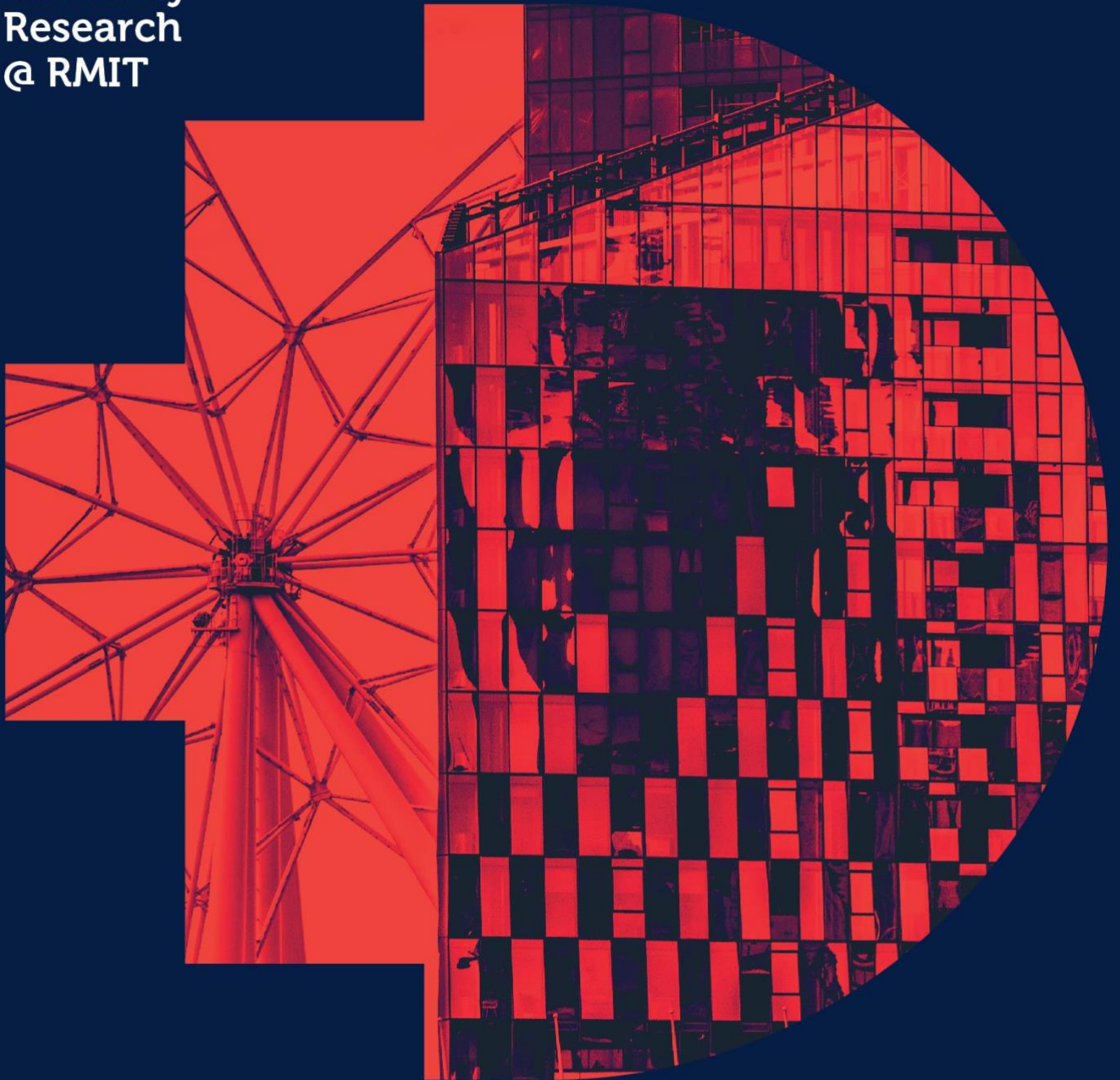


Construction  
Work Health  
and Safety  
Research  
@ RMIT



## Triple Wins: Work Hour Cultures for Health, Safety and Gender Equality in Construction

Literature Review

April 2021

Published by  
Construction Work Health and Safety Research @ RMIT

**Copyright © 2021 RMIT University**

Except external referenced documents and images

All rights reserved. Apart from any use permitted under the Copyright Act 1968 no part may be reproduced, stored in a retrieval system or transmitted by any means or process whatsoever without the prior written permission of the publisher.

This research was funded by the Construction Industry Leadership Forum.

**Authors**

Construction Work Health and Safety Research @ RMIT, RMIT University  
Helen Lingard, Andrew Nette, James Harley, Payam Pirzadeh, Jack Clarke

Research School of Population Health, College of Health and Medicine, Australian National University  
Amelia Yazidjoglou, Lyndall Strazdins, Ginny M Sargent



Australian  
National  
University



---

**About Construction Work Health and Safety Research @ RMIT**

Construction Work Health and Safety Research @ RMIT provides leading-edge, applied research to the construction and property industries. Our members are able to work with organisations to analyse health and safety (H&S) performance and identify opportunities for improvement. We can develop and evaluate innovative solutions, provide specialised H&S programs or undertake other research-based consulting activities. Our work addresses real-world H&S challenges and our strong international linkages provide a global perspective to our research.

Construction Work Health and Safety Research @ RMIT  
Building 8, Level 8, Reception  
360 Swanston Street  
Melbourne VIC 3000  
Phone: +61 3 9925 2230  
Fax: + 61 3 9925 1939  
Email: [constructionwhs@rmit.edu.au](mailto:constructionwhs@rmit.edu.au)  
[www.rmit.edu.au/research/health-safety-research](http://www.rmit.edu.au/research/health-safety-research)

---

# Triple Wins: Work Hour Cultures for Health, Safety and Gender Equality in Construction

Literature Review

---

## **Authors**

Construction Work Health and Safety Research @ RMIT, RMIT University  
Helen Lingard, Andrew Nette, James Harley, Payam Pirzadeh, Jack Clarke

Research School of Population Health, College of Health and Medicine, Australian National University  
Amelia Yazidjoglou, Lyndall Strazdins, Ginny M Sargent

## **Acknowledgements**

This research was funded by the Construction Industry Leadership Forum.



# Contents

<b>Executive summary</b>	<b>1</b>
<b>Chapter 1. Long work hours in the Australian construction industry</b>	<b>5</b>
Introduction	5
A review of the evidence	6
Structural determinants of working time in the construction industry	6
The prevailing industrial environment	8
Conclusion	10
<b>Chapter 2. The impact of long work hours</b>	<b>11</b>
Work hours, health and wellbeing	11
Work hours and gender inequality	14
The interaction between work hours, health and gender inequality	16
Work hours and productivity	17
Work hours and employment levels	18
Conclusion	19
<b>Chapter 3. Strategies for reducing or modifying work hours</b>	<b>20</b>
Regulatory strategies	20
Company and enterprise level strategies	23
Compressed work weeks	23
Reduced working hours - loss of remuneration	26
Reduced working hours - no loss of remuneration	28
Six-hour shifts – The introduction of a two-shift day	29
Free time options	31
Conclusion	39
<b>Chapter 4. Effectiveness of reducing or modifying work hours in the construction industry</b>	<b>40</b>
Introduction	40
Article screening	40
Results	41
Effectiveness in relation to wellbeing	43
Gender outcomes	43
Cost-benefit analysis	44
Conclusion	46
<b>Chapter 5. Support for work hour reduction in the construction industry</b>	<b>49</b>
Clients	49
Construction contracting organisations	52
Subcontractors	52
Workers	53
Unions	53

Conclusion	54
<b>Chapter 6. Discussion</b>	<b>55</b>
Work hours, health and gender	55
Working time interventions in construction	56
General strategies for reducing/modifying working time	57
Who bears the cost of working time reductions/modifications?	58
Lack of data on stakeholder viewpoints	59
Limitations	60
<b>References</b>	<b>61</b>
<b>Appendix 1. Methods</b>	<b>70</b>
Literature review	70
Inclusion and exclusion	70
Rapid review	70
Search strategy	70
Inclusion and exclusion criteria	71
Screening	71
Data extraction	71
Strategy for data synthesis	71
<b>Appendix 2. PRISMA diagram-rapid review</b>	<b>72</b>
<hr/>	
<b>List of figures</b>	
Figure 1: Categories of procurement strategy (adapted from NSW Government 2018)	7
Figure 2: Annual hours worked per person '000 (Data source: OEDC 2021)	17
Figure 3: GDP against hours worked per person, '000 (Data source: OEDC 2021)	18
<hr/>	
<b>List of tables</b>	
Table 1: Strategies for reducing work hours - trials from industries other than construction	33
Table 2: Interventions in the construction industry to reduce or redistribute work hours	47
Table 3: General strategies for reducing work time (advantages, disadvantages and comments)	57

# Executive summary

Construction is Australia's third-largest industry, employing over 1.1 million Australians (close to 10% of the working population) and contributing 7.2% of GDP annually. Through the design, development and delivery of essential infrastructure and buildings, the construction industry is vital to the long-term economic growth of the nation.

