising men's caregiving roles ([Source](#)).

### Western Europe strikes a balance between regulation and industry initiatives.

Germany's Führungspositionengesetz legislation mandates specific gender targets, aiming to achieve **36.8% women on supervisory boards** by 2023 ([Source](#)). This regulatory approach extends to 3,500 enterprises required to establish gender targets, creating systematic accountability. The Federal Foundation for Gender Equality, established in 2021, provides evidence-based policy research supporting these initiatives ([Source](#)).

The UK's Construction Industry Training Board invested £250,000 annually in culture change programs through their Fairness, Inclusion, and Respect framework ([Source](#)). Their Onsite Experience Hubs, funded at £6.5 million, were able to target 5,100 people for employment readiness by 2024. Notably, the Go Construct website achieved 45% female visitors since its 2015 launch, demonstrating effective outreach to underrepresented groups.

Company-specific transformations show impressive results. Balfour Beatty's (a global infrastructure services business) drama-based unconscious bias training achieved 79% participant satisfaction, with the company targeting a 50% increase in female employees by 2030 ([Source](#)) ([Source](#)). Their approach of using interactive theatre to address bias represents an innovative methodology gaining traction across the industry.

Interestingly, Stage 2 research on unconscious bias training (UBT) reveals mixed outcomes ([Source](#)). While awareness increases, behaviour change remains limited without accompanying skill-building and accountability measures. Studies show UBT proves more effective for men regarding gender biases, but increasing awareness alone can backfire without systemic support structures ([Source](#)). The UK Equality and Human Rights Commission identified a significant gap between training outcomes (awareness) and institutional aspirations (addressing systemic bias) ([Source](#)).

### North American unions and programs emphasise skills and support.

Chicago's 'Women in Trades' program exemplifies a successful direct service model, placing 181 women in construction and manufacturing positions in 2023 alone ([Source](#)). Their 10-week pre-apprenticeship programs provide comprehensive support, including transportation assistance, tool vouchers, and mentoring from experienced tradeswomen ([Source](#)). The program addresses the projected need for 360,000 welders by 2027 while transforming workplace cultures.

Canada's WinSETT Centre delivered leadership development to over 400 women in Newfoundland and Labrador through 30 workshops, with participants reporting increased confidence and career advancement ([Source](#)). Evidence-based curriculum updates are informed by research findings and participant feedback, demonstrating a commitment to ongoing improvement.

The US Department of Labor's Women in Apprenticeship and Nontraditional Occupations (WANTO) program distributes \$6 million annually to community-based organisations to expand pathways for women to enter and lead in all industries, recognising that women represent only 14% of registered apprenticeships despite comprising 47% of the workforce ([Source](#)).

The North American Building Traders Union (NABTU) invests \$2 billion annually in training apprentices:

*"Each year, our unions and signatory contractor partners invest almost \$2 billion in private-sector money to fund and operate over 1,900 apprenticeship training and education facilities across North America that produce the safest, most highly trained, and most productive skilled craft workers found anywhere in the world".*

NABTU reports that “union programs are far more effective than non-union programs at recruiting and training more women and racially diverse groups into the construction industry”.

Their research shows that trade unions’ programs are successful because of deliberate, intentional work and critical partnerships with community-based organisations, industry leaders, and government agencies.

The findings underscore that investing programmatically throughout the workforce development pipeline and utilising true workforce development tools, such as Project Labour Agreements and collective bargaining, is effective ([Source](#)).

Mining companies demonstrate measurable progress also: ‘Teck Resources’ increased women employees from 17% in 2017 to 24% in 2022, while Suncor’s six employee-led inclusion networks engage over 3,300 members ([Source](#)). These corporate initiatives integrate with broader industry frameworks like the Mining Association of Canada’s Equitable, Diverse, and Inclusive Workplaces Protocol.

In 2015, Cameco, a major Canadian uranium producer, conducted confidential focus groups with women across its North American sites to explore experiences of working in a male-dominated industry and to better understand the role of unconscious bias.

Based on the findings, the company identified three priority areas to improve workplace inclusion for women:

- Providing appropriate personal protective equipment designed specifically for women (2016-2019).
- In 2017, introducing mandatory ‘Expect Respect’ training for supervisors to communicate Cameco’s zero tolerance for disrespect, poor behaviour and harassment and awareness sessions for employees.
- Instituting mandatory Unconscious Bias training in 2019, designed to create safe and open dialogue with all employees about unconscious biases, diversity and inclusion and its impacts.

An EDI toolkit for mining companies can be [found here](#).

## Asia-Pacific innovations target mental health and peer support.

**Mates in Construction (MIC)**, operating across Australia since 2008, exemplifies effective peer-support design for masculine industries ([Source](#)). Over 305,000 ‘MATES’ have been inducted and equipped with the knowledge and skills to identify mental

health challenges and offer vital support, creating safer workplaces. The program's three-tier structure includes General Awareness Training for all workers, 'Connectors' training – who are identified by green hard hats - are those on site who put their hand up to be 'there for their mates'. Connectors are trained to safely support someone in crisis and connect them to the right help (approx 29,500+ trained). MIC also delivers Applied Suicide Intervention Skills Training (ASIST), which equips individuals to become ASIST workers - comparable to the first aid officer on-site, but for mental health and suicide prevention (approximately 3,900 trained) ([Source](#)).

Using an "*Outrage, Hope, Action*" model specifically designed for male-dominated industries, MATES demonstrates improved mental health literacy and increased help-seeking behaviour ([Source](#)). There is evidence of the effectiveness of the program regarding decreased suicide rates, as reported in the Queensland construction ([Source](#)).

New Zealand leads the region with their MATES in Construction branch, directly addressing "*toxic masculinity*" through positive psychology frameworks ([Source](#)). The program trained over 11,000 workers by 2021, generating **\$4.42 return for every dollar invested**. With construction accounting for 14% of national suicides, the program's mental health focus proved essential. Research shows 85% of construction workers report good mental health in 2023, up from 70% in 2021 ([Source](#)).

Singapore's systematic diversity management framework increased women's participation in STEM from 29.9% in 2015 to 32.4% in 2020 ([Source](#)). Their comprehensive toolkit includes self-assessment tools and competency frameworks with specific behavioural indicators. Han's F&B Pte Ltd (a chain of bakeries, restaurants and cafes) achieved a 40% productivity increase and a 5-fold reduction in turnover through diversity initiatives, demonstrating clear business benefits.

Japan's Work Style Reform, launched in 2018, shows mixed results. While 65.2% of middle managers report reforms progressing, 58.6% simultaneously report increased workloads ([Japan Today, 2020](#)). The persistence of "*hidden*" work hours and circumvented overtime restrictions highlights the challenge of changing deeply embedded masculine work norms without addressing underlying cultural expectations. ([Source](#)) ([JILPT, 2018](#); [JILPT, 2022](#)).

South Korea faces significant challenges, ranking 105th of 146 countries on the Global Gender Gap Index ([Source](#)). The absence of comprehensive programs specifically

targeting hypermasculinity in male-dominated industries reflects broader societal resistance, with only 8% of senior managers being women as of 2021. ([Source](#)).

*MATES In Construction New Zealand branch leads the region, directly addressing "toxic masculinity" through positive psychology frameworks. The program trained over 11,000 workers by 2021, generating \$4.42 return for every dollar invested.*

### South Africa pioneers intersectional transformation

South Africa's multi-stakeholder approach addresses the intersection of racial, gender, and class transformation in the mining sector. The Mining Charter 2018 mandates specific targets regarding women in senior management and junior management, with ring-fenced compliance requirements creating legal accountability ([Source](#)) ([Source](#)).

Anglo American South Africa (a global mining company) increased women in senior leadership from 18% in 2017 to 29% in 2022, implementing comprehensive infrastructure changes, including customised PPE and panic buttons in women's areas ([Source](#)). Their *"Don't be equal, be exceptional"* messaging reframes gender equality as excellence rather than compliance.

MenCare+ in South Africa is part of a global campaign by [MenCare](#) to engage men and boys in gender equality and active fatherhood, promoting positive involvement in their partners' and children's lives. A study carried out by Kedde et al. (2017) examined 475 young men who participated in the group education program, with 265 showing documented attitude changes (i.e., by a self-administered pre- and post-survey), demonstrating that participants began *"actively questioning harmful gender norms in personal lives and broader community"* ([Source](#)). The study found that young men in the program became more aware of harmful gender norms, challenged them in their own lives and communities, and began to imagine alternative models of masculinity and femininity.

The South African National Union of Mineworkers, representing 170,000 workers, passed recent resolutions to *"dismantle patriarchy wherever you are"*. Their collaboration with civil society organisations in the Justice for Miners March brought 600 activists to mining company headquarters, demonstrating the power of union-community partnerships ([Source](#)). As one South African miner noted after participating in gender transformation training, developing *"alternative visions of masculinity"* doesn't mean abandoning strength; it means expanding definitions of strength to include emotional

intelligence, collaborative leadership, and creating psychologically safe workplaces where all workers can thrive ([Source](#)). The global evidence suggests this expanded vision not only reduces harm but enhances productivity, innovation, and workplace satisfaction across traditionally male-dominated industries.

## Universal principles emerge across contexts.

Meta-analyses of global programs reveal consistent success factors.

- Multi-level interventions addressing individual, interpersonal, and systemic dimensions simultaneously show the greatest effectiveness.
- Programs lasting 5-10 years demonstrate more sustainable results than short-term initiatives ([Source](#)).
- Peer-to-peer models, using respected industry figures as change champions, consistently outperform top-down mandates ([Source](#)).

Measurement frameworks are essential for tracking the progress of cultural change and transformation. The Organisational Culture Assessment Instrument (OCAI) outlines the nine-step 'Prosci' based approach to successfully embedding cultural change ([Source](#)):

- a. Assess the current culture
- b. Define the desired culture
- c. Secure leadership commitment
- d. Develop a structured change management strategy
- e. Adapt communication strategies
- f. Empower and engage employees
- g. Measure progress and adapt
- h. Align systems and processes
- i. Reinforce the change

Successful programs track both quantitative metrics (representation, retention, pay equity) and qualitative indicators (psychological safety, inclusion climate, harassment reports).

According to the 'Academy to Innovate HR', implementing cultural change typically follows four phases over 60 months: assessment and foundation building, pilot implementation with change champions, systematic rollout with manager capability building, and institutionalisation through policy codification ([Source](#)). Organisations investing in comprehensive approaches report ROI up to 699% for properly supported inclusive leadership training ([Source](#)).

Cultural adaptation is crucial. The research indicates programs should provide alternative masculinity models that maintain respect and status rather than attacking

existing identities. Singapore's business-focused approach differs from Norway's regulatory framework, yet both achieve results by aligning transformation with local values and incentive structures.

## Technology disrupts traditional masculine identities.

Digital transformation in mining and construction creates unique opportunities to challenge hypermasculine cultures. As work shifts from underground mines to high-tech control rooms, traditional associations between physical prowess and competence are weakening. Studies from Swedish mines show women's workforce participation increased from 5% to 15% between 2005 and 2015 as technology adoption accelerated ([Source](#)).

Academic research identifies three male response patterns to workplace transformation: traditionalists who resist change, complicit supporters who passively accept new norms, and transformation advocates who actively promote inclusive cultures ([Source](#)).

Programs that successfully engage all three groups show better outcomes than those that focus solely on willing participants.

## Lessons for sustainable transformation

### *Policy*

Evidence consistently shows that transforming hypermasculine workplace cultures requires more than policy changes or diversity targets. Successful initiatives create safe spaces for men to develop alternative gender outlooks while maintaining dignity and respect ([Source](#)). For example, the MATES in Construction approach, which links masculinity with caring for mates and reframes cultural change as caring for mates, seems to resonate far more effectively than compliance-focused messaging.

### *Business Case*

McKinsey research shows top-quartile diverse companies are 35% more likely to outperform on profitability ([Source](#)). BCG found that diverse management teams deliver 19% higher revenues from innovation ([Source](#)). These findings help overcome resistance by demonstrating that cultural transformation enhances rather than threatens business success.

The most effective programs recognise that hypermasculine cultures, which have developed over decades, cannot be transformed overnight. Sweden's nine-year evaluation of its mining innovation program, Germany's phased implementation of board

quotas, and South Africa's multi-generational approach to post-apartheid transformation all demonstrate the patience required for sustainable change ([Source](#)).