The industry faces significant problems which impact on its ability to sustainably and productively deliver the pipeline of work and attract and retain a healthy and well workforce. These problems include:

- **Work hours** in project-based construction work are notoriously long, particularly in large public infrastructure construction projects, which often work 'around the clock' to optimise the use of machinery. Australian research suggests an average of 63 hours worked per week by tradespersons and 56 hours per week by site officers and administrators. These hours exceed the maximum weekly threshold of 48 hours, established by the International Labour Organisation (ILO) over 90 years ago to protect workers' health.
- **Diversity**, particularly gender diversity, within the construction industry is low with only 12% female workers across all job roles in the sector. Research indicates that there are structural and cultural impediments to women's participation in the industry, including the above-mentioned work hours (particularly in project-based roles) providing a deterrent to women's participation and, indirectly, promotion within the industry. This is further compounded by expectations around presenteeism, total availability and geographical mobility conflicting with family and caring commitments often shouldered by women.
- **The health and wellbeing** of the construction industry workforce is impacted negatively by certain structural and cultural aspects of the industry. Working hours, contractual arrangements, adversarial behaviours and pressures around project milestone delivery all impact the health and wellbeing of the workforce. This is indicated by industry's suicide rates, attrition and worker turn over, increased levels of stress/burn out, as well as impacts on family relationships and children's perspectives on gender, jobs and wellbeing. Research shows that stress levels and suicide rates amongst construction workers are double the national average and provide a distressing impetus to pursue industry reform.

This literature review evaluates the available research that explores these industry-wide issues, details the outcomes of various industry interventions and signposts gaps in the knowledge and evidence where further research is needed. Although further research is required, this review puts forward the position that a triple win on these issues may be achieved through focusing on one element only: working hours.

Project-based work in the construction industry is characterised by long and inflexible hours. Working time in construction projects can, in part, be attributed to some of the industry's practices associated with the establishment of timelines, competitive tendering processes and risk allocation in construction contracts. The procurement methods, commercial frameworks and extension of time regimes adopted by clients can impact project cultures and create undue pressures to work long hours, whilst time performance risks accepted by principal contractors are typically transferred to subcontractors who may be less able to manage these risks.

In order to address long working hours in construction projects, working time practices need to be understood in the context of the construction industry's structural characteristics and commercial practices. Clients are in a strong position to lead the changes needed to improve the 'health' of the Australian construction industry, acknowledging that the prevailing industrial climate is also relevant, with unions being a critical stakeholder in the negotiation of working time arrangements in construction projects.

Long and inflexible hours of work have important implications for the health and wellbeing of workers, having been linked to heightened stress, burnout, depression and anxiety. Research has also established a direct link between long work hours and chronic diseases, such as cardiovascular disease and diabetes, and the risk of workplace injury also increases as work hours rise. Work hours in project-based construction workers are also linked to negative spill-over between work and family life (work-family conflict) which is also consistently linked to poor health outcomes.

The relationship between working time and health is gendered, as a result of inequality in the division of domestic labour. This means that women can work fewer hours than men before their mental health is negatively impacted. Long and inflexible work hours therefore act as a barrier to women's workforce participation in jobs in which these hours are the cultural norm.

It is noteworthy that, although the rapid review of the literature found many peer-reviewed articles that focus on the risks of working long and inflexible hours, only a very limited number included an evaluation of a working time reduction/modification intervention that was implemented in a construction project setting. Many of these studies are now outdated and only consider a narrow range of outcome variables, typically focusing only on compressed work weeks as a working time modification strategy. Notably, although compressed work weeks appear to have a positive impact on project-based construction workers' balance between work and non-work lives, impacts in relation to physical or mental health and gender diversity are not reported.

The published case studies of work week compression indicate that waged and salaried workers have different preferences for work hour reductions and working time arrangements. Waged workers expressed concerns about loss of income under some of the working time models implemented in which salaried workers' income remained unaffected. Given the limited amount of available data on the impact of working time modifications in the construction industry, it is critical that future studies utilise robust experimental designs and evaluation strategies that capture a broader range of outcome variables.

However, there is increasing support for a reduction of the working hours in the Australian construction industry, as demonstrated by the growing number of sites that are trialling and adopting alternative working hour strategies, as well as the commissioning of this review. Examples are emerging of client-led interventions placing upper limits on hours worked during project delivery. These interventions are often driven by fatigue management programs. Concerns about mental health and wellbeing have also led a number of construction companies to implement a five-day (Monday to Friday) work week in some of their projects. Anecdotal evidence suggests this is favourably received by both waged and salaried workers. Importantly, the option to introduce a five-day week has been recently formalised with signed enterprise agreements between construction unions and a number of principal contracting organisations in New South Wales. However, the acceptance of reduced or modified work hours hinges upon impacts on remuneration. The gendered nature of the relationship between working time and health also raises questions about the viability of long work hours (albeit in compressed work week form) for women with substantial caring responsibilities.



The industry's adherence to long and rigid hours of work is likely to reinforce traditional gender roles in the household. Female partners are more likely than male partners to scale back their involvement in paid work and absorb the largest share of the domestic/household workload. This perpetuates salary inequity and the gap between women's and men's retirement savings accrued through superannuation contributions. The persistence of long work hours can therefore be seen as a source of structural economic disadvantage for women over time.

To date, very limited research has been published regarding working time reduction or modification interventions in the construction industry. The few published intervention studies that are available share some common characteristics: they were all undertaken in the construction industry in Queensland, in civil engineering projects that were being delivered as project alliances. This means that the findings from these intervention-studies cannot be generalised to the construction industry as a whole.

These studies also revealed that waged workers were supportive of modified work hours only to the extent that their income was not impacted. Workers repeatedly mentioned their dissatisfaction and concerns regarding the loss of income as a result of not working on weekends and thereby missing out on weekend penalty pay rates. Although waged workers experienced improvements in their health, this was considerably less than their salaried counterparts (who experienced no change in remuneration). Where construction projects changed to a five-day week without extending the working days (thereby impacting the pay of workers paid an hourly wage), the interventions were not supported. This highlights the tension in attempting to identify a single solution, or a solution that will be acceptable to the majority of waged and salaried workers. The specific costs and benefits of different approaches must always be considered when designing alternative working time regimes.

This review also outlines a broad range of working time reduction/modification interventions that have been implemented and evaluated outside of the construction industry. Table 3 summarises the advantages and disadvantages of six working time reduction/modification strategies. Generally speaking, each of these strategies produced benefits relating to improvements in health, wellbeing and reductions in work-family conflict. Although all workers express a clear desire to be able to combine work and family responsibilities, loss of pay/overtime is a concern for most male workers (who currently assume a main breadwinner role) while long work hours remain a barrier to women. It is critical that the preferences of female and male workers are understood and considered in the design of work time reduction/modification interventions.

As such, this review highlights the critical importance of undertaking a rigorous analysis of the costs and benefits associated with working time reductions or modifications, in order to fully understand the impacts and success of these strategies. The question of who pays for working time reductions and the potential benefits/trade-offs of alternative working time strategies have not been comprehensively examined. We therefore propose that more in-depth and comprehensive research is required before firm conclusions can be drawn about the financial viability of the various models of working time reduction/modification in the construction context.

Finally, this literature review found very few publicly available studies of industry or workers' viewpoints about working hours, beyond a few recent reports in the mainstream media. Many key perspectives are therefore yet to be investigated, particularly in relation to client, subcontractor and union viewpoints. This information is urgently needed as the success of a work hour reduction strategy will ultimately hinge upon understanding and addressing the concerns and barriers specific to each group. Furthermore, if gender inequality is to be addressed in the industry, both men and

women must be represented and given a voice in this research. Workers in different age brackets and life stages, as well as young people considering entry into the industry, should also be canvassed.

In summary, there is consistent evidence that the construction industry bears significant costs from long, inflexible work hours. The consequent lack of diversity, poor mental health and work-family conflict impair workforce sustainability, adding to skills shortages and increasing turnover. Long work hours exclude those with caring responsibilities, a key factor in women's underrepresentation in the construction industry. As a result, long work hours limit financial performance, hamper corporate social responsibility and innovation and fuel a high-pressure and high-conflict culture within workplaces, thereby impacting upon the cost and deliverability of projects in Australia. This issue requires collaboration and engagement from all stakeholders – including clients, contractors, supply chain members and union representatives – to resolve.

Further research and exploration of the impacts of mitigations are needed to test the success of a work hour reduction strategy, but available research suggests that such an intervention has the potential to be a triple win, in that reforming industry working hour culture will aid in addressing issues with industry diversity, health and wellbeing and the balance between the work and non-work lives of the workforce.

# Chapter 1. Long work hours in the Australian construction industry

## Introduction

The construction industry is Australia's third largest industry employing 9% of the overall workforce (AI Group). Work hours in project-based construction work are notoriously long (Lingard et al. 2010a), particularly in large public infrastructure construction projects which often work 'around the clock' to optimise the use of machinery (Persson et al. 2006; Tüchsen et al. 2005). Australian research suggests an average of 63 hours worked per week by tradespersons and 56 hours per week by site officers and administrators (Lingard & Francis 2004). These hours exceed the maximum weekly threshold of 48 hours, established by the International Labour Organisation (ILO) to protect workers' health over 90 years ago.

To accommodate such long hours, workers in the construction industry distribute their work time over non-standard or unsocial hours that include early mornings, evening, night, and weekend work, with many workers having little autonomy over how long or when they work. These long work hours are, in part, driven by clients' expectations for timelines and deadlines which can contribute to a workplace culture in which long hours are viewed as normal or inevitable.

The impact of long work hours is compounded by commute times in cities, and the 'always on' work-life bleed driven by 24/7 technology which, in particular, affects professional and managerial workers. For example, Bowen and Zhang (2020) report that work pressure experienced by construction professionals negatively spills over to the family domain through after-hours work-related contact, which then leads to work-to-family conflict. In turn, this work-family conflict contributes to psychological distress, sleep problems and alcohol consumption (Bowen & Zhang 2020).

There is consistent evidence that the construction industry bears significant costs from long, inflexible work hours. The consequent lack of diversity, poor mental health, and work-family conflict impair workforce sustainability, adding to skills shortages and increasing turnover. Long work hours exclude those with care responsibilities, a key factor in women's underrepresentation in the construction industry. Long work hours, therefore, limit financial performance, hamper corporate social responsibility and innovation, and fuel a high pressure and high conflict culture within workplaces (Campbell & Mínguez-Vera 2008; Díaz-García et al. 2013; Loosemore & Galea 2008; Sunindijo & Kamardeen 2017; Tijani et al. 2020).

Improving health, wellbeing and gender diversity in the construction industry has become a policy priority, fuelling interest in work hour reduction options and alternative ways of scheduling work. Further, because health is a major component of productivity, one rationale for reducing hours is that this will increase labour productivity through enhancing health and improving worker general wellbeing and satisfaction with work.

This report summarises the findings of a review of the literature requested by the Construction Industry Culture Taskforce (CICT) to support the development of a Culture Standard focused on improving the sustainability and performance of the Australian construction industry.

## A review of the evidence

This review focuses on implications of long work hours and the potential or realised benefits associated with reducing or modifying work hours. While the focus of the Culture Standard is the construction industry, the review includes information and evidence from work hour modifications in other industry contexts, as well as information pertaining to the construction industry.

This review seeks to summarise:

- the industry context, including the structural determinants of long hours of work and the industrial environment within which working time arrangements are negotiated in the construction industry
- the impacts of long work hours on critical industry outcomes including health, gender diversity, productivity and employment
- strategies that have been used to modify or reduce work hours in industries other than construction, including evidence as to the impacts of these strategies
- strategies that have been used to modify or reduce work hours in the construction industry, including evidence as to the impacts of these strategies, and
- consideration of stakeholder interests and preferences for changing working time practices in project-based construction work.

Importantly, the review highlights what is currently known about the impacts of and opportunities to reduce long work hours, as well as critical gaps in the extant literature. These knowledge gaps are substantial and directions for future research are identified in the concluding section of this review.

## Structural determinants of working time in the construction industry

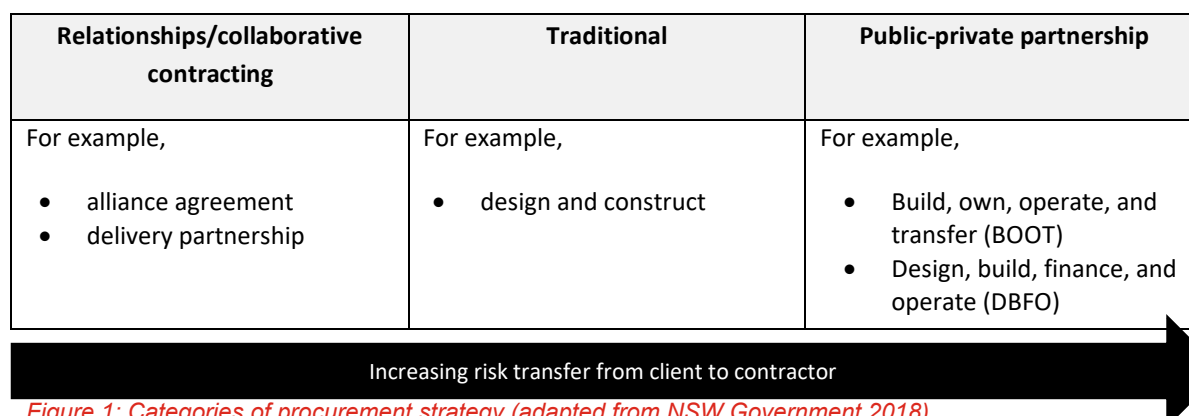
Long and inflexible hours of work in construction projects can be, in part, attributed to the industry's structural characteristics.

Construction projects are delivered through temporary coalitions of organisations working interdependently to achieve project outcomes, while also managing their individual business interests (Berggren et al. 2001). In construction projects, time performance (i.e. completion of work to a pre-determined timeline) is considered an essential determinant of success (Serrador & Turner 2015). Soderlund (2005) argues that project deadlines are a “fundamental organisational rationale for project organising” (p. 381) and project management teams play a role in setting the pace of work, changing the time orientations of workers to respond to project milestones, and monitoring the ‘rhythms’ of the project to identify and resolve activities that may be out of step with requirements.

Clients initiate projects and make key decisions concerning project budgets, timelines, objectives, and performance criteria. Clients also establish the commercial arrangements through which construction projects are procured and project team members are selected. The procurement methods, commercial frameworks and contracting strategies adopted by clients can impact project cultures and exacerbate work time pressures. Naoum and Egbu (2015) also argue that adherence to traditional procurement methods and ‘lump sum’ payment arrangements has stifled innovation and prohibited performance improvement in construction projects.

Project delivery models vary in the extent to which risk is transferred from the client to the contractor (Figure 1 illustrates this as a continuum). Risk allocation in commercial contracts was recently

identified as the largest area of concern among industry stakeholders when considering factors that impact the health of the Australian construction industry (Sharkey et al. 2020).



*Figure 1: Categories of procurement strategy (adapted from NSW Government 2018)*

One key element of project risk relates to the ability to meet project timelines. This was borne out in a recent analysis of sources of mental ill-health in the Australian construction industry, in which industry leaders observed construction project timelines established by clients can sometimes be unrealistic, yet substantial financial penalties are applied to construction organisations if these timelines are not met. Industry leaders also described an inherent ‘optimism bias’, in which construction organisations assume that projects will run smoothly in all instances, exposing them to considerable financial risk if unexpected delays occur (Lingard and Harley 2020). When unexpected project events threaten time-related goal attainment, workers experience this as stressful (Gällstedt 2003). Limited time resources impact project workers’ wellbeing (Nordqvist et al. 2004) and create psychological distress (Zika-Viktorsson et al. 2006). Unexpected delays can also contribute to an intensification of work, increase required work pace and have a damaging impact on workers’ health (Persson et al. 2006; Tüchsen et al. 2005).