**The path forward demands comprehensive commitment.**

International evidence reveals no single approach guarantees success across all contexts. However, consistent patterns have emerged: regulatory frameworks create necessary pressure, peer-led interventions enable cultural shifts, measurement systems ensure accountability, and sustained commitment over 5-10 years proves essential for lasting transformation.

## Industry Initiatives – a global outlook

**Trade unions have emerged as powerful change agents** through initiatives like Oregon's Safe from Hate Alliance in the United States, which was formed in response to a 2020 noose incident. The alliance's 63 signatory organisations enforce zero-tolerance policies, mandate respectful workplace training, and implement hiring hall suspensions (ranging from 30 days to 1 year) for violations ([source](#)). Union-specific programs include the IBEW's RISE training (Respect, Inclusion, Safety, Equity) and the Pacific Northwest Carpenters' Positive Jobsite Culture program, which addresses unconscious bias ([source](#)).

The Plumbing and Pipe Trades Employees Union (PPTEU detailed below) stands out as a key agent of change across the Australian industry.

**Military and policing transformations reveal both failures and breakthroughs.**

Military sexual assault prevention programs illustrate the challenges of cultural transformation in hierarchical, masculine institutions. The US Department of Defence SHARP program, despite operating since 2009 with full-time staff at the brigade level, has faced significant criticism ([source](#)). A 2022 GAO report found that the Army has not systematically evaluated its effectiveness since its inception, lacks proper performance measures, and continues to see rising reports despite implementation ([Source](#)).

Canada's Operation HONOUR (2015-2021), developed to prevent and address sexual misconduct within its ranks, achieved mixed results before ending amid leadership scandals. While awareness improved, with those rating it *"very/extremely effective"* rising from 30% to 45%, sexual assault rates remained unchanged ([Source](#)). The program's demise highlighted the importance of leadership credibility in driving cultural change initiatives. ([Source](#))

More promising approaches emerge from progressive forces internationally. New Zealand Police's evidence-based model combines unarmed service with systematic

program evaluation, achieving reduced staff assaults and decreased use of force while maintaining high public trust. [\(Source\)](#)[\(Source\)](#) Their Tactical Response Model trial demonstrated that cultural transformation need not compromise operational effectiveness [\(Source\)](#), a critical insight for masculine organisations fearing that change equals weakness.

Police reform research highlights the importance of shifting from a "warrior" to a "guardian" mindset. Studies show distinct, measurable differences between these approaches, with warriors responding more positively to force scenarios while guardians emphasise communication and partnership [\(Source\)](#). Washington State's Criminal Justice Training Commission leads guardian transformation through the integration of procedural justice and specific instruction to eliminate "warrior" terminology from academy training. [\(Source\)](#)

## Australian initiatives demonstrate comprehensive system-level change.

Australia's approach to cultural change in masculine industries combines regulatory requirements with voluntary initiatives, creating multiple reinforcing mechanisms. The Workplace Gender Equality Agency requires organisations with 100+ employees to report against six indicators, with new legislation mandating large employers (500+) to set specific targets. [\(Source\)](#)[\(Source\)](#) This regulatory foundation supports voluntary programs achieving significant scale.

The Male Champions of Change coalition, founded in 2010, now includes 250+ CEO and board-level leaders representing 1.5 million employees [\(Source\)](#). Their initiatives include the Panel Pledge (refusing to speak at events lacking gender balance) and the Supplier Multiplier program, which embeds equality requirements affecting 54,000 suppliers and \$30 billion annually. [\(Source\)](#) Members report measurable improvements in representation, pay gaps, and cultural indicators.

The Construction Industry Culture Taskforce, established in 2018 by the Australian Constructors Association and its government partners, developed a Culture Standard Framework to address the \$8 billion annual cost of workplace injuries, mental illness, and a lack of diversity [\(Source\)](#). The framework's three core elements include: wellbeing (mental health prioritisation), time for life (maximum 55-hour work weeks), and diversity/inclusion, and are being integrated into government procurement requirements following successful pilot implementations [\(Source\)](#).

Our Watch's Workplace Equality and Respect framework provides evidence-based tools for embedding gender equality and preventing gender-based violence [\(Source\)](#). Their approach combines assessment of workplace capacity, team motivation, leadership development, and practical implementation support. The framework's flexibility allows

organisations to choose appropriate actions while maintaining accountability to core standards.

Industry-specific Australian programs show particular promise. The mining sector's collaboration among BHP, Rio Tinto, and Fortescue has created joint learning programs addressing harassment and discrimination, which are being piloted through technical colleges to reach workers before they enter the industry. [\(Source\)](#)[\(Source\)](#)

Construction's adoption of mental health first aiders and suicide prevention programs addresses the sector's sixfold higher suicide risk compared to workplace accidents. [\(Source\)](#). These initiatives demonstrate how masculine industries can maintain their identity while transforming harmful aspects of traditional culture.

## Plumbing and Fire Protection Industry (Australia)

Following the research framework outlined in Stage 1, the following Australian plumbing industry initiatives demonstrate many of the evidence-based principles identified, particularly the importance of peer-led approaches and comprehensive support systems.

### Industry-Wide Initiatives

**The Plumbing and Pipe Trades Employees Union (PPTEU)** [\(Source\)](#) is one of the fastest-growing and most progressive trade unions in Australia. It leads industry transformation through multiple means and initiatives, including:

#### **Enterprise Bargaining Agreements (EBAs):**

Across the plumbing and construction industry, [Enterprise Bargaining Agreements](#) outline statements of commitment and intent regarding gender equity. PPTEU's EBA also includes mandatory provisions:

- Respectful treatment of women: Clause 7 mandates zero tolerance for discrimination and harassment,
- Appendix H requires employers on major projects to directly employ at least one qualified woman with ongoing mentoring.
- Gendered-violence prevention training: No specific gender-based violence prevention training is required beyond general anti-harassment obligations, though suicide-prevention training is mandated for OHS representatives.
- Enhanced amenities requirements: The agreement provides for parental leave (Clause 43B) and domestic violence leave (Clause 45)—potential scope to include additional specific provisions for site amenities to include specific women-friendly sanitation amenities.

**The PPTEU and RAW Group Training Organisation (GTO) 'Women in Plumbing' pilot program** [\(source\)](#) is a promising union-led initiative addressing the severe

underrepresentation of women in the plumbing sector, who comprise only 2% of the national workforce.

Launched in 2023, the program leverages existing family connections to the trade - acknowledging that intergenerational pathways common among male plumbers have been largely absent for women. The initiative recruited women through member networks via social media, with the union specifically asking members to consider 'daughters, nieces, partners, family friends' who might be interested in plumbing careers. Ten women are currently completing apprenticeships through the program, receiving training at PICAC while gaining on-site experience with EBA-compliant host employers, including A.G. Coombs and All Staff Fredon.

- The program's early success demonstrates the effectiveness of wraparound support models combining formal training, supportive host employers, and dedicated GTO assistance. Case studies of participants illustrate how leveraging existing industry connections while providing structured support can overcome traditional barriers. Participants emphasised the importance of working with other female apprentices to build connections and create pathways for future generations.
- Critically, the program ensures workplace safety through careful employer selection and ongoing GTO support, with participants reporting respectful treatment on male-dominated sites. This union-industry partnership model provides a replicable framework for increasing women's participation in the plumbing industry, although a peer-reviewed evaluation of the outcomes remains pending.

#### **Indigenous Apprenticeship Programme (established approximately 2004):**

Since the inception of the PPTEU Indigenous Apprentice Program, more than 80 indigenous plumbing apprentices have successfully completed their apprenticeship:

- A PPTEU partnership with Western Australian, Northern Territory and Victorian Aboriginal communities.
- Young men and women from remote Kimberley communities work in Melbourne and are placed with plumbing contractors to complete their 4-year apprenticeship in Certificate III plumbing.
- Learning plumbing services skills, including improved sanitation and water management, qualified plumbers can then return to and enrich their communities and transfer this knowledge.

## Master Plumbers Programs

Master Plumbers' initiatives demonstrate quantifiable successes:

### **Women in Plumbing Program (Victoria, 2021-2023) with Plumbing Apprenticeships Victoria (PAV)** [\(Source\)](#):

The Victorian Government-funded Women in Plumbing initiative, launched by Master Plumbers and Plumbing Apprenticeships Victoria (PAV), represents a comprehensive pathway approach to addressing the severe underrepresentation of women in plumbing (National Skills Commission, cited in Master Plumbers, 2022). The program offers structured support at every career stage, including paid pre-apprenticeships, direct entry to Plumbing Apprenticeships Victoria (a Master Plumbers' Group Training Organisation), and ongoing networking, mentoring, and training opportunities.

Central to the initiative's success were field officers/mentors who personally guided women through the system. The program addresses the isolation experienced by women in the trade, with participants emphasising the value of 'having a group of female friends, all thriving in the same industry' to provide crucial support during challenging times, including experiences of sexism and bullying.

The initiative also addressed misconceptions about plumbing work, educating school leavers about the diverse sectors within the industry beyond the stereotypical assumptions of 'toilets and sewerage.' A female apprentice on the program said: "*It's one thing to talk about helping women, but it is another actually to do it, and that is what is happening here*".

The program has:

- Transformed recruitment from 1 in 100 female applicants to 1 in 20 within two years [\(source\)](#)
- Achieved 26% female apprentice participation rate - 13 times the industry average [\(source\)](#)
- Invested \$1.2 million over two years, creating a complete pathway from pre-apprenticeship to employment [\(source\)](#)
- Employed a dedicated Field Officer who personally guides women through the system [\(source\)](#)

### **Women in Solar Program (2023) [\(Source\)](#)**

- Partnership with Solar Victoria
- Offered four-year apprenticeships, and participants were supported with financial incentives for the first two years of their apprenticeship, including a tool allowance and fully funded accredited training.

- Host employers benefited from a 50% discount on hire costs and assistance with administration.
- In total, 32 women have been supported as mechanical services plumbing apprentices, air conditioning and refrigeration mechanic apprentices, and solar electrical apprentices over the life of this program
- Builds on the success of the plumbing program model

The alternative statistics underscore ongoing challenges: Today, Victoria has approximately 101 female registered plumbers among 30,000+ total, highlighting how decades of exclusion may have created systemic barriers that short-term programs alone cannot overcome.

Research observed identifies that cultural attitudes remain a primary obstacle for women and diverse groups in trades, with workplace hostility and discrimination still common despite policy changes and other innovative initiatives. A focus on cultural change will be key for this project.

### **Cooke & Dowsett Plumbing Group (CDPG)**

CDPG demonstrates another comprehensive approach to advancing women's participation in the construction industry, offering valuable insights for the Building Women's Careers program. CDPG has grown from virtually no female representation to employing 91 women nationally across diverse roles, including 18 female apprentices and qualified plumbers, as well as 31 project administrators and 42 professionals in other functions (CDPG Women in Construction Stats, July 2025).

Their multi-pronged strategy includes targeted school outreach programs, partnerships with industry bodies such as NAWIC and the Master Plumbers' Women in Plumbing program, and structured mentorship systems (CDPG Women in Construction Report, March 2023). Particularly noteworthy is their subsidiary Pathway Plumbing Service's Willan Guiding Spirits Program, which provides a culturally supportive pathway into the construction industry – blending mentorship, skills development, and long-term career opportunities, resulting in the successful recruitment of two women as their first Indigenous female apprentices in 2024 (Pathway Plumbing Service - Breaking Ground and Building Futures, 2024).

CDPG's approach demonstrates that sustainable workforce diversification requires both quantitative targets (5% annual growth in female employment) (CDPG Women in Construction Report, March 2023) and qualitative support systems that address practical barriers, with their success evidenced by recognition such as a woman (Jazlyn

McClear) winning the 2024 PPTEU Apprentice of the Year award (PPTEU 2024 Apprentice Awards).