Many factors beyond the control of construction organisations can impact time performance in construction projects (for example unforeseen ground conditions, unplanned work arising from utility relocations or third-party interfaces, unexpected changes to the law, etc.). Yet, in an intensely competitive environment, constructors may not fully price all risks related to potential delays. Coupled with tight timelines and substantial penalties for time over-runs, this substantially increases the pressure experienced by project-based workers to work longer, non-standard hours.

These time pressures are then transferred (through a hierarchical system of subcontracting) to a multitude of subcontractors engaged by the principal contractor in the project. Soderlund (2005) acknowledges that the work of project managers involves putting pressure on project participants to ensure timelines are met, which can create the feeling that project-based work is “constantly under time pressure” (p. 384). The payment of subcontractors (based on the amount of work done) means that they are likely to push themselves harder and work excessive hours to ensure work is completed per the project schedule (Mayhew et al. 1997; McDermott & Hayes 2018). Further, contractor work hours within the industry are subject to little or no regulation, thus there is effectively no upper limit. Therefore, the ability of project-based workers to manage work-life balance and satisfactorily meet demands at home and work is substantially impacted by project schedule demands that can dramatically increase required work quantity and pace at critical pressure points in a project lifecycle (Lingard et al. 2010a).

Attempts to reduce working time or modify working time practices need to be understood in the context of the construction industry’s structural characteristics and commercial practices. Industry

policy documents have addressed these issues and called for change. Industry and government representatives, in recognition that current work practices are not sustainable, have called for industry-wide reform. For example, a recent policy document developed by the UK Government states that: “Ensuring that risks are owned or jointly owned by the party or parties best able to manage and bear them is key to delivering value for money and successful outcomes with the private sector” (p. 47). This document also establishes ‘fair return’ as a fundamental principle of commercial relationships on the basis that a sustainable market requires that contracts are profitable for suppliers (Cabinet Office 2020).

In Australia, there have also been calls for change. In a 2020 seminar delivered to the Construction Law Society of Australia, Owen Hayford suggested that time obligations in contracts should be softened where possible and/or commercial arrangements should provide entitlements to extra money and extra time for risks that contractors are unlikely to fully price in a competitive tendering environment. Hayford argues that it is possible to incentivise project time performance without imposing onerous time obligations and extension of time regimes in construction contracts (Hayford 2020).

Clients, and particularly government clients, have been identified as the parties best positioned to lead changes needed to improve the ‘health’ of the Australian construction industry (Sharkey et al. 2020). Importantly, when clients have considerable construction volume, they are in a stronger position to initiate major improvements in supply networks than when they engage in single one-off projects (Vrijhoef & Koskela 2000).

Public sector procurement practices are influenced by a variety of social and economic policy considerations. There is a need to ensure publicly funded construction projects provide value for money while satisfying a range of desired project outcomes (Walker & Lloyd-Walker 2016). Key result areas (objectives) established for projects typically include cost, time, and satisfaction, as well as other areas of environmental and social performance. Within this policy context, workforce health and sustainable work practices are important considerations that are undoubtedly impacted by the industry’s prevailing culture of long working hours (see Chapter 2). It is noteworthy that some industry leaders have recommended that construction project programs be ‘stress-tested’ during tendering processes to ensure that projects can reasonably be delivered within specified timelines without adverse impacts (Lingard & Harley 2019).

## **The prevailing industrial environment**

Berg et al., (2014) observes that establishing new working-time norms is a long-term social process that requires the intervention of different industry stakeholders, including trade unions and employers. The role of collective bargaining and the industrial relations context is an important determinant of the practicability and implementation of reduced working hours (Seifert & Trinczek 2000; Bosch & Lehndorff 2001; Van Wanrooy & Wilson 2006; Dembe 2011; Brettschneider 2014; Ahlstrand 2015; Dixon et al. 2019).

Berg et al. (2014) identify and analyse three categories of industrial climate within which working time practices are determined:

- unilateral - characterised by employer control over working time
- negotiated - within which negotiations between employers and employee representatives shape working time, and
- mandated - characterised by the role of the state in regulating working time.

In the Australia working time is not regulated by the state. Rather, working time practices are typically negotiated between trade unions and employers via the enterprise bargaining process.

In the Australian construction industry rostered days off (RDOs) entitlements have been a key feature of enterprise bargaining agreements (EBAs). The frequency and flexibility of these RDOs varies by state and territory, and can also vary between EBAs entered into by individual companies.

EBAs established in the construction industry reflect varying degrees of flexibility and acceptance of working time trade-offs. During the recent round of enterprise bargaining that occurred in the construction industry of New South Wales, unions pursued the adoption of a calendar that would provide workers with a nine-day fortnight (Marin-Guzman 2020).

It was reported that some employer organisations negotiated modifications to this calendar, for example, altering the frequency of RDOs from every second Monday to one per month (Marin-Guzman 2020).

However, in an agreement with construction company Roberts Pizzarotti (Now Roberts Co), the union reportedly agreed to suspend its RDO calendar for projects working a five-day week. Other companies were also reported to have negotiated exemptions for existing projects that operate under fully flexible schedules and new projects that would work a five-day week (Marin-Guzman 2020).

These changes represent a significant development in the collective negotiation of working time arrangements in the construction industry of New South Wales, opening the door to the introduction of a five-day week (Monday to Friday) in certain projects.

Several New South Wales-based construction companies have also chosen to enter into non-union agreements that provide employers with greater flexibility to schedule project-based work. Some commentators and industry stakeholders have suggested the entry by (generally smaller) construction organisations into non-union agreements has the potential to reduce the competitiveness of very large companies with union agreements (Marin-Guzman 2020).

Thus, there is the potential that working time practices in the construction industry will become more variable, depending upon locally negotiated practices at a project level. In this context, the rigorous evaluation of the impacts, costs, and benefits of work hour reduction measures is extremely important.

Another important question relates to whether collectively negotiated working time practices produce better outcomes for workers' health and wellbeing and gender diversity than informally or individually negotiated practices (Berg et al. 2014).

At the time of writing, it was reported that the Construction, Forestry, Maritime, Mining and Energy Union (CFMMEU) had finalised EBA negotiations for workers, “across the majority of the NSW construction industry” (Mirage 2021). The result of this is that CFMMEU members working at construction sites being delivered by many large construction companies will receive a variety of entitlements, including the option to work a five-day week at some projects.

## **Conclusion**

Project-based work in the construction industry is characterised by long and inflexible hours. Working time in construction projects can, in part, be attributed to some of the industry’s practices associated with the establishment of timelines, competitive tendering processes and risk allocation in construction contracts. The procurement methods, commercial frameworks and extension of time regimes adopted by clients can impact project cultures and create undue pressures to work long hours. Time performance risks accepted by principal contractors are typically transferred to subcontractors who may be less able to manage these risks.

It is recognised that, in order to address long working hours in construction projects, working time practices need to be understood in the context of the construction industry’s structural characteristics and commercial practices. Clients have been identified as being in a strong position to lead the changes needed to improve the ‘health’ of the Australian construction industry. The prevailing industrial climate is also relevant, with unions being a critical stakeholder in the negotiation of working time arrangements in construction projects.

The next chapter of this review will look at the impacts of long and inflexible work hours, focussing on the health and wellbeing of workers and gender diversity in the workforce.



## Chapter 2. The impact of long work hours

This chapter provides a summary of the evidence regarding the impacts of long work hours on various aspects of workforce sustainability and productivity. In particular, it focuses on the central components of the CICT Culture Standard, i.e., workers' health and wellbeing and gender diversity.

### Work hours, health and wellbeing

Long hours of work have important implications for the balance between work and non-work life, health and well-being (Charlesworth et al. 2011; Fagan & Walthery 2011). In the construction industry, long work hours and overtime work have been linked to stress at work and at home, fatigue, disrupted sleep, insufficient recovery opportunity and productivity losses in project-based construction work (Beswick et al. 2007; Goldenhar et al. 2003; Alvanchi et al. 2012).