### National Fire Industry Association Programs

The National Fire Industry Association's **SPRINKS Program** ([Source](#)) offers another successful model. The program is aimed at removing barriers faced by women in the fire protection industry:

- Placed 25+ female sprinkler fitters since 2022
- Partner companies include Walker Fire and Pinnacle Fire Protection
- Annual International Women's Day events showcase female apprentices' experiences through video content
- 17 industry sponsors support recognition events
- *"Visibility matters as much as placement"*

### Specialised Support Programs

#### Incolink's Women in Construction Program ([Source](#))

- Collaborates with organisations that recognise the benefits of a diverse workforce.
- Operates nationally with wraparound services
- Worksite interventions addressing cultural barriers
- Partnership network includes Aboriginal organisations, unions, major contractors, and training providers
- Funded under the BWC Initiative

### Group Training Organisations (GTO)

Stage 2 research revealed that GTOs can play a vital role in supporting apprentices from equity cohorts. As the Strategic Review of the Australian Apprenticeship Incentive System (2024) notes, GTOs have historically provided important support for apprentices who face additional barriers to completion, including women in male-dominated trades. ([Source](#))

The review highlights:

- women report poor working conditions as a reason for discontinuing apprenticeships at double the rate of men (14% vs 7%)
- women in trades observe workplace bullying at nearly twice the rate of men (46% vs 24%)

### Sexual Harassment

- 41% of women and 26% of men experienced workplace sexual harassment between 2017 and 2022
- Male-dominated workplaces show higher sexual harassment rates (Treasury 2023b)

*Structural Barriers - Flexibility*

- Male-dominated trades have smaller proportions of part-time employees
- The construction industry lacks flexibility in training and work hours
- Inflexibility particularly impacts adult women apprentices with family/caring responsibilities
- These structural barriers significantly limit women's participation in male-dominated trades

The review indicates that women apprentices are also less likely to be employed after completing their apprenticeship and are less likely to remain in the same occupation after their apprenticeship than men.

According to the review, apprentices employed through GTOs generally have higher completion rates than those employed directly by employers, particularly SMEs. This is reflected in the experiences of women apprentices. The review found that as of August 2024, for women starting apprenticeships in 2019, the highest rates of completion were for non-trade occupations employed through a GTO (66.7%) and trade occupations employed through a GTO (56.1%) compared with a direct employer (55.6% non-trade and 48.7% trade).

The review (2024) found that GTOs can assist to provide wraparound support to apprentices and trainees, including mentoring and pastoral care, which can be particularly important for those from equity cohorts or facing additional challenges. Analysis of completion rates demonstrates that such support structures have a significant impact on women in trades.

The review identifies that women in male-dominated occupations face particular challenges, including workplace culture issues, a lack of appropriate facilities, and isolation from peers. GTOs can help address these challenges through their intermediary role, providing both a buffer between apprentices and potentially difficult workplace environments and ensuring appropriate support mechanisms are in place.

The evidence suggests that this model of employment and support can be particularly beneficial for women entering non-traditional trades, as GTOs can provide advocacy and intervention when workplace issues arise, offer continuity of training if a placement proves unsuitable, and deliver structured mentoring that may be absent in direct

employment arrangements. The importance of GTOs, as revealed in Stage 2 of this LACPR, should be considered in conjunction with the findings in Stage 1; ultimately, GTOs remain a crucial partner in achieving cultural change and gender equity in the industry.

Refer to Stage 3 of this LACPR, which includes findings from an interview with key figures from RAWGTO. RAWGTO ([Source](#))

- addresses intersectional challenges by providing culturally safe employment for Aboriginal men and women in plumbing
- offers 24/7 mentorship and kinship outreach programs
- focuses on addressing compound barriers faced by Indigenous men and women

## Construction Sector Snapshots

### Industry Associations and Advocacy

The broader construction sector's journey towards gender equity offers valuable lessons for the plumbing industry, particularly through **union-led** cultural change initiatives and successful advocacy campaigns. Data from 2024 indicate that women represent 12-15% of the total construction workforce, but only 2-3% in trade roles ([Source](#)).

It is worth noting that a Buildskills Australia analysis (2024) reports a record number of young women aged 15-24 working as tradespeople in the Australian construction industry. The number of female construction trades workers rose from about 6,100 in 2019 to nearly 12,000 in 2024 (though they still account for only 2.9% of the construction trades workforce). BuildSkills reports that the increase is largely among women over 18, many of whom are apprentices ([Source](#)).

### National Association of Women in Construction (NAWIC) Australia ([Source](#)):

NAWIC Australia's Male Allies Program, launched in July 2024 in partnership with training provider Lysander, represents a strategic shift in engaging men as active participants in achieving gender equity in the construction industry. The program comprises five self-paced digital modules:

1. **Foundations of Inclusion:** *Developing a comprehensive understanding of gender disparities and their impact on both individuals and the wider organisation—Foster empathy and awareness of the challenges women face in male-dominated industries.*

2. **Breaking Bias:** *Identifying common stereotypes and biases affecting women and understanding the consequences. Increase awareness of and overcome unconscious biases utilising tools for recognition.*
3. **Allyship in Action:** *Defining the role of a male ally, applying strategies to support female colleagues, and understanding the importance of bystander intervention. Develop skills in mentoring and sponsoring women for career development.*
4. **Driving Change:** *Applying techniques that promote diversity and inclusion in teams and the wider organisation. Identify and address microaggressions to foster a culture of respect and inclusion.*
5. **Leadership Impact:** *Developing action plans to create a positive and inclusive leadership shadow. Empower and inspire male allies to lead by example.*

Each is designed to help men understand gender disparities, overcome unconscious biases, and develop practical skills for supporting female colleagues. Exclusive to NAWIC members, the program recognises that with men comprising 88% of the construction workforce, sustainable cultural change requires their active engagement as allies and advocates.

This approach acknowledges that creating inclusive workplaces is 'everyone's responsibility' and that men in allyship programmes are three times more likely to positively address gender bias, driving both inclusive culture and women's advancement ([Source](#)). The initiative forms part of NAWIC's broader 'Allyship in Action: Transforming Culture to Attract and Retain Women' project, which received funding through the Building Women's Careers Program.

NAWIC also has:

- 13,500+ members nationally with chapters in every state
- Excellence Awards program received 242 submissions in 2024—double from three years prior
- "We Rise Together" campaign promotes collective advancement
- Partnership with Bunnings for Trade Women in Apprenticeships Awards worth \$10,500+ each
- Added Specialist Plant and Machinery Operators Excellence Award, recognising women in non-traditional construction roles

Additionally, the NAWIC's 'Crystal Vision' Awards (recognising individuals, businesses or organisations that actively promote and encourage participation and career

progression of women in the construction), have documented measurable positive impacts on career progression of women in construction.

#### **A.G. Coombs Diversity & Inclusion ([Source](#)):**

A.G. Coombs Group represents a significant Australian employer-led initiative in diversifying the building and construction trades. Their comprehensive Diversity & Inclusion Action Plan (2023-2025) demonstrates systematic organisational transformation with direct relevance to plumbing industry gender equity.

The company identifies "*Advancement of Women*" as one of three key pathways, implementing over 50 specific actions designed to achieve "*equity in all workplace positions, actively encouraging women to apply for every role within the organisation*". Importantly, A.G. Coombs explicitly acknowledges that:

*"misconceptions of overly physical work have led to entrenched myths and biases in the building and construction industry, acting as barriers to women, people with disabilities and older workers".*

This recognition directly parallels barriers identified in plumbing trades research.

The initiative's strategic approach extends beyond internal policies to encompass social procurement, prioritising majority women-owned businesses within their supply chain ecosystem. Board-level commitment is also evident through dedicated governance structures, with the Diversity & Inclusion Committee Chair emphasising that gender equity and the advancement of women are centred around the practical building blocks that advance female participation rates across all business streams. The company's integration of diversity initiatives with its core company policies and processes demonstrates how major Australian construction employers can embed systematic change into their core business operations, providing a scalable model for the transformation of the plumbing industry.

#### **Further Union Initiatives - Sanitation**

Australian studies and union-led surveys have consistently found that inadequate toilet and hygiene facilities contribute to serious health and retention issues for women in the trades. The Electrical Trades Union's Nowhere to report (2021) revealed that many tradeswomen deliberately restrict fluid intake during shifts to avoid using unsanitary or inaccessible site toilets, a behaviour linked to dehydration and recurrent urinary tract infections.

Women also reported dignity violations, such as being told to urinate behind trees, carrying used sanitary products for lack of disposal options, or facing ridicule for requesting appropriate amenities ([ETU, 2021](#)).

These findings align with a SafeWork SA (2019) review, which highlights inadequate amenities as a significant contributor to female attrition in the sector. Similar trends are reflected internationally: a North American survey of tradeswomen found that 78% restricted fluid intake, 43% experienced UTIs, and 67% cited poor facilities as a reason to consider leaving the industry (Institute for Women's Policy Research, 2012).

The significance of adequate toilet facilities for women in construction reached Australia's High Court in 2021, when the CFMMEU's request for designated female toilets on a construction site led to legal proceedings ([Source](#)). Despite this landmark case highlighting the issue, Victorian OHS legislation requires only 'adequate facilities' rather than gender-specific provisions, with the Workplace Facilities Code permitting unisex facilities for sites with ten or fewer workers ([Source](#)). This regulatory ambiguity continues to leave women vulnerable to inadequate sanitary provisions on smaller construction sites.

PPTEU representatives engaged during this LACPR noted that any broader recommendations emerging from this project should include the need for legislative change at both the State and federal levels to ensure the enforceability of minimum basic amenities.

**Electrical Trades Union (ETU) ([Source](#)):**

- "Nowhere to Go" campaign ([Source](#)): National survey revealing 1 in 5 construction workers lack running water in bathrooms led to SafeWork SA's enforcement crackdown in 2023 ([Source](#))
- Has a national Women's Committee
- State-based "Sparkettes" social media networks - where women can connect with other women in their state in the industry for support
- Women in Apprenticeships Victoria Electrical (WAVE) program funded by Apprenticeships Victoria ([Source](#)):
  - Under this program, more than 30 women have completed their electrical pre-apprenticeship, and 12 have gone on to successfully gain employment in the industry so far.
  - Participants in the program enrol and complete a women-only electrical pre-apprenticeship with Holmesglen Institute-Futuretech.

- They are also required to undertake training on Respectful and Safe Workplace Training, Making the Most Out of Being a Mentee, and a Meet Your Mentor session.
- In addition to all the training, participants in the WAVE Program are matched with a mentor who supports them on their training and employment journey and connects them to employers looking to employ women.

## Government Programs

Government initiatives at the federal and state levels provide substantial funding and policy frameworks:

### Key Federal Initiatives:

*Building Women's Careers Program: Three pillars - Educate, Empower, and Enable* Workplace Gender Equality Agency ([Source](#)):

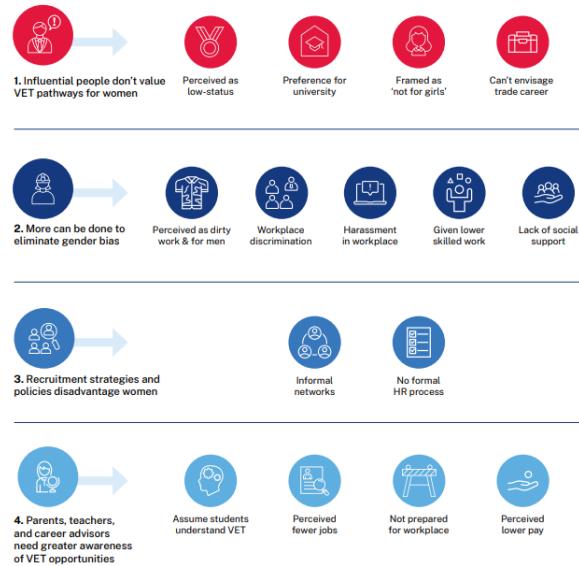
- Employer of Choice for Gender Equality citation held by 115 organisations (2023-2025)
- Construction companies achieving recognition: John Holland, Lendlease, CPB Contractors
- WGEA-certified employers demonstrate 26% lower gender pay gaps
- Construction showed the least improvement in reducing gender pay gaps between 2014 and 2021

### State Programs - snapshots

#### NSW

Published in 2022, the NSW Behavioural Insights Unit (NSW Department of Education) analysed twenty-two international studies and identified four interconnected barrier categories that systematically prevent women from entering trade apprenticeships ([source](#))

## Issues and Barriers



NSW Government invested \$20.2 million into a Women in Construction Grant Program (2022) [\(Source\)](#)

- Embedded project officers across 23 infrastructure projects
- Funded 34 pilot programs addressing entry and retention barriers

NSW Apprenticeship System Review, [Source](#) (2025)

- Maddison Daly case study: discovered trades at 25 via Instagram
- Review prompted by 50% dropout rates (15,000 of 27,000 in H1 2024)
- \$3.4 billion allocated for TAFE and skills
- Focus on better aligning training with workforce needs
- Addressing the lack of trades promotion to girls in schools

The Maddison Daly case study provides powerful evidence that many women do not know trades are an option for them, reinforcing the importance of visibility and awareness campaigns using social media channels where young women are already engaged.