Long work hours are also associated with heightened stress, burnout, and poor mental health. International studies have linked long work hours to poor mental health, depression and anxiety (Artazcoz et al. 2009; Bannai & Tamakoshi 2014; Dinh et al. 2017a). Factors such as long, inflexible, and unsocial hours and poor job security are associated with suicide rates in the construction industry (Milner et al. 2017). Currently, suicide rates in the Australian construction industry stand at 40.3 suicides per 100,000 people, more than double the national rate (Amagasa et al. 2005, Heller et al. 2007). 190 construction workers take their own lives in Australia every year – one death by suicide every second day and construction workers are reported to be six times more likely to die from suicide than an accident at work (Mates in Construction 2020). Despite the growing burden of mental illness in the construction industry, physical safety remains the dominant priority on site and there are calls to redress this imbalance (Galea et al. 2018).

Work-life conflict is one of the greatest health concerns plaguing the construction industry (Tijani et al. 2020). Long hours, in combination with inflexible work durations are substantial contributing factors to work-family conflict and an imbalance between work and non-work life (Turner et al. 2009). A recent report undertaken on behalf of the Chartered Institute of Building (UK) revealed that construction industry workers are worse off than workers in other industries in terms of experiencing:

- poor work-life balance
- high workload
- excessive travel time
- technology overload, and
- unrealistic deadlines (Cattell et al. 2017).

Work-family conflict is strongly and consistently linked to psychological distress, depression, anxiety, sleep problems, and negative attitudes towards mental health in international samples of construction industry workers (Bowen et al. 2018, Kotera et al. 2019). In the Australian construction industry, work-family conflict is associated with a variety of poor health outcomes such as stress, anxiety, and burnout, and has also been linked to substance abuse and/or misuse and marital dissatisfaction (Lingard et al. 2010b; Tijani et al. 2020).

Work-family conflict not only negatively affects workers' health but extends to their families and their children (Dinh et al. 2017a). Children whose fathers work long hours report less closeness with their fathers, and wish for more enjoyable times with their fathers, altering family relationships, and shaping children's views about gender, jobs, and wellbeing (Strazdins et al. 2017). Any assessment of the health cost of long work hours therefore needs to consider the impacts on family members, in addition to those experienced directly by construction workers.

Multiple studies have also demonstrated the direct link between long work hours and chronic diseases, such as cardiovascular disease, diabetes, and depression (van der Hulst 2003; Artazcoz et al. 2009). Furthermore, the risk of occupational injury increases as work hours rise due to fatigue and burnout (Dembe et al. 2005; Kecklund 2005; Dong 2005).

Injury rates increase from 2.03 per 100 workers for those working less than 20 hours per week to 3.71 for 50-60 hours and 4.34 for greater than 100 hours per week (Lombardi et al. 2010). An American study demonstrated the construction workers that exceeded eight hours per day of work were 1.57 (95% CI 1.56-1.58) times more likely to be injured than working 7-8 hours (Dong 2005).

Health-related impacts of long hours are attributed to:

- (i) less time to recover from work
- (ii) longer exposure to work-related hazards and
- (iii) interference with time spent in non-work activities (Caruso 2006).

However, the relationship between work hours and health is not simple and linear. Up to a certain point, paid work hours are conducive to good health. Employment not only provides income required for health and wellbeing but provides the opportunity for regular social interactions and the creation of shared experiences with people outside the family (Productivity Commission 2019). However, once work hours become excessive or long and this threshold is exceeded, both physical and mental health can be negatively impacted. There are only 24 hours each day, so the ability to work long hours shifts time away from care, sleep, exercise, healthy eating, and this is where many of the social, psychological, and physical impacts arise. Long work hours therefore reduce time allocated to health and restrict participation in beneficial health behaviours. Long work hours are one of the biggest barriers to healthy eating and physical activity and contribute to time scarcity (Venn & Strazdins 2017). Devine et al. (2007) report that work demands, time, fatigue, and stress interfere with family meals and healthy food choices in a sample of construction labourers. The experience of negative spillover between work and family life was associated with lower consumption of fruit and vegetables. In the Australian construction context, Lingard and Turner (2015) report that time scarcity impeded healthy eating and physical exercise among project-based workers, even in the context of an organisational health promotion program focused on improving diet and exercise.

It is also important to note that working hard involves more than working long hours (see also Burke et al. 2010; Strazdins et al. 2011). Adam (1995) identifies the *tempo* and *timing* of work as facets of working time which, in addition to the number of hours worked, have the potential to impact health and wellbeing. The tempo of work refers to the number of activities to be conducted within a specific timeframe and is sometimes referred to as work pace or intensity. The timing of work reflects when work is scheduled. The extent to which the timing of work is compatible with the timing of other life activities, e.g., family routines, is particularly relevant to health and wellbeing (Tammelin 2018).

Both tempo and timing of work have been linked to workers' health experiences. For example, increases in work pace associated with lean production processes have been linked to psychosocial risk factors at work (Koukoulaki 2014). Work speed and quantity of work have also been linked to symptoms of depression in bricklayers and construction supervisors – i.e., foremen, leading hands

(Boschman et al. 2013). In addition, workers' wellbeing is reported to be negatively impacted if work is scheduled at times that do not fit well with workers' family commitments and personal preferences (Golden et al. 2011). Importantly, Kristensen et al. (2004) observe interdependencies between work time, tempo and timing, such that a heavy workload coupled with tight deadlines can create pressures to work faster, as well as a need to work longer or non-standard hours.

A final facet of work time that has the potential to impact health and wellbeing is the degree to which workers have control over their working time. Härmä (2006) argues that control over work quantity, schedule, pace of work and when rest breaks can be taken are important determinants of wellbeing. This is also empirically supported by research that shows that the extent that overtime negatively impacts wellbeing, sleep and depressive symptoms depends on whether workers have control over their working hours or schedule (Beckers et al. 2008; Takahashi et al. 2011).

In a 2019 study, Brauner et al. outline a taxonomy for the design of sustainable work schedules by considering working time demands (the amount of physical and mental excursion required) in relation to working time control (an individual's autonomy over the duration/timing of their work). By analysing data from the 2015 BAuA-Working Time Survey of the Federal Institute for Occupational Safety and Health in Germany, Brauner et al. identified six different classes of work schedules:

1. **Flexible extended:** typically represented by business administration professionals and production/specialised services managers, this class did not work shifts but had a high probability of occasionally working on weekends and working overtime, (high working time demands/high working time control).
2. **Extended shift:** typically represented by health associate professionals, metal, machinery, and related trade workers, as well as stationary plant and machine operators, this class had the highest probability of shift work and working overtime, (high working time demands/low working time control).
3. **Rigid standard:** typically represented by business administration professionals, teaching professionals and numerical/material recording clerks, this class had the lowest probabilities of overlong working hours, frequent change in working hours and control over the beginning/end of work days, (low working time demands/low working time control).
4. **Flexible standard:** typically represented by administration professionals, and science and engineering professionals, this class had the lowest probability of working on weekends and were very likely to have control over the beginning/end of work days and taking hours off, (low working time demands/high working time control).
5. **Rigid all-week:** typically represented by health associate professionals, metal, machinery, and related trade workers, as well as stationary plant and machine operators, this class had the highest probability of working on weekends and were unlikely to have control over the beginning/end of work days and taking hours off, (high working time demands/low working time control).
6. **Rigid extended:** typically represented by teaching professionals, drivers, mobile plant operators, and health associate professionals, this class did not work shifts, but were likely to work overtime and on weekends, (high working time demands/low working time control) (Brauner et al. 2019).

Brauner et al. note that workers with schedules that allowed for high working time control perceived increased health benefits. Of these six classes, 'extended shift', 'rigid all-week' and 'rigid extended' are all characterised by high demand and low control, and can thus be considered as high-strain risk groups (Brauner et al. 2019). Workers in these three risk groups reported the worst health results, as well as the lowest satisfaction regarding balance between work and non-work lives (Brauner et al. 2019). These results emphasise the need for urgent reforms in the construction industry, as a large percentage of the construction workforce's schedules currently align with one of these three risk group classes.

## Work hours and gender inequality

Long and inflexible hours of work act as an impediment to women's workforce participation and women's under-representation in the construction industry is often attributed to the industry's prevailing working time practices (Sunindijo & Kamardeen 2017; Francis 2017; Rosa & Hon 2017; Bryce et al. 2019). Rigid working time practices, particularly in project-based roles have been identified as a source of indirect gender discrimination in construction organisations (Dainty & Lingard 2006).