NSW government's (2022) [Connecting Women to Trades Grant](#): to organisations for the design and delivery of innovative and targeted projects delivered through partnerships and aligned to the three pillars of action and outcomes of the Women's Strategy. The three pillars include:

- Increase the appeal of trades to raise women's level of participation
- Facilitate change to remove cultural and societal barriers

- Support women's learning to maximise vocational outcomes

## Victoria

Building Equality Policy ([Source](#))

- Mandatory targets for projects over \$20 million: 3% women in trade positions, 7% in non-trade construction roles, 35% in management
- Penalty provisions after January 2024
- Represents a shift from voluntary to mandatory compliance

## ACT

The government is working to establish the Women in Construction Procurement Policy, which includes proposed gender quotas for government-backed projects estimated at \$5 million or more ([Source](#)) ([Source 2](#))

## QLD

From 1 January 2025, principal contractors have been required to ensure designated female toilets and improved facilities and amenities for certain construction projects, as outlined in the Queensland Work Health and Safety (Amenities for Construction Work) Amendment Regulation 2024 ([Source](#)).

The Queensland Productivity Commission's 2025 inquiry into construction industry productivity offers critical insights into the barriers to female participation, which have been reiterated throughout this LACPR ([Source](#)). The QPC reports that despite recent growth—with 46,000 females working in Queensland construction in 2024 (a 16% increase from 2023)—women constitute only 17% of the total construction workforce and a mere 5% of construction trades ([Source](#)). The Queensland Training Ombudsman's 2022 review revealed that females account for approximately 4% of construction apprenticeship commencements and are less likely than males to complete their apprenticeships. Conversely, females demonstrate higher completion rates in construction traineeships, representing 11% of total traineeship completions despite facing systemic barriers ([Source](#)).

- The 2024 Strategic Review of the Australian Apprenticeship Incentive System identified that females were more likely to drop out due to:
  - poor working conditions and were more likely to observe or experience bullying ([Source](#)).
- Stakeholder consultations highlighted the construction industry's image as *"physically hard, unfriendly to family life and/or highly masculine as a significant deterrent to prospective female workers"* ([Source](#)).
- Solutions proposed include:
  - continuing programs like the \$4.6 million Women in Trades Mentoring Program delivered by Master Builders Queensland and the Housing Industry Association, and
  - the ongoing implementation of the Queensland Women in Construction Strategy by Construction Skills Queensland ([Source](#)).

## **Western Australia**

The Women in Non-Traditional Trades (WiNTT) Scholarship Program (2024) provides financial support and mentoring; however, published outcomes are not yet available. The program is said to provide 400 women with a one-off \$5,000 payment to support them in undertaking eligible vocational education and training (VET) qualifications at WA TAFE colleges from 2024.

The program is part of the state government's \$3 million four-year investment to help reduce barriers to training and support increased workforce participation in traditionally male-dominated industries such as building and construction, automotive and electrical, and engineering and mining. [\(source\)](#).

After reviewing state-based and other initiatives at Stage 2, an important limitation emerged: while substantial financial and programmatic efforts have targeted gender equity in recruitment and retention in the trades, fewer initiatives have addressed workplace culture, and most critically, rigorous evaluation of these initiatives is lacking/not available.

## Major Contractor Initiatives

Some leading Australian construction companies are demonstrating comprehensive approaches:

### **John Holland** ([source](#)):

- Achieved nearly 25% female representation overall, above industry average
- The 'first Australian construction company to implement a paid parental leave scheme' – now offering 18 weeks paid parental leave
- AFLW partnerships are recruiting entire squads across its programs and offices
- Annual female mentoring programs
- WGEA Employer of Choice

### **CPB Contractors** ([Source](#)):

- Four-step paid training from fundamentals through Certificate III completion
- Comprehensive support throughout the training journey
- Women in Construction Program 2023-Graduates leave the program with job-ready skills and a position on one of Victoria's infrastructure projects, where they can continue their studies with a Certificate III in Civil Construction accreditation.
- The three-week paid pre-employment program offers participants a comprehensive introduction to infrastructure construction through classroom learning and practical hands-on training.
- WGEA has recognised CPB Contractors as an Employer of Choice for Gender Equality (EOCGE) and WGEA Employer of Choice for Gender Equality citation.

### **Lendlease** ([Source](#))

As of January 31, 2025, Lendlease's Corporate Leadership team is 40% female, and the Lendlease (LL) board of directors is 33%.

- WGEA Employer of Choice citations
- Sustained diversity efforts across all levels
- A member of the Champions of Change Coalition
- During the annual compensation review process, LL reviews pay equity across genders.
- The recruitment process no longer asks candidates what their current salary is, to eliminate any existing bias.
- Data allows LL to set targets and track progress
- Data allows LL to set targets and track progress

## Research on Barriers

Dr Marzena Baker's (formerly at the University of Sydney, now Australian Catholic University) 2022 research revealed ([Source](#)) ([Source](#)):

- Women make up 18% of employees in construction and 12% in engineering in Australia
- Women hold just 2.7% of CEO positions in construction and 1.5% in engineering, and comprise 15.1% of executive teams in construction and 13.6% in engineering.
- Analysis of 495 construction and engineering organisations revealed that while women in senior management roles positively influenced women's appointments and promotions, many gender equality initiatives reported by organisations showed no measurable impact.

These findings suggest that initiatives are often selected to satisfy compliance and reporting obligations rather than to address deeper structural inequalities within the industry. The temporary and mobile nature of construction work requires fundamentally different approaches than office-based industries.

## Other Sectors - Transferable Learnings

### Mining Industry Transformation

The mining sector provides compelling evidence of achievable transformation. (along with details of the BHP study presented in Stage 1):

#### Rio Tinto's Transferable Pathways Program ([source](#)):

Focuses on transferable skills rather than mining experience, creating alternative entry pathways that recognise transferable skills. Their recruitment of women from hospitality, retail, and administration into mining operations:

- Attracted **3,200+ applications via women-targeted campaigns**
- Achieved 32% female new hires in 2021
- 12-month tailored development plans with peer mentoring and coaching
- Targets 2% year-on-year increases in female senior management
- 18 weeks paid parental leave for all genders

#### Anglo American (mining):

- Female-only traineeships attracted over 1,000 expressions of interest
- Demonstrates significant untapped demand when barriers are addressed ([source](#))

## Australian Women in Resources Alliance (AWRA)

AWRA, facilitated by the Australian Resources and Energy Employer Association (AREEA), offers a comprehensive model for advancing women's participation in male-dominated industries that could inform the project ([source](#)). Established in 2011, AWRA addresses the challenge of women representing only 20.5% of the direct resources workforce through multiple interconnected strategies.

Their approach includes:

- free lunchtime webinars on diversity and inclusion topics available for real-time participation or later download,
- female role model 'Mentoring Circles' providing intimate roundtable discussions with industry leaders, limited to 16 participants, and
- advisory services encompassing customised training on appropriate workplace behaviours and supervisor Skills,
- gender safety audits, and
- flexible work arrangement implementation

Particularly relevant for training delivery is their 'Bright Future STEM program', which reaches primary school students in Years 5-6 across Australia through hands-on activities, VR experiences demonstrating workplace environments, and presentations from industry professionals, having engaged with over 300 schools nationally.

Interestingly, in their Women in Trades Promising Practice Review, the NSW government reported:

*"In a UK-based case study, Archer and colleagues (2014) piloted a six-week school-based STEM careers intervention. This involved excursions to a science centre and STEM conference, visits from STEM Ambassadors and researchers, and attendance at a STEM roadshow. The intervention had no significant impact on girls' attitudes toward school science. Schoolgirls reported lower confidence in their ability to do well in STEM careers after the intervention. This was partly due to the lack of diversity in STEM career representation, including non-graduate pathways". ([Source](#))*

AWRA's toolkit approach, combining online resources, mentoring programs, workplace culture assessments, and early education interventions, demonstrates how multi-level strategies can address workforce diversity challenges. Their focus on providing both complimentary resources for members and fee-based specialised services offers a sustainable model for program delivery. At the same time, their annual Diversity and Inclusion Awards create visibility and recognition for successful initiatives, potentially providing a framework for acknowledging achievements within the Building Women's Careers program.

## Empowered Women in Trades (EWIT)

EWIT Australia offers a comprehensive advocacy model for addressing the severe underrepresentation of women in Australian trades, with their ambitious goal of achieving 30% female representation by 2030 ([Source](#)): Operating as both a registered charity and social enterprise, EWIT delivers immersive programs that span the education-to-employment pipeline, including Tools Skills Days for Years 9-10 students aligned with Victorian Curriculum standards, talent attraction programs connecting women directly with employers, and cultural transformation workshops such as Empower Minds and Thrive that address workplace psychological safety and unconscious bias.

Their 'Kicking Goals in Trades' school programs demonstrate how trades underpin all careers while providing hands-on tool experience in supportive environments, complemented by Women in Trades networking events across Queensland, Victoria, South Australia and New South Wales that build community and retention among existing tradeswomen. EWIT's dual approach of empowering women through practical skills development while simultaneously working with employers to prepare workplaces for gender diversity provides a replicable framework for the Building Women's Careers program, particularly their strategy of addressing both supply and demand sides of workforce participation.

Their recognition through the 2024 Telstra Best of Business Awards and partnerships with organisations like Apprenticeship Support Australia and TAFE demonstrate how collaborative approaches between training providers, industry, and advocacy organisations can create sustainable pathways for women in non-traditional careers.

## Australian Federal Police

In terms of gender equity recruitment, the AFP transformation offers a particularly relevant model to consider ([Source](#)):

- **Achieved 41.3% women in the workforce and a 50:50 gender balance in Deputy Commissioner positions.**
- Gender Equity Action Plan 2024-2027 provides a blueprint for systematic change:
  - Six focus areas: Recruit, Educate, Support, Uplift, Lead, and Track & Sustain
- Policy changes also include increasing parental leave to 18 weeks for all parents by 2027

Further research is needed to assess the AFP's progress on gender equity culture. Certainly, anecdotal evidence indicates that much more progress is needed in this area (Insights, SBS Australia, September 2025).

## Engineers Australia

In research commissioned by Engineers Australia, interesting insights for industry 'attraction' strategies are revealed ([Source](#)):

- In the research, which focused on identifying avenues for increasing female participation in engineering by understanding the motivators and barriers around entry and progression, it found that only **7% of women in non-engineering fields ever seriously considered engineering**. This highlights how perception barriers begin early.
- Message focus group testing revealed 'Shape a better tomorrow' resonated more as a call to attract women to engineering, over the traditional STEM-focused messaging
- Emphasising the impact of the role/profession over technical aspects attracts wider female participation
- Combined hands-on activities and young female role models also equal very effective attraction strategies

## SAGE/Athena Swan Accreditation Framework

One of the most rigorously tested gender equity accreditation framework models is the Athena Swan Charter, administered by the Science Gender Equity organisation (SAGE) in Australia. SAGE accredit and grants awards to tertiary education and research institutions for gender equity, diversity and inclusion ([Source](#)):

- Established in 2015, now covers **42 universities and 60 medical research institutions**
- **87% of university employees** work in SAGE-accredited institutions
- Three-tier system: Cygnet Awards → Bronze → Silver → Gold
- Requires organisations to:
  - Identify five key barriers
  - Develop evidence-based action plans
  - Demonstrate measurable progress
- University of Newcastle achieved silver accreditation with significant improvements in women's perceptions of fairness in promotions
- The framework principles may potentially be transferable to trades training, i.e.,
  - Transparent self-assessment processes
  - Evidence-based initiatives
  - Clear governance structures
  - Indigenous knowledge integration

## Legal Sector Victoria: the ‘Starts With Us’ Model

The Starts With Us project, led by Women’s Legal Service ([source](#)) ([source](#)) ([source](#)) Victoria, with funding from the Victorian Government’s Free From Violence strategy, represents a coordinated sector-wide approach to trying to prevent gendered violence in Victoria’s legal and justice workforce of 32,000 people.