In a systematic review of the academic literature exploring women's recruitment and retention in male-dominated skilled trades, including construction, Bridges et al. (2020) note that long work hours and challenges inherent in balancing work and family commitments is a major barrier to women's workforce participation.

While expectations of presenteeism, total availability, geographical mobility and very long work hours can negatively impact the health and wellbeing of both male and female workers, Galea et al. (2016) argue that women are more acutely affected because they carry the greatest share of caring responsibilities within families. Galea et al. (2016) also describe construction project work cultures in which employees who arrive late, are perceived to be leaving early or who refuse to take work home if they cannot complete it within their standard work-day, are subjected to verbal and behavioural shaming and sanctioning.

This appears to be a global problem. In the UK, a study of female civil engineers reported a dominant masculine culture of long working hours in which being available for work at all times was expected and acted as a significant barrier to women's participation (Watts 2009). Within this culture, working long hours and being visibly present in the workplace was seen as a proxy indicator of commitment and job performance. Importantly, because women are significantly under-represented in construction workplaces, they tended to adopt similar work styles to their male colleagues.

The negative impact of working time practices on gender equality in the construction industry is acknowledged in policy documents and industry initiatives. For example, The *Victorian Women in Construction Strategy 2019-2022: Building Gender Equity* (Department of Premier and Cabinet 2019) identifies rigid workplace practices and the expectation to work excessive hours as a major barrier to women entering and staying in construction jobs.

However, gender equity initiatives implemented in the construction industry sometimes produce disappointing results. One of the main reasons for this is that these initiatives are undermined by inconsistent application, poor implementation and mixed messaging on the part of the companies concerned (Galea et al. 2016). They also target women in a vacuum, with no attention paid to the broader context of how masculine cultures operates on-site. Sunindijo and Kamardeen (2017) argue

that changes to the dominant long hours work culture are unlikely to be successful unless they are part of a collective effort by the entire industry.

Galea et al. (2015) analyses gender equity initiatives in two large Australian construction firms and found that simply focusing on increasing the number of women employed in an organisation is not enough. Instead, underlying values, norms and ways of working need to be challenged. Galea et al. (2015) note a significant mismatch between core company values and gender equality policies, where “inherent gendered norms and practices, such as long work hours, sit in conflict with attempts to support more flexible work hours that promote healthy lifestyles and support women and men with caring duties in the workplace” (Galea et al. 2015 p. 386). Policies and perceptions that emphasise gender inequality as a ‘women’s issue’ further reduced the opportunity to change existing practices, whilst those policies that focussed heavily on increasing the participation of women in construction risked being seen as irrelevant to the male powerbase or being relegated to the status of a lower organisational priority.

Even when companies have policies in place to support workers with family or caring responsibilities, the utilisation of these policies is sometimes difficult, particularly when users are concerned about the implications for their career development or job security (Lingard & Francis 2009). This includes the perception that the person taking advantage of the flexible working time initiatives lack commitment or ambition. De Speigelaere and Piasna (2017) describe how women who take advantage of part time or reduced working hour initiatives are sometimes treated differently to other workers, i.e., given reduced responsibilities or marginalised in terms of their roles with significant career implications.

Watts (2009) argues that employees, particularly women, ignore the stigma around taking reduced working hours at their peril. Rejecting the culture of working long hours, she writes is “risk-laden at both the personal and professional level, with job security increasingly an issue in professional and non-professional occupations” (p. 41), whilst the perceived requirement to be time-flexible and available to stay late in the office or travel (interstate or abroad) at short notice creates stress.

A number of other barriers can stand in the way of women taking advantage of reduced working hour initiatives. Lingard et al., (2012) argue that “workers who are already putting in very long hours have restricted ‘degrees of freedom’ to rearrange their work schedules to provide a better ‘fit’ between work and personal life” (p. 292).

Hallberg’s concept of “synchronous leisure” references the need for workplace strategies to synchronise working time with the different schedules of family carers, especially in the context of dual earner couples with dependent care responsibilities (Hallberg 2003). When one or both carers are engaged in atypical work schedules that cause involuntary desynchronizations, juggling caring responsibilities is particularly challenging (Brown et al. 2011). In a study of dual earner couples in which one partner at least worked in the construction industry Lingard and Francis (2008) describe how adaptive strategies used by couples to cope with long, inflexible work hours are highly gendered. In the majority of these cases, it is the female domestic partner who reduces their involvement in paid work.

A recent report into the uptake of the two interventions outlined in the Strategy (women's wellbeing and communities of practice) also shows much of the research in the construction industry has focused on women in professional and managerial roles, with limited research in the trades and semi-skilled roles (Holdsworth et al. 2020). In detailing several recommendations, the report notes that interventions to address gender inequality will only occur if they are:

- (i) genuinely supported at Board and senior management levels
- (ii) targeted at implementing change across the entire construction industry ecosystem, and
- (iii) monitored, reported and audited (Holdsworth et al. 2020).

## **The interaction between work hours, health and gender inequality**

The relationship between long work hours, gender inequality and health is complex as the impact of long work hours on health is highly gendered. This was illustrated in research in which the extra time required to undertake care and household management activities was accounted for. This study considered the way this extra time combined with work hours to influence workers' health (Dinh et al. 2017b).

The study used a large representative sample of employed Australians: men, women, young, middle-aged, and older. Averaging over every person in the labour market the researchers found that working at least some hours was good for people. Mental health improved because jobs deliver a sense of identity, security, status, and inclusion, as well as income. But this was to a point - 39 hours a week – and after that mental health started to deteriorate.

Importantly, the average 39 hours tipping point for health hid a large gender difference. For women, the tipping point was 34 hours per week, but men could work up to 47 hours a week before they experienced any detriment to their mental health. This is a 13-hour difference in weekly work hours. It means an Australian man can, every week, average 13 hours longer on his job than a woman can before he starts to trade-off his mental health. The reason for this is that, for most men, long work hours are not combined with care and domestic work hours. If men who work long hours try to increase their share of the care, their mental health goes down. If women try to move from part-time or low hour jobs to long hour jobs, but still do domestic and care work, their mental health goes down. Women's lower tipping point is entirely due to the unpaid time spent on care. Within families, long work hours create a gendered system of who has a job and who has time for care. This undermines workforce gender diversity, while also putting pressure on family relationships, including those with children (Strazdins et al. 2017).

The research also showed that if no one spends time on care or domestic work, or if workers do not have a family, then both men and women are able to work long hours before this affects their health (the tipping points for both men and women are close to the ILO's 48 hours). Effectively this means that long hours force people to make either-or decisions about work or family, and this is one reason why they are such a powerful driver of gender inequality, especially in the construction industry (Bryce et al. 2019; Galea, et al. 2018).

It is important to note that the ILO's definition of 48 hours as the safe limit up to which people should work was set when the labour market was almost entirely male (ILO 2019). Consequently, this work time threshold did not include the essential time needed every day, to cook, clean and care for children, run errands, or manage a household.

No nation has yet defined a safe work hour standard that includes this extra time which, in a gender equal labour market, needs to be re-examined. The research described above shows that, if women try to add on long full-time hours to their extra time (or we expect men to add more care time onto long hours) then major health impacts are likely, however, most research on work hours and health does not consider this extra time and the implications this time has for gender equality and/or health.

## Work hours and productivity

Productivity broadly refers to the amount of work produced per unit of time. Labour productivity is the amount produced per person. Capital productivity is the productivity of machines or buildings, linked to operating times (and shifts). Work hours are integral to understanding both of these forms of productivity, which can also combine to deliver productivity gains.

One rationale for reducing hours is that it might increase labour productivity through its impact on better health and morale. Health is a major component of productivity. Fatigue can increase rates of injury (Swaen et al. 2003) and absence (Gingerich et al. 2018), and stress and fatigue affect cognitive and interpersonal functions such as planning, problem solving, teamwork, and creativity (Zhang et al. 2015). However, reducing work hours can also produce some negative impacts on productivity, due to increased management and administrative burdens arising from greater numbers of workers working fewer hours. Also, it is possible that, if people are paid less for working time reductions, they may become less motivated (De Spiegelaere & Piasna 2017).

Data from the OECD (2021) indicates that, at least for those countries for which data are available, the majority of people are working fewer hours in 2019 than they did in 1990 (Figure 2).

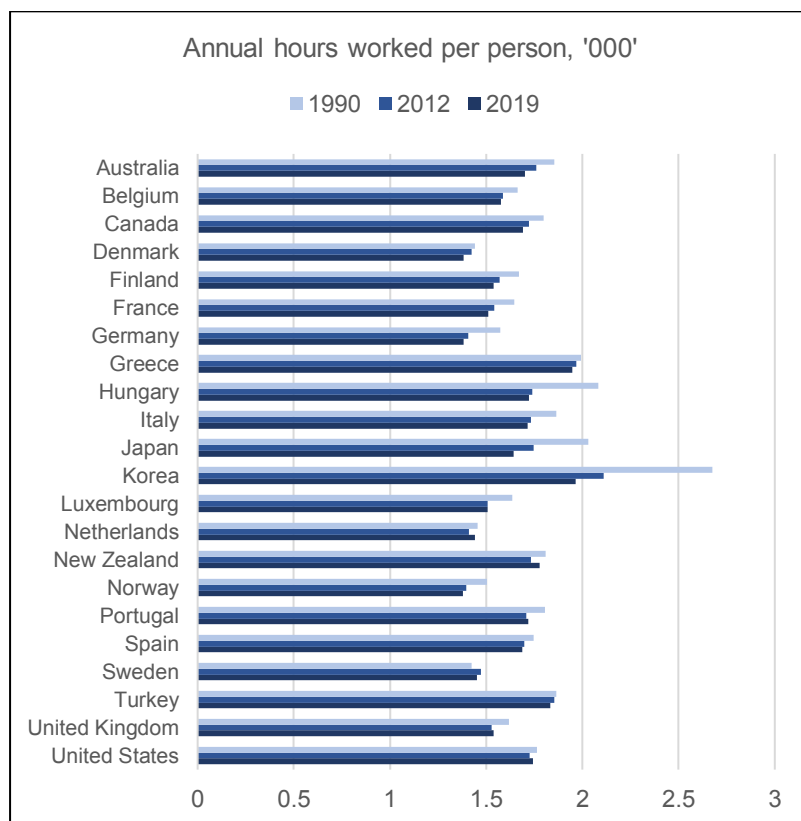
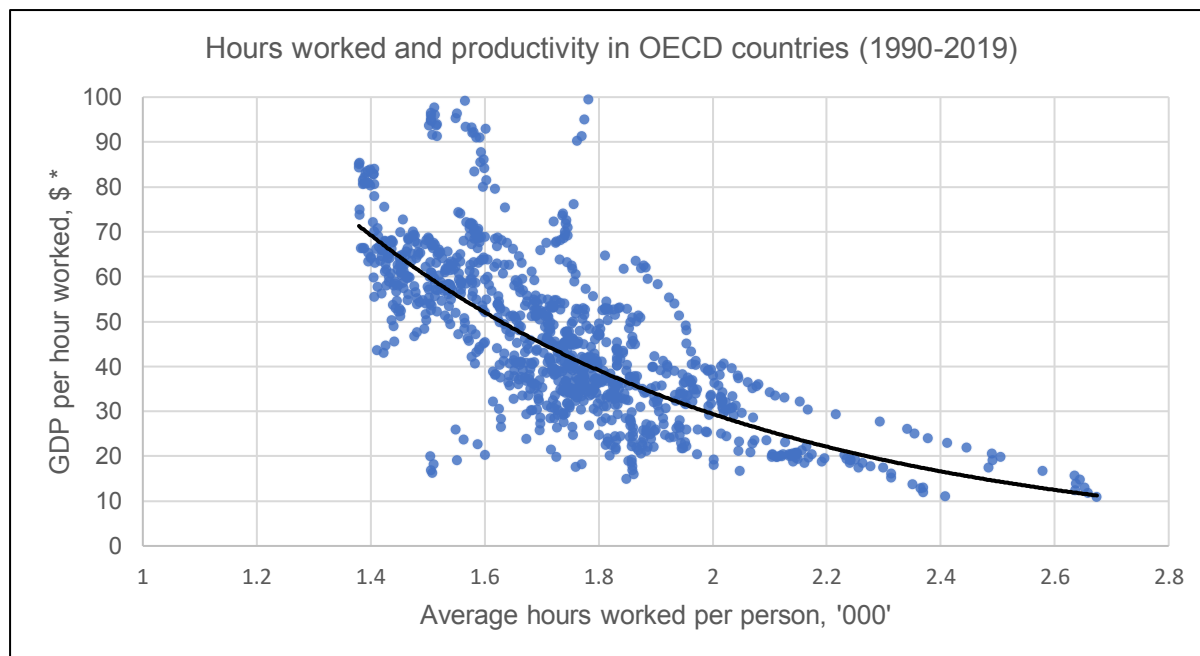


Figure 2: Annual hours worked per person '000 (Data source: OEDC 2021)

Figure 3 shows the GDP per hour worked compared to the average annual hours worked in OECD countries between 1990 and 2019. The data show substantially higher GDP per hour in those countries in which people work, on average, 2,000 hours or less each year. Although this aggregated data does not reflect the experiences of specific industry sectors, it does provide evidence of an economy-level inverse relationship between work hours and productivity.



\* 2015 purchasing-power parity

Figure 3: GDP against hours worked per person, '000 (Data source: OEDC 2021)

## Work hours and employment levels

It has been argued that reducing hours has the potential to create, maintain and redistribute employment (De Spiegelaere & Piasna 2017). The premise is that if the number of hours worked per worker is reduced, then another worker will be required to compensate for this loss. Potentially, both employees and employers would benefit from such an arrangement in that more employees gain employment and retain an income whilst employers potentially avoid hiring and firing costs and retain worker experience and skills (Spencer 2020). However, although this may be sound in theory, the reality is more complex.

Bosch and Lehndorff (2001) identify an array of conditions that will support the creation of employment via reduced working time. Firstly, time reductions and related wage compensation need to be decided simultaneously to prevent increases in wage costs. Secondly, work time needs to be reorganised (for example, operation hours could be extended) to enable productivity growth. Thirdly, reductions should not be too rigid, allowing for the consideration of individual circumstances. Fourthly, a flexible labour market with a sufficient supply of unemployed skilled workers ensures that there is not a corresponding labour supply shortage and finally, social contributions (e.g., government top ups or subsidies) should be proportional to wages.



Other constraints to be considered include:

1. Fixed labour costs: the financial burden associated with hiring new employees such as recruitment costs, training, and work resources are likely to increase for employers.
2. Imperfect substitution: staff recruited to compensate for the reduction of hours may not possess the required skills and experience for the position, negatively impacting productivity and the health of the company.
3. Division of tasks: not all job tasks or job positions can be easily divided or shared, thus one employee may be required to undertake more work in less time (De Spiegelaere & Piasna 2017).

Despite the challenges associated with job creation via reduced work hours, there is evidence to suggest its success in response to a recession or economic downturn, which may be particularly relevant in the wake of the COVID-19 pandemic (Cahuc & Carcillo 2011). For example, in Germany the Kurzarbeit scheme, in which wage compensation was provided by the government, was credited with keeping unemployment levels stable and speeding up economic recovery during and in the aftermath of the 2007-08 financial crisis (Spencer 2020).

## Conclusion

Long and inflexible hours of work have important implications for health and wellbeing, having been linked to heightened stress, burnout, poor mental health, depression and anxiety. Work hours in project-based construction workers are also linked to negative spill-over between work and family life (work-family conflict) which is also consistently linked to poor health outcomes. Research has also demonstrated the direct link between long work hours and chronic diseases, such as cardiovascular disease and diabetes, whilst the risk of workplace injury also increases as work hours rise.

The relationship between working time and health is gendered, as a result of inequality in the division of domestic labour. This means that women can work fewer hours than men before their mental health is negatively impacted. Long and inflexible work hours therefore act as a barrier to women's workforce participation in jobs in which these hours are the cultural norm.

## Chapter 3. Strategies for reducing or modifying work hours

The mounting evidence demonstrating the negative effects of long work hours and weekend work has strengthened interest in work time reduction strategies and alternative ways of scheduling work.