The project progressed through multiple phases ([Source](#)): beginning with a 2019 Discussion Paper on sexism and gender inequality ([Source](#)), followed by a 2022 Research Report on Gender and Intersectional Inequality that revealed over half of participants observed discrimination in their workplaces and almost half considered leaving the sector ([Source](#)). The initiative brings together major legal sector organisations, including Victoria Legal Aid, the Federation of Community Legal Centres, the Victorian Bar, the Law Institute of Victoria, and leading law firms like Slater and Gordon and Lander & Rogers ([source](#)).

As part of this momentum, the Law Institute of Victoria adopted the NSW Law Society’s Charter for the Advancement of Women in September 2021, inviting all Victorian legal workplaces to become signatories and commit to establishing fair and transparent processes for addressing sexual harassment and discrimination ([source](#)). This Framework builds on that foundation of evidence and the growing commitment across the sector to create workplaces with gender-equal cultures, fair systems and structures, and robust reporting mechanisms. An evaluation of this initiative was not available and/or does not appear to have been undertaken at the time of developing this LACPR.

## Further International Snapshots

The following cross-national snapshots provide valuable comparative insights into diverse policy approaches, cultural contexts, and emerging practices that can inform the Australian plumbing industry's transformation journey.

### United Kingdom

The last official Office for National Statistics (ONS) figures show that there were over 300,000 women employed in construction in the UK compared to 1.76 million men, as of the third quarter of 2024. However, only 2% worked on onsite roles ([Source](#)). Eighty-one per cent (81%) of women in construction in the UK were employed in administrative and design roles, while only 1% worked in skilled trades ([Source](#)).

#### Women into Construction (2011-2014) ([Source](#)):

It is an independent, not-for-profit organisation that promotes opportunities for women in the construction industry on a national basis. To date, it has:

- Trained over 450 women, placed 135 in work placements, employed 195
- Exceeded gender equity targets by 15-25%
- Over 50% of women remained employed after one year, with 78% previously unemployed
- Success factors include:
  - Holistic support addressing childcare and transport
  - Sustained 6+ year funding
  - Work placements as "*extended interviews*"
  - Procurement requirements driving employer engagement

#### CITB 'Be Fair' Framework ([Source](#)):

Five-module system designed for mobile workforce and subcontracting practices

- The CITB Be Fair Framework includes "*industry-specific*" content in the form of core modules designed to feature criteria reflecting all of the protected characteristics within the Equality Act 2010, as well as the challenges and needs unique to the construction and built environment.
  - The modules include criteria around: leadership, recruitment, management, monitoring, training and procurement/supply chain integration
- Operating since 2010
- 3-year accreditation process for apprentices

### Canada

Canada demonstrates a comprehensive national commitment to getting more women in trades ([Source](#)):

- Target: 15% women apprentices by 2030
- Women in Skilled Trades Initiative: \$85+ million across multiple projects in 2024
- \$1.1 million for national mentorship programs

- \$2.6 million for Indigenous women apprentices
- 39 funded projects, including the Temiskaming Native Women's Support Group, training 200 Indigenous women apprentices
- Canadian Apprenticeship Forum provides biennial conferences and structured programs
- Provincial programs like Alberta's Women Building Futures provide 12-week introductory trades programs with comprehensive wraparound supports, demonstrating 93% completion rates.

## United States

### Organisational Leadership ([Source](#)):

- NAWIC US operates 120+ chapters with 6,000+ members
- Distributes \$100,000+ annually in scholarships
- Youth outreach from kindergarten through high school
- Million Women in Construction Community Pledge secured major firm commitments

### Federal Support ([Source](#)):

- WANTO (Women in Apprenticeship and Nontraditional Occupations) program: \$26 million since 2017, \$6 million in 2024
- National Center for Women's Equity in Apprenticeship and Employment: \$20.4 million federal investment
- Focuses on childcare, transportation and work gear support for women in nontraditional occupations

### State Programs:

**California's ERiCA Grant:** California's Equal Representation in Construction Apprenticeship (ERiCA) Grant represents a substantial investment of \$26.2 million (2025-27) to increase equitable access to construction apprenticeships for women, non-binary individuals, and underrepresented populations.

- The program's second round introduces a notable innovation with dedicated 'Worksite Culture' funding (\$100,000-\$500,000) specifically targeting mentoring, mental health supports, and anti-harassment training for apprentices, journey workers, contractors, and managers.
- This comprehensive approach addresses both recruitment barriers and workplace culture transformation, distinguishing it from initiatives that focus solely on entry-level access ([Source](#)).
- Division of Apprenticeship Standards women-specific initiatives ([Source](#))
- Seattle Priority Hire met annual diversity goals in 7 of 8 years through Community Workforce Agreements ([Source](#)).

### **Women in Plumbing & Piping (WiPP) ([Source](#)):**

WiPP is a nonprofit membership organisation that focuses on the inclusion, empowerment, and support of women in the plumbing industry, from the field to the boardroom, providing a place for women to thrive and unlock their full potential.

- Established 2023
- 250+ members and eight state chapters in the first year
- Has a four-pillar approach to supporting women in the industry: mentoring, networking, recognition, and education.

### **United Association (UA)**

The United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry of the United States and Canada (UA) represents approximately 390,000 members across North America, including plumbers, pipefitters, sprinkler fitters, HVACR technicians, welders and pipeliners (source). The UA places strong emphasis on training and equity, with initiatives such as Diversity in the UA and local women's committees that promote greater inclusion of women and underrepresented groups in the trades (source).

- Programs like UA Pipe PALS and the Veterans in Piping (VIP) scheme provide tailored entry pathways (source), while women's committees (for example, Local 562 tradeswomen) and the 'Ladies of 798' contribute skilled labour to community housing projects and advocacy campaigns (source) (source) (source). Under its Diversity in the UA initiative, the union also supports networks such as the Tradeswomen Build Nations (TWBN) conference, which brings together women in the building trades globally to discuss issues of particular relevance to women.
- In 2019, TWBN saw over 400 UA delegates and nearly 3,000 tradeswomen attend (source). Last year (2024), UA members participated in a Tradeswomen Build Nations march highlighting women in the trades and underscoring the union's visible role in supporting gender equity in construction and plumbing (source). While impact data remains limited on the central UA site, the visibility of these programs and public campaigns indicates a growing emphasis on retention and cultural change alongside traditional training pathways.
- For example, in the USA more broadly, female participation in registered apprenticeship has been growing: the number of active female apprentices more than tripled from 28,456 in FY 2014 to just over 92,500 in FY 2023 (source). Though this number still represents a minority of all apprentices, it reflects a significant upward trend. These data suggest that UA and allied apprenticeship programmes are, as noted, increasingly prioritising both recruitment and retention of women in traditionally male-dominated trades, through public events, supportive networks, and targeted funding.

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## Europe

European nations have pioneered regulatory frameworks and cross-border initiatives that demonstrate how policy innovation can drive systemic change in gender representation across the construction and trades sectors.

### Policy Innovation:

- Germany: 30% female quota for management boards ([source](#))
- Norway: 40% women on boards representation quota ([source](#))
- EU Gender Equality Strategy 2020-2025: Mandates gender considerations in public procurement ([source](#)) ([source](#))
- France's Women and Construction Project: 62.5% employment rates through women-only training on construction sites ([source](#))

### FEMCON Project ([Source](#)) ([Source](#)):

- Spans Denmark, Poland, Spain and Germany
- Develops innovative vocational education tools
- Creates shared curriculum and digital platforms for cross-border knowledge sharing
- Also includes Ireland through partners Momentum and Future Cast
- Part of the Erasmus+ Programme
- Developed FEMCON Inclusion Reach & Teach Toolkit for VET educators to create Inclusion Action Plans ([Toolkit](#))- includes a self-assessment questionnaire for companies
- Partners include NOT Szczecin (Poland), Fundación Laboral de la Construcción (Spain), Outside Media & Knowledge UG (Germany), European E-Learning Institute (Denmark)
- Created a collection of Open Education Resources to equip VET trainers with specialist learning content for women in construction ([Source](#))
- Developed 35 case studies via video in Good Practice Showcase ([Source](#))
- Toolkit divided into four sections addressing crucial aspects of promoting gender equality in construction ([Source](#))

## South Africa & Germany

A German-South African partnership between 'Gesellschaft für Internationale Zusammenarbeit' (GIZ) and the Institute of Plumbing in South Africa (IOPSA) reveals how international knowledge exchange accelerates progress. Female German master plumbers visiting South Africa share technical expertise while learning from South African innovations in training delivery. This two-way exchange challenges assumptions about where expertise resides and creates global communities of practice ([Source](#)):

- **54% of IOPSA training students are women**, despite only 2% of registered plumbers being female, which indicates strong latent demand when barriers are addressed.
- React 24 Training College ([Source](#)):
  - First black women-owned trade training academy
  - **6-month competency-based modular program** (CBMT) replacing traditional 3-year apprenticeships
  - CBMT led to the first cohort of qualified female plumbers in Cape Town
  - This innovation addresses time barriers that particularly affect women with caring responsibilities, while maintaining skill standards through competency-based assessment. Their first cohort of qualified female plumbers in Cape Town proves the model's viability.

## Singapore

Singapore's Association of Women in Construction, founded in 2019, shows how professional associations can quickly build momentum ([Source](#)):

- Their focus on **empowerment, connection, collaboration, and perseverance** creates a values-based framework that resonates across cultures.
- Their annual awards gala provides the celebration and visibility that research shows is crucial for attracting new entrants.
- Similarly, the success of Women in Plumbing and Piping (WiPP) in the United States demonstrates how women-led professional organisations can advocate effectively for systemic change.

## New Zealand

Research-based strategies focusing on attracting and retaining women in trades in New Zealand demonstrate a systematic approach.

### Construction Sector Accord:

There is public acknowledgement that women currently make up only ~18% of the construction-related workforce in NZ.

- The Accord was launched in April 2019 as a partnership between the government and industry to transform the construction sector, focusing on productivity, sustainability, safety, capability, and inclusivity [\(source\)](#)
- Among its priorities is increasing workforce diversity, specifically promoting the participation of women, Māori and Pasifika in construction, with Māori and Pasifika underrepresented in skilled and leadership roles. [\(source\)](#).
- The initial focus was on increasing the participation of women in construction through supporting the Women in Trades and Engineering New Zealand's The Diversity Agenda initiative. Which has two key focuses [\(source\)](#).
  - Diversity campaigns
  - And skills training pilots

### **‘TradeCareers’ Insights Summary (NZ, 2021) [\(Source\)](#)**

- The TradeCareers ‘Insights Research’ (commissioned in April 2021) surveyed women and employers to understand barriers facing women entering building, construction, and infrastructure trades, especially after many lost work or were underemployed due to COVID-19. At that time, women made up ~15% of apprenticeships in the sector (8,235 women under apprenticeship/apprentice programs), up from around 13.5% in 2020, and overall, about 13.5% of those working in the trades (including administrative roles).
- Key findings were that many women expressed interest in the trades (~ 60% of the ~2,200 surveyed), but cited needing supportive bosses, flexible hours, clearer career paths, and safe, respectful workplaces. Employers were largely willing (79%) to hire more women but identified needing resources/training to overcome myths about what women are capable of and to understand their unique workplace needs.

Other relevant NZ initiatives:

- NAWIC NZ partners with Bunnings for Future Leader Awards (\$7,500 prize packages + 12-month mentorships) [\(Source\)](#)
- TradeCareers Research Project: Surveyed 2,200 women (60% expressed interest in trades) [\(source\)](#)
- Destination Trades: 32-week carpentry programs based on Canada's model [\(source\)](#)

## The World Plumbing Council

The World Plumbing Council (WPC) is a global umbrella organisation of plumbing associations and industry stakeholders, with over 200 members from more than 30 countries, dedicated to promoting the role of plumbing in protecting public health, improving access to water and sanitation, and supporting sustainability and training worldwide (Source).

- A key initiative is the WPC Scholarship Programme, which provides opportunities for plumbers and trainers to undertake international educational exchanges, with separate scholarships available for applicants from developed and developing countries as well as instructors and trainers (source). The WPC's Strategic Plan highlights objectives such as promoting plumbing as a viable and rewarding career pathway, encouraging the standardisation of training and competency globally, and supporting groups that face barriers to access, including underrepresented cohorts (source).
- To build visibility and attract young people, the WPC coordinates events such as World Plumbing Day and supports apprentice skills contests, including those held in Australia at PICAC campuses, which showcase technical skill and raise awareness of career opportunities in plumbing (source). The Council has also explicitly recognised the under-representation of women in the trade, with dedicated resources such as 'Female Plumber' materials and campaigns like Attracting More Women to Plumbing, which call for cultural change and industry action to expand women's participation globally (source)

## Intersectional Experiences and Gaps

Despite some targeted initiatives observed throughout the research for Stage 2, notable experiences and research gaps remain for diverse cohorts:

### Indigenous Women

Documented Barriers (not construction industry specific) [\(Source\)](#) :

The *Gari Yala* study (2020), a survey of more than 1,000 Aboriginal and/or Torres Strait Islander workers, found that:

- 38% reported being treated unfairly at work because of their Indigenous background, while
- 44% reported hearing racial slurs sometimes, often, or all the **time**.

These findings highlight the prevalence of culturally unsafe workplace environments for Indigenous employees. According to the research, programs addressing both cultural safety and gender equity simultaneously will be most effective.

## Culturally and Linguistically Diverse (CALD) Women

University of Technology Sydney research (2024) studying 16 skilled female migrants who had sought work in the NSW construction industry revealed ([Source](#)):

- Initial hopes quickly turned to frustration
- Formal online processes automatically exclude many
- STAR interview methods created additional barriers
- Language barriers compound gender discrimination
- Qualification recognition issues
- Limited professional networks

The researchers concluded: *“Among the challenges facing female migrants with the skills needed by the construction industry were sexism, racism and traditional cultural expectations about their role in society”*.

## Limited Programs:

Mas National's Empowering Women into Trades program (2023) ([source](#)) targeted Western Sydney's diverse communities. The program included in-language support and resources, along with:

- 1-on-1 sessions to develop client goals and aspirations
- pre-employment programs to assist with relevant training and tickets
- linking to employers in the construction field
- post-placement support to ensure clients are comfortable and confident in their roles.
- Approximately six women completed the program.
- Comprehensive intersectional approaches remain rare in the grey literature.

## Rural and Remote-Based Women

Geographic isolation compounds gender barriers in the trades:

- Jobs and Skills Australia reports VET students in regional areas are more likely to be from Indigenous or lower socioeconomic backgrounds ([source](#)).
- Australian Institute of Health and Welfare documents the following as key barriers to those in remote and regional areas ([source](#)):
  - Lower service access
  - Unreliable internet connectivity
  - Additional transport costs are key barriers
- Pre-apprenticeship programs have been identified as particularly effective for underrepresented cohorts, including women. Construction Skills Queensland's Year 13 program equips high school students with the tools to explore career compatibility in the construction industry, helping to address information barriers that

disproportionately affect female students who may not have considered trades as viable career options ([Source](#)).

- Tradeswomen Australia runs regional programs ([source](#))

## Women with Disabilities

**Critical Gap:** No targeted initiatives for women with disabilities entering trades were identified in the research:

- General Disability Employment Services exist
- Employment assistance funds provide workplace modification funding, etc

## Systemic Change Mechanisms

### Policy and Regulatory Frameworks

The United Nations warns it will take nearly 300 years for women to achieve full workplace and social equality globally ([Source](#)). In any case, the research reveals that lasting change in the plumbing and construction industry requires coordinated interventions. Some examples and frameworks include:

#### Procurement Requirements

- Victoria's Building Equality Policy creates training and employment opportunities for women in the construction industry: includes minimum targets with penalty provisions ([Source](#))
- World Bank: 4.5% procurement to women-led SMEs (2020) ([Source](#))

#### International Standards

- International Organisation for Standardisation ([ISO 53800:2024](#)): Most current gender equality implementation guidelines
- [ISO 30415:2021](#): Scored assessment across seven HR lifecycle areas
- UN Women's Empowerment Principles: 11,000+ CEO signatories globally ([source](#))

## Culture Change Programs

An examination of the grey literature for Stage 2 has revealed that effective cultural change initiatives combine multiple elements, including:

### **Leadership and Accountability:**

- Executive performance reviews include gender targets
- Zero-tolerance policies with clear reporting mechanisms
- Regular workplace culture assessments

### **Training Approaches:**

- Campaign shifts construction culture, preventing gender-based violence
- Peer-led approaches (e.g., those who experienced harassment create training videos)

### **Mentoring Models:**

- Manufacturing Skills Queensland: recruits 100 female apprentices annually through algorithm-based matching
- Canada's National Mentor Development Program: Five training modules with personalised coaching
- Tradeswomen Inc.: 300+ tradeswomen annually for peer support
- Chicago Women in Trades: Technical assistance achieving above-average retention

- *The PPTEU/RAW GTO Women in Plumbing program ...*
- *provides a tested model that the Building Women's Careers initiative could adapt and scale.*
- *Key lessons include the effectiveness of leveraging existing industry connections through family networks, the importance of union-industry partnerships in ensuring workplace safety and support, and the value of cohort-based training where women learn alongside other women.*
- *The program's success in placing women with established EBA employers who are committed to creating safe and respectful workplaces addresses the critical safety concerns identified throughout the literature.*
- *For Project implementation, partnering with unions and GTOs could provide the necessary infrastructure and accountability mechanisms to ensure sustainable outcomes for women entering the plumbing career.*

## Measurement and Accountability –Tools

Validated assessment tools provide the foundation for tracking cultural transformation. **Over 10,000 companies use the Organisational Culture Assessment Instrument (OCAI) to measure six cultural dimensions, employing a point distribution methodology that encourages realistic trade-offs** ([Source](#)).

The masculinity contest culture scales specifically assess workplace norms around competition and dominance, which are directly linked to health outcomes, including emotional exhaustion and turnover ([Source](#)).

Effective measurement combines leading indicators (such as training completion and manager meeting frequency) with lagging indicators (such as turnover rates and engagement scores) ([Source](#)). Research shows culture-performance relationships peak between 1-3 years but require longer horizons for full impact ([Source](#)) ([Source](#)). Longitudinal studies using panel methodology across 400+ organisations in Korea demonstrated that clan cultures significantly decrease over time without active reinforcement, highlighting the need for sustained intervention ([Source](#)).

Return-on-investment calculations provide compelling business cases for cultural programs. McKinsey research finds top-quartile diverse companies outperform by 25-36% in profitability ([Source](#)) ([Source](#)) while inclusive workforces demonstrate 1.12x more discretionary effort and 1.57x more team collaboration ([Source](#)) ([Source](#)). Comprehensive tracking shows average replacement costs of 20-213% of salary, making retention improvements highly valuable ([Source](#)) ([Source](#)). BHP's data linking team, which has demonstrated a 67% reduction in injuries, provides safety-based ROI arguments that are particularly compelling in high-risk industries. ([Source](#)) ([Source](#)).

Creating psychologically safe feedback mechanisms in masculine cultures requires careful design. Amy Edmondson's validated 7-statement assessment provides a baseline measurement, while implementation strategies include vulnerability modelling by leaders, anonymous feedback systems with visible follow-through, and "failure parties" that celebrate learning ([Source](#)). Critically, these mechanisms must be framed using masculine-valued concepts, such as team performance and competitive advantage, rather than emotional language that may trigger resistance.

The true cost of training presents a significant barrier, with the Master Plumbers' Association Queensland estimating that training a single apprentice exceeds \$250,000, with only 2% of the cost covered by government financial incentives ([source](#)). This financial burden disproportionately affects women, who are more likely to pursue trades careers later in life and face additional barriers, justifying the wage disadvantage to small businesses.

## Technological Innovation

### Technology-Enabled Solutions

Virtual Reality and digital platforms are revolutionising trades training by dramatically accelerating skill acquisition and reducing costs.

- Companies like [Interplay Learning](#) demonstrate VR's potential to create job-ready workers *"in weeks, not years"* while specialised systems such as
- OcuWeld's VR welding simulator reduces training costs by 100-fold per student compared to traditional methods ([source](#)). This technological transformation is supported by compelling research from
- PwC showing that VR training delivers results 4x faster than classroom learning and proves more cost-effective at scale ([source](#)). The widespread accessibility of enterprise headset ecosystems under \$1,000 has made this technology viable for organisations of all sizes ([source](#)), with
- 37% of Australian construction companies now using or trialling AI-driven solutions to enhance workforce development. Building information modelling enables detailed planning with reduced site work, while cloud-based platforms help to facilitate remote project management ([source](#)).

### Conclusion – Stage 2

The evidence demonstrates that while women remain severely underrepresented at 2% in Australian plumbing, targeted programs can achieve good results, though many programs and initiatives still have not been officially evaluated. PPTEU, RAWGTO, and CDPG programs demonstrate that change is possible with dedicated resources, comprehensive support, and sustained commitment. Master Plumbers' 26% female participation rate proves transformation is possible,

Furthermore, the 2% of women in Australian plumbing statistics that have remained largely unchanged for decades may indicate that decades of exclusion have created systemic barriers that short-term programs alone cannot overcome. Research observed identifies that cultural attitudes remain a primary obstacle for women and diverse groups in trades, with workplace hostility and discrimination still common despite policy changes and other innovative initiatives. A focus on cultural change will be key for this project.

International examples from aspirational Europe, with mandated quotas and targets regarding women in trades, South Africa's 6-month modular training pathway to accreditation, and Canada's \$20 million investment, demonstrate multiple pathways to success.

Dr Marzena Baker's research confirms that "*special measures*" targeting construction-specific gender diversity challenges outperform generic diversity initiatives. The combination of proven program models, emerging technologies, and increasing recognition of diversity's business benefits creates unprecedented opportunity for achieving gender equity in plumbing.

Success requires coordinated action across government, industry, unions, and training providers, addressing not just skills development but workplace culture, practical barriers, and systemic discrimination.

# Stage 3: Interviews

## Interview Findings - Voices from the Field

### Introduction

To triangulate and verify findings from the peer-reviewed literature (Stage 1) and the environmental scan (Stage 2), interviews were conducted with key stakeholders who are actively working to advance women's participation in plumbing and comparable sectors. This qualitative research component gathered insights from seven organisations spanning trade unions, industry employers, training organisations, advocacy groups, and cross-sector initiatives, including international perspectives.

Interviews were conducted with a key representative/s from:

- Plumbing and Pipe Trades Employees Union (PPTEU)
- Major plumbing contractor (Cooke & Dowsett)
- RAW Group Training Organisation (RAW GTO)
- Prominent tradeswomen & 'Empowered Women in Trades' representative (advocacy organisation)
- Australian Football League (AFL)
- It Starts With Us initiative (legal sector transformation initiative)
- UK-based woman plumber, educator and women in plumbing ambassador

The interviews aimed to gather lived experiences, test theoretical findings against practical realities, and identify actionable strategies for the project's deliverables: an employer framework, an individual training program, and a national awareness campaign.

### Key Themes and Findings

**Culture as the Primary Barrier:** Across all interviews, workplace culture emerged as the most significant barrier for women in male-dominated fields, more challenging than skills gaps, physical requirements, or even legislative frameworks. As one interviewee stated bluntly: *"It is the culture, really, it is the greatest barrier... it is the attitudes of the majority of the workforce to women engaging in the industry"*.

Interviewees said these cultural challenges manifest in multiple ways:

**Persistent Gender Bias:** An interviewee estimated that approximately 60-70% of employers still believe women are hired in the industry to meet quotas rather than for their capabilities. They noted: *"They're only doing it because they have to do it, not*

*because they think they can get the production".* The UK representative confirmed similar attitudes persist internationally, noting that acceptance varied dramatically by demographic: *"The only real thing I had issues with is sort of middle-aged males".* This perception persists despite evidence to the contrary, with successful female apprentices demonstrating excellence across the trade as uncovered in stage 1 &2 of this LACPR.

**Harassment and Violence:** A female trades advocate shared harrowing personal experiences and those of other women: having ponytails pulled or cut, threats of rape, being urinated on at worksites, and tampons covered in tomato sauce and placed in tool bags. These extreme behaviours exist alongside more subtle forms of exclusion—women eating alone because male colleagues won't invite them to sit at lunch tables.

**The '2% Problem':** Multiple interviewees agreed that women's 2% representation in plumbing *"hasn't been a problem for the 98% of men"* who have maintained employment and high wages. The PPTEU confirmed this static statistic despite spearheading many legislative advances, noting *"there's been more movement in the legislative space in the last 10 years than on the ground"* in terms of actual participation.

**The 'Proof of Competence' Burden:** Women consistently report having to demonstrate superior skills to gain basic acceptance. The UK representative developed a strategic approach to overcome this, using an icebreaker activity in her teaching where she demonstrates her qualifications and skills upfront: *"Once we've got that ice breaker done... if I then take them to do something practical, like solder or something I know they can't do and I show them how to do it, the barriers really broken down"*.

## PPTEU's Leadership and Structural Initiatives

The PPTEU has taken significant leadership in advancing gender equity through both advocacy, women in plumbing programs and concrete provisions in Enterprise Bargaining Agreements (EBAs):

**Regulatory Achievements:** The PPTEU has championed landmark cases, including supporting a CFMEU-led High Court decision regarding amenities on construction sites that established a legal precedent for basic facilities as a human rights issue. As their representative noted: *"That one kind of shook up a little bit of the industry's perception"*.

**EBA Provisions:** PPTEU EBAs contain the strongest gender inclusion provisions in the country, including:

- **Clause 7 (Intentions and Commitments):** Explicitly commits parties to *"ensuring that equitable employment practices are applied in the workplace"* and creating policies providing *"better employment opportunities for women, mature age, Aboriginal and Torres Strait Islander people"*.

- **Clause 43B (Paid Parental Leave):** Provides wage top-ups beyond the national scheme, with the PPTEU noting that while not gender-specific, "only women members have, as far as the Union is aware, qualified for paid parental leave under this clause".
- **Clause 45 (Family and Domestic Violence Leave):** Provides 10 days paid leave, addressing an issue that "*disproportionately affects women*".
- **Appendix H (Under-represented Persons):** Establishes minimum engagement requirements for women and First Nations people on projects over \$50 million, requiring employers to use "*best endeavours*" to directly employ or on-hire women through approved GTOs.

**Implementation Challenges:** Despite these achievements, the PPTEU acknowledges a critical gap: "*We haven't actually run a case on breach of any of those terms*". Their legal representative suspects widespread non-compliance but notes that enforcement is challenging, given that only 2% of the workforce would be affected by these clauses.

## Success Models and What Works – Australia

Despite challenges, interviewees identified proven strategies for achieving measurable results:

**Comprehensive Mentoring Models:** The RAW GTO's 90.4% retention rate for female apprentices demonstrates the power of holistic support. Their approach extends beyond trade training to encompass "*life coaching*" covering financial literacy, mental health support, housing assistance, and crisis management. As an interviewee explained: "*The key component of mentoring is building that relationship... more of a friend than an employer*".

Several interviewees strongly endorsed this approach, emphasising that "*mentorship is the most important thing for apprentices... a strong-minded supervisor that's attuned to the inherent barriers for women entering the industry*".

**The PPTEU/Raw GTO Women in Plumbing program** offers a proven model that demonstrates the effectiveness of leveraging existing industry connections through family networks, the importance of union-industry partnerships in ensuring workplace safety and support, and the value of cohort-based training, where women learn alongside other women. The program's success in placing women with established EBA employers who are committed to creating safe and respectful workplaces addresses the critical safety concerns identified throughout the literature.

**Tri-partite Collaboration:** PPTEU highlighted Victoria's unique position to work together and be at the forefront in terms of gender inclusion in the industry. Due to its strong unionism, which enables close collaboration between PPTEU, Master Plumbers

and employers, these types of partnerships have created an environment where union-backed EBA sites can provide stronger protections and accountability than domestic/small business sectors.

**Pairing Strategies:** An interviewee noted that pairing Indigenous apprentices together dramatically improved outcomes for plumbing apprentices—a strategy they found equally applicable to women. As they explained: *"When they're together... they're excelling... because they're in an environment where they're supported, happy and confident".*

**Financial Incentives:** Removing employer incentives has created placement barriers. One interviewee said: *"We need to give employers a financial incentive, because... people think 'I'm going to get a woman or I'm going to get an Indigenous boy', and they've got that stigma".*

**Visibility and Role Models:** Cross sector, an interviewee spoke of the significant increases in female participation through visibility strategies. As the representative noted: *"The more you see women coaches, umpires, it becomes normalised"*. This principle applies directly to plumbing, where visible female role models remain rare or not spotlighted.

## Progress Through Policy and Infrastructure – International

The UK interviewee experiences demonstrate how regulatory frameworks and infrastructure can create meaningful change:

**Zero Tolerance Enforcement:** The UK interviewee outlined how many worksites have a 'carding' system similar to the 'red/yellow' card in football (soccer), where poor behaviour and/or harassment results in immediate removal of the perpetrator from the site. The UK representative explained: *"If someone wolf whistled a female... they'd be off. They kind of built up more and more rules which made you feel safer to be on there"*. This zero-tolerance approach has transformed building site culture in the UK.

**Mandated Facilities:** The UK interviewee spoke of how women's toilets are now mandatory on UK construction sites, creating basic dignity. The UK representative noted the dramatic shift: *"Even now, when I go on to see my apprentices on building sites... the site managers get excited because they've got a female to use their female toilets, as still there is not many females taking up the profession"*.

**Mental Health Support Infrastructure:** The UK has established the Lighthouse Construction Charity, providing crucial mental health support specifically for construction workers and their families. The UK representative highlighted: *"It's a charity that's for all*

*trades, because the suicide rate here, trade-related, is quite high... we even have a text thing where we can just text a number if we've had a bad day".*

**Complaints Infrastructure:** Perhaps most critically, the UK has developed robust infrastructure for addressing complaints. The UK representative emphasised: *"I know if something happens, that I can go to whoever is running the building site and say, this ain't right... I know that there is a process of things to go through, and then if that process is not done properly, I can go somewhere else higher up and complain that they are not doing their processes properly, and that this will be taken seriously".*

## Reframing the Narrative

Interviewees consistently emphasised the need to reframe both the industry's image and the gender equity conversation:

**"Plumbing is a Human's Job":** Rather than positioning this as a *"women's issue"*, successful messaging frames inclusion as improving the industry for all workers. As one advocate powerfully stated: *"Plumbing is a human's job... to be a great plumber, you need to be a good human. It doesn't matter what's between your legs".*

**Beyond "Dirty Work":** Multiple interviewees identified public perception of plumbing as *"fixing toilets"* and *"dirty, shitty work"* as deterring women. The reality of diverse career pathways—from clean energy and hydrogen technology to project management—remains invisible.

**Safety and Dignity Focus:** Framing cultural change through workplace safety resonates more than diversity arguments. The union's successful *'Nowhere to Go'* campaign, which focused on toilet facilities, positioned basic amenities as human rights issues rather than special accommodations.

## Practical Barriers Requiring Immediate Action

Interviewees identified specific, actionable barriers that could be addressed immediately:

**Menstruation Support:** As an interviewee advocated: *"If we can have sanitary items as a mandatory thing in first aid kits, that would really change the game for so many women on sites".* This interviewee detailed the challenges women face on-site when menstruating, including a lack of access to products, nowhere to dispose of them, and no understanding from male colleagues about the physical impacts.

**Appropriate PPE and Tools:** Multiple interviewees confirmed the literature finding that 91% of women experience ill-fitting equipment or barriers due to tools being designed

based on male hand sizes and grip strength, among other factors. One interviewee noted these barriers extended beyond gender: *"It's actually also new men coming through into the industry... I don't know what it is, because of gaming or whatever, just humans evolving"*. This evolution in physical development means tool redesign would benefit the entire emerging workforce.

**Facilities and Amenities:** The PPTEU and other unions have led legal challenges over basic facilities, establishing precedents that adequate amenities are human rights issues. However, implementation remains inconsistent, particularly on smaller sites.

**Flexible Working Arrangements:** Multiple interviewees highlighted the challenge of balancing apprenticeships with family responsibilities. One industry leader said: *"Women can have kids whilst doing the apprenticeship, but it could be a long apprenticeship"*.

## The Intersectional Dimension

Interviewees spoke about their relevant programs working with diverse cohorts, which revealed important parallels and compounding challenges:

**Isolation and Support Needs:** Indigenous apprentices eating alone, facing casual racism, and needing peer support mirrors women's experiences. The RAW GTO found that pairing Indigenous apprentices together dramatically improved outcomes—a strategy equally applicable to women.

**Complex Life Circumstances:** Successful programs address intergenerational trauma, family obligations, financial literacy, and housing instability. As one mentor noted, apprentices face *"everything from addiction to domestic violence to homelessness"*.

**Cultural Competence Requirements:** An interviewee found that when working on gender equity in the legal sector, introducing intersectionality to the framework *"brought a lot of people on board"* who might have resisted gender-only initiatives, as it speaks to *"all the injustices"*.

## Generational Change and Education Pathways

Across the interviews, a strong consensus emerged that lasting change requires generational intervention:

**School-Age Engagement:** Multiple interviewees emphasised targeting Year 11-12 students before career decisions solidify. The PPTEU specifically recommended *"pre-education at Year 11 and 12 level"* as the critical intervention point. As one interviewee

noted: *"The current cohort above 35... it is difficult to change their mindsets..."*. This assessment suggests resources should focus on *"the next generation of workers... getting into the minds of younger people entering the workforce"*.

Multiple interviewees confirmed that career counsellors rarely promote trades to female students, with one industry leader noting: *"No school would even in their careers office would even know what a plumbing company did"*.

**Reimagining Apprenticeships:** With modern workers expecting five or more career changes, traditional four-year apprenticeships may need restructuring. Extended timelines for parents, modular training, and recognition of prior learning could broaden participation. An interviewee also suggested that a successful approach would be more feasible if the apprentice remained with one company throughout their entire apprenticeship, and this could be mandated.

**Male Education Imperative:** Every interviewee emphasised men's essential role in cultural change. One sporting organisation found that attempts to increase female participation failed until they developed specific programs for male allies: *"We're spending all this time empowering women, but we're not spending any time teaching men how to work alongside empowered women"*. Another interviewee said, *"You've got to get men involved"*.

**Alternative Entry Pathways:** Several programs have demonstrated success in attracting mature-age women to the trade. The RAW GTO's oldest female apprentice is 42 with three children, proving that plumbing careers need not follow traditional pathways.

## Systemic and Structural Requirements

Interviewees identified critical system-level changes needed:

**Leadership Accountability:** One industry leader's litmus test resonated across interviews: *"Would I want my daughter working in this space?... If you ask that question and you're comfortable, then you've got a good business"*.

**Procurement Leverage:** Several interviewees noted that government contracts increasingly include social procurement targets. However, implementation varies, with one interviewee noting: *"You can put this stuff in your contracts... but you need to audit it, because everyone's just going to tick a box"*.

**Organisational Readiness:** An interviewee emphasised that organisations need minimum standards before attempting culture change, particularly *"being able to respond and provide an adequate level of support for employees"*, including EAP

services and robust reporting mechanisms. *"You need to have an EAP... you need to be able to refer people on to support services... you need to have adequate things in place".*

**Measurement and Timeframes:** Successful transformation takes time. One interviewee noted: *"If we get to 2030, I don't actually think we'll get equal representation by then, but that's okay. If we move the dial, that'll be a bonus".*

**International Comparisons:** The UK representative's experience demonstrates both progress and persistent challenges internationally. After 15 years in the industry, the interviewee reflected on improvements, including zero-tolerance policies for harassment (a *"carding system"* that immediately removes offenders from the site), mandatory women's facilities, and mental health support through the Lighthouse Construction Charity. However, she emphasised that fundamental cultural challenges persist: *"You have to be strong... it's not for the faint-hearted to work with blokes".*

## Distinctive Insights and Innovations

Several unique insights emerged from interviews consolidating insights gleaned in Stages 1 & 2:

**Pregnancy During Apprenticeships:** One industry leader raised an unaddressed issue: *"Women can have kids whilst doing the apprenticeship, but it could be a long apprenticeship".* This practical reality requires policy consideration.

**Career Progression Barriers:** Multiple interviewees noted that women often leave the industry not just due to harassment but because they don't see progression opportunities, getting stuck in basic maintenance roles rather than advancing to complex work.

**Multi-Trade Site Dynamics:** Although plumbing has made progress, women still face harassment from other trades on shared work sites. As one interviewee noted: *"You're going to have concreters... steel fixers. And in those industries, they're probably not as advanced as the plumbing industry".*

**Trust-Building Methodology:** The RAW GTO's success stems from mentors becoming *"more of a friend than an employer"*, enabling early intervention before crises escalate. This relationship-centred approach was achieved through personal connection, starting from induction, regular informal check-ins, and the documentation of 98% of interactions.

**Mental Health Integration:** Both Australian and UK programs increasingly recognise mental health support as essential infrastructure. The sporting organisation noted

parallels with their sector: "*Coaching is no different to plumbing... it's all the same principles that need to be followed*".

**The "Self-Selection" Dynamic:** On worksites, underperformers naturally get excluded from teams. This self-regulating mechanism could support high-performing women but may also perpetuate exclusion of those struggling with hostile environments.

## Implications for Project Deliverables

### For the Employer Framework:

- PPTEU's EBA provisions as minimum standards across all employers
- Establish organisational readiness criteria including EAP services and reporting mechanisms
- Develop mentoring programs modelled on RAW GTO's holistic approach
- Create accountability metrics tied to leadership KPIs
- Implement procurement requirements with robust auditing/ Integration with social procurement frameworks

### For Individual Training Programs:

- Target Year 11-12 students as recommended by PPTEU
- Develop male ally training as a core component, not an add-on
- Include menstruation education and support protocols
- Integrate mental health first aid training
- Provide bystander intervention skills training
- Address intersectional barriers through culturally competent approaches

### For the National Awareness Campaign:

- Frame as "*humans in plumbing*" rather than a women's issue
- Challenge perception of plumbing as "*dirty work*"
- Showcase diverse career pathways beyond "*fixing toilets*"
- Use role models across age ranges and backgrounds
- Partner with schools for early intervention
- Highlight the trade's contribution to society: "*Plumbing literally saves more lives than doctors*".
- Celebrate success stories while acknowledging ongoing challenges

## Conclusion – Stage 3

The interviews powerfully validated literature findings while adding crucial practical dimensions. The PPTEU's contributions were particularly valuable, demonstrating both significant legislative progress through their EBA provisions and the sobering reality that enforcement remains elusive, with participation rates unchanged at 2%.

The success of programs like RAW GTO's 90.4% retention rate proves that change is achievable with adequate investment and holistic support. However, interviewees unanimously agreed that piecemeal approaches will fail. As an interviewee concluded: "*I don't have a silver bullet... any movement that we get hits up against all the other barriers that still exist*".

Interviewees unanimously agreed that piecemeal approaches will fail. As one legal sector expert warned: "*If you want to address pay equity, it's fabulous... but how are you going to do that?*" The path forward requires addressing the **how** with the same rigour as the **what**—combining immediate practical fixes with long-term cultural transformation, always remembering that behind every statistic is a woman trying to build a career while navigating extraordinary challenges.

The path forward requires comprehensive, multifaceted approaches addressing immediate practical needs while pursuing long-term cultural transformation. Most critically, it requires recognising that behind every statistic is a woman trying to build a career while navigating extraordinary challenges that their male colleagues will never face.

# Consolidated evidence across the research

## Critical Success Factors

The environmental scan and stakeholder interviews provide practical evidence that validates and extends the academic findings, revealing what works in real-world implementation.

### Integrated success factors as observed across the evidence

| Domain          | Stage 1 Findings<br>(Literature)         | Stage 2 Findings<br>(Programs)                 | Stage 3 Findings<br>(Interviews)                    | Consolidated<br>Recommendation                   |
|-----------------|--|--|---|--|
| Culture Change  | Hypermasculine cultures' primary barrier | MATES model: reframe as mate care              | <i>"60-70% believe women hired for quotas"</i>      | Peer-led programs using safety/dignity framing   |
| Support Systems | Mentorship is crucial but underutilised  | RAW GTO: 90.4% retention with holistic support | <i>"Mentoring is building relationships"</i>        | Life coaching model beyond trade skills          |
| Entry Pathways  | Career stage-specific needs              | Master Plumbers: 26% female participation      | <i>"Target Year 11-12 students."</i>                | Multiple entry points with pre-apprenticeships   |
| Male Engagement | Bystander intervention effective         | NAWIC Male Allies Program                      | <i>"Teaching men to work with empowered women."</i> | Mandatory male ally training for all supervisors |
| Infrastructure  | 91% ill-fitting PPE                      | UK: mandatory female toilets                   | <i>"Sanitary items in first aid kits"</i>           | Comprehensive infrastructure standards           |
| Accountability  | Leadership commitment essential          | Procurement driving change                     | <i>"Would I want my daughter here?"</i>             | KPIs tied to executive performance               |

## Five Essential Elements for Achieving Gender Equity

Evidence from Stage 2 and 3 confirms five essential elements, to be implemented simultaneously, for achieving gender equity in plumbing:

| Success Factor  | Evidence from Programs  | Key Outcomes   |
|---|---|--|
| <b>1. Comprehensive Support Systems</b><br>Programs combining training, mentoring, and wraparound services consistently outperform training-only initiatives. | RAW GTO's holistic "life coaching" model<br>Chicago Women in Trades' wraparound support<br>Master Plumbers Victoria's field officer model, PPTEU & RAWGTO Women in Plumbing Program | 90.4% retention rate<br>181 women placed (2023)<br>20-fold increase in female applicants                       |
| <b>2. Policy Integration</b><br>Programs embedded in Enterprise Bargaining Agreements or procurement requirements achieve better outcomes.                    | PPTEU EBA Appendix H mandates<br>Victoria's Building Equality Policy<br>UK's zero-tolerance "carding system"  | Direct employment requirements<br>3% mandatory targets with penalties<br>Immediate site removal for harassment |
| <b>3. Industry Partnerships</b><br>Union-industry collaborations produce higher participation and completion rates.   | PPTEU/RAW GTO collaboration<br>Construction Industry Culture Taskforce<br>BHP/Rio Tinto/Fortescue joint programs  | Leveraged family networks<br>Government-industry alignment<br>Shared learning through colleges                 |
| <b>4. Extended Duration</b> Programs with 1-2 years follow-up support show significantly better retention.  | Canadian multi-year mentorship<br>NAWIC's five-module program<br>UK's decade-long transformation  | Sustained behavioural change<br>Ongoing reinforcement<br>5-10 year commitment required                         |
| <b>5. Peer Networks</b><br>Chapter-based models or cohort structures report higher satisfaction and career success.   | NAWIC's 13,500+ members<br>ETU's "Sparkettes" networks<br>Paired apprentice placements  | State chapter support<br>Peer connection points<br>"Dramatically improved outcomes"                            |

## Barriers requiring systemic response

Stage 2 & 3 research identified specific structural and cultural barriers that, if addressed, could accelerate transformation:

| Barrier Identified               | Impact                     | Proposed solution from the research |
|----------------------------------|----------------------------|-------------------------------------|
| Pregnancy during apprenticeships | Career disruption          | Flexible completion policies        |
| Multi-trade site dynamics        | Cross-trade harassment     | Industry-wide coordination          |
| Employer incentives removed      | Placement barriers         | Restore financial support           |
| Career progression barriers      | Women stuck in basic roles | Clear advancement pathways          |

## Critical Quotes from Stakeholder Interviews

**Cultural Barriers Persist** - *"60-70% of employers believe women are hired to meet quotas rather than for capability"*

**Leadership Litmus Test** - *"Would I want my daughter working in this space? If you're comfortable, then you've got a good business."*

**Realistic Timeframes** - *"If we get to 2030, I don't actually think we'll get equal representation, but if we move the dial, that'll be a bonus"*

## Research Reveals: An Evidence-Informed Roadmap for Industry Transformation.

This extensive examination of the literature revealed potential roadmaps for industry transformation. For example, based on Stage 2 and 3 findings, industry transformation requires phased implementation:

### Immediate Actions (1-3 years)

| Infrastructure                                     | Policy                                   | Support                                     |
|--|--|---|
| Appropriate amenities with menstruation facilities | Zero-tolerance policies with enforcement | Sanitary products in first aid kits on-site |
| PPE procurement in women's sizes                   | UK-style immediate removal system        | Emergency support                           |
| Facility upgrades (Queensland model)               | Flexible work for caregiving             | Crisis management protocols                 |

### Medium-Term Initiatives (3-5 years)

| Training                            | Culture                             | Recruitment                |
|-------------------------------------|-------------------------------------|----------------------------|
| Mentorship programs (RAW GTO model) | Male ally training (NAWIC 5-module) | Target Year 11-12 students |
| Pre-apprenticeship programs         | Culture assessment frameworks       | School partnerships        |
| Supervisor training mandatory       | Bystander intervention skills       | Alternative pathways       |

## Long Term Transformation (5+ years)

| Systemic Change           | Investment                | Research                  |
|---------------------------|---------------------------|---------------------------|
| 15% female target by 2030 | Sustained funding models  | Plumbing-specific studies |
| Procurement leverage      | Infrastructure investment | Longitudinal tracking     |
| Education pipeline K-12   | Support services scale-up | International exchange    |

## Project Deliverables: Evidence-informed recommendations

### Employer Framework

Establishing mandatory targets with leadership accountability has proven essential across various sectors.

| Component                | Good Practice Examples   | Recommendation examples   |
|--------------------------|--|---|
| Targets & Accountability | AFP: 41.3% women achieved<br>BHP: 40% female participation at South Flank with 67% injury reduction<br>Cooke & Dowsett: growth from zero to 91 women nationally through 5% annual growth targets | Set a 15% female apprentice target by 2030, matching Canada's ambition but adapted to Australian contexts, with executive KPIs tied to achievement. |
| Infrastructure Standards | Purpose-built facilities<br>Appropriate PPE systems<br>Dignity-focused amenities   | Mandatory compliance with audited standards   |
| Cultural Assessment      | Construction Culture Taskforce<br>SAGE/Athena Swan model<br>Regular climate surveys  | Annual assessment with external validation  |

## Training Program

Successful cultural transformation requires targeted interventions that address specific masculine workplace behaviours, with a particular emphasis on male ally development, practical workplace education about women's needs, and reframing masculinity through peer-led approaches.

| Component                             | Evidence from Contemporary Practice & Interviews   | Recommendation examples  |
|---------------------------------------|--|--|
| <b>Male Ally Development</b>          | NAWIC: 5-module program (Foundations of Inclusion, Breaking Bias, Allyship in Action, Driving Change, Leadership Impact)<br>Interview: "Teaching men to work alongside empowered women"<br>Interview: "You've got to get men involved" | Mandatory supervisor/all training with ongoing reinforcement through five structured modules                         |
| <b>Addressing Workplace Attitudes</b> | Interview: 60-70% believe women are hired for quotas<br>UK experience: "middle-aged males" are the most resistant<br>MATES model: reframing caring as masculine strength   | Challenge assumptions about women's capability through peer-led programs   |
| <b>Bystander Intervention</b>         | Safe from Hate Alliance's RISE training (Respect, Inclusion, Safety, Equity)<br>The UK's "carding system" for immediate accountability<br>Pacific Northwest Carpenters' Positive Jobsite Culture program                               | Provide concrete scripts and accountability mechanisms<br>Zero tolerance standards for poor behaviour and harassment |
| <b>Mental Health Support</b>          | MATES in Construction's three-tier structure<br>UK's Lighthouse Construction Charity model<br>Interview: link between hostile cultures and turnover  | Integrate mental health first aid and peer support systems   |
| <b>Practical Workplace Education</b>  | Interview: menstruation education and support<br>Interview: Pregnancy during the apprenticeship gap<br>Construction Culture Taskforce's OHS framing  | Frame as workplace safety and human dignity issues   |

## Awareness Campaign

Successful campaigns reframe the current or prevailing narrative.

| Strategy                         | Proven Approaches   | Key Messages   |
|----------------------------------|---|--|
| <b>Reframe the Narrative</b>     | ETU: "Nowhere to Go" human rights<br>MATES: Caring as strength<br>AFL: Normalisation through visibility | "Plumbing is a human's job"<br>Mental health is not gender based.<br>Emphasise its importance, the thread that keeps us all alive. |
| <b>Challenge the Perceptions</b> | Beyond the "dirty work" stereotype<br>Diverse career pathways<br>Technology and innovation              | Embrace the Clean energy future<br>New plumbing roles for women, e.g., project management.<br>Embrace it or lose.                  |
| <b>Celebrate the Successes</b>   | Industry awards<br>Media coverage<br>Females are prominent<br>Male champions are prominent              | We "plumbers" matter<br>Make excellence visible.<br>If she can, I can too.<br>My role is to help women, not hinder them.           |

## Spend: International Investment Benchmarks and Resource Requirements

| Country/Program | Investment                           |
|-----------------|--------------------------------------|
| Canada          | \$20 million Women in Skilled Trades |
| USA             | \$6 million annually (WANTO)         |