However, before describing the various strategies and approaches to reducing or modifying work hours it is necessary to consider what constitutes true work hour reduction. Work hour reduction describes an absolute decline in the total number of hours worked. However, many approaches, such as compressed work weeks or the introduction of flexitime, may not reduce work hours. Rather, they often redistribute time spent at work. Although the days worked may be reduced under compressed work week arrangements, the total weekly hours of work often remain constant. The same is true for schemes focused on flexibility. Employees may be able to alter their start and finish times based on their needs, but they are still required to fulfil their total weekly hours. While strategies for reducing work hours may also include compression of the work week or flexitime, the distinction between work hour reductions and work hour redistribution is important and has potential implications for the effectiveness of these strategies in improving gender diversity, health and wellbeing.

This chapter provides a summary of strategies that have been used to reduce or modify working hours in industries other than construction and presents evidence as to the impact of these strategies. The impact measures include indicators of health and wellbeing, such as stress, diet and sleep habits, balance between work and non-work life and work or general life satisfaction. This chapter begins by describing strategies implemented at national and intergovernmental levels before considering strategies implemented at an organisational or industry level. Where available, gender comparisons or gender diversity impacts are presented. However, it is important to note that many studies are limited in terms of the outcome measures considered.

### Regulatory strategies

Schneider (2018) draws attention to the important role government can play in working time reductions on a national or supranational level. In particular, Europe has an extensive history of working time reductions. Initial efforts in the 1950s which continued until the late 1970s saw waves of statutory and collectively agreed working time reductions in several Western European countries (Bosch & Lehdorff 2001; Lehdorff 2007). More recently in November 2003, the European Parliament and Council issued Directive 2003/88/EC, more commonly known as the Working Time Directive. The Working Time Directive required member states to impose national legislation to limit work weeks to a maximum 48 hours, including overtime (Hayden 2006). Countries were provided with flexibility in how they would enact the Working Time Directive to take into consideration pre-existing national legislation and regulation, occupational characteristics, and individual preferences. In 2008, major revisions to the Working Time Directive were made amid strong criticism regarding the flexibility of provisions. In particular, debates regarding the effect of the Working Time Directive have focused on:

- whether the resulting working time reductions negatively impacted the costs and competitiveness of business, with some employers arguing that requirements to reduce working hours would act as a brake on growth, and
- whether the requirements produced an overall reduction of working time or whether they simply increased overtime and the intensity of work (Bosch & Lehendorff 2001).

The most well-known example of a national effort to curb long work hours occurred in France. In 1982, the French government introduced a 39-hour working week with an additional fifth paid week of vacation. Building on this, the working threshold was further reduced in 1998 to 35-hours per week, however, the enactment of the legislation was staggered such that it came into effect in 2000 for large firms but 2002 for organisations with fewer than 20 employees (De Spiegelaere & Piasna 2017).

Employees experienced no cut to wages, although there was a corresponding wage freeze for the 18-month period following the working time reduction. Through the legislation, the government sought to reduce unemployment (then standing at around 12%); maintain and enhance companies' economic performance; and improve employees' quality of life (Hayden 2006). The state supported the transition to a shorter working week by providing significant tax cuts to firms applying the reduction (Askenazy 2013).

It was determined that between 350,000 and 500,000 jobs were created in response to this legislation. However, many argue that it was, in fact, the greater flexibility facilitated by the legislation and tax cuts that were responsible for creation of employment (De Spiegelaere & Piasna 2017). In addition to the creation of jobs, an increase in older persons' employment was observed, which tentatively suggests that the shorter weeks enable employees to stay active in the labour market for longer. Part-time work was also diminished, particularly for women, thereby improving gender equality since the extensive use of part-time arrangements by women is seen as a substantial barrier to gender equality.

The impact of the legislation on the balance between work and non-work life was mixed. Although some workers reported improvements in life balance, satisfaction with the work hour reduction was higher among workers with higher levels of skill and social standing (Hayden 2006). Other workers reported experiencing reduced control over their work hours, work intensification and the expectation of working non-standard hours (De Spiegelaere & Piasna 2017). De Spiegelaere and Piasna (2017) also note that successive French governments have subsequently undermined the 35-hour week in various ways, increasing the average working week to 40 hours for some employees.

While the French experience demonstrates the efficacy of working hour reduction strategies at the national level, it also highlights the vulnerability of these schemes to political pressure and government prioritisation. Understanding working time regulation in the broader political context in which these types of strategies are situated is therefore important.

A number of European governments, in particular Greece, Germany and the Netherlands, have focused on workers' rights to part-time work and leave. The most significant state sanctioned focus on redistributing working time has been observed in the Netherlands in which approximately 47% of all employees are in part time employment (De Spiegelaere & Piasna 2017, p. 19). The increase in part-time employment in the Netherlands has lowered the average weekly working hours below 30, the lowest in the European Union (De Spiegelaere & Piasna 2017).

The prevalence of part time employment in the Netherlands was encouraged by Dutch labour policies, which sought to improve the position of part time workers by removing hours-related thresholds for entitlements to the minimum wage and holiday allowance, and prohibiting discrimination between employees based on working hours, thus guaranteeing equal treatment in terms of wages, holiday pay, bonuses, training and other entitlements (De Spiegelaere & Piasna 2017).

Furthermore, workers in the Netherlands are entitled to request an alteration in working hours with the onus on employers to justify their position in the case of refusal. The Dutch 'part time economy' demonstrates that the widespread re-distribution of work can be achieved through regulatory means. However, the adoption of part-time work is highly gendered. Although men in the Netherlands tend to be in part time work more than is the case in other EU countries, more than 70 per cent of all part time jobs are occupied by women (De Spiegelaere & Piasna 2017). Some commentators argue that the higher uptake of part-time work among women results in lower incomes and poorer career prospects for women, thereby devaluing women's position in the labour market.

Vissar (2002) argues that the provision of good quality part time jobs, that are commensurate with full-time work in terms of earnings, job security and career development opportunities are critical to encouraging more men to take up part time work options. This is seen as necessary in order to overcome inequalities associated with a 'one-and-a-half-earner' employment model, in which men continue to work full time while women choose part time options in order to manage care and domestic work.

As the nature of work evolves, work hour reduction strategies must also adapt to address the challenges linked to technology. Technological advancements enabling 24-hour connectivity, further contribute to the complexity surrounding work hours. Technologies such as smartphones, remote conferencing, and email have eroded once definitive boundaries between work and life domains and fuelled discreet and unpaid overtime away from the workplace. This blurring of the boundaries between work and non-work life has become particularly evident during the COVID-19 pandemic in which there has been a widespread and rapid shift to home-based teleworking.

This shift was not anticipated and, therefore, the ability to plan for this change to work arrangements was limited. Bouziri et al. (2020) suggest that, as a result, important health and safety considerations have not been implemented. Further, because the shift to working at home has been involuntary and continued over an extended period, the potential for negative impacts in relation to working time patterns and work-family conflict increased (Caligiuri et al. 2020). Hallin (2020) notes that the distinction between work and family time, as well as weekdays and weekend work became less clear for Swedish teleworkers in the COVID-19 pandemic. In France, Recchi et al. (2020), who analysed longitudinal panel data, reported high levels of stress among those who indicated they were working long hours during a period of enforced lockdown.

To address the impact of technology on work hours and unpaid overtime, the French government legislated a 'right to disconnect' in 2017. Under the French labour code, companies with more than 50 workers have to draw up a charter setting out the hours during which staff are not obliged to send or action emails and receive or return work-related calls (De Spiegelaere & Piasna 2017). The law does not mandate specific procedures that should be enacted but requires that parties enter negotiations with respective unions to produce agreements protecting employees' right to disconnect (Brin 2019).

Other European countries are considering similar legislation. Most recently, the EU Parliament announced that it will increase efforts to protect employees "fundamental right to disconnect from work and not be reachable outside work hours" (Butt 2021). Noting that teleworking, especially during

the COVID 19 pandemic, has blurred the distinction between work and private life, the European Commission is proposing regulation that would “establish minimum requirements for remote working and clarify working conditions, hours and rest periods” (Butt 2021). Canada has also adopted similar legislation (Ornstein 2019).

In Australia, the notion of a right to disconnect is also gaining momentum. In 2021, the Police Association of Victoria successfully negotiated the right to disconnect for their workers (Ziffer 2021). As a result, Victoria Police managers are now prohibited from contacting staff outside of work hours, unless in an emergency or to check on their welfare (Ziffer 2021). In light of Victoria Police’s success, other Australian unions are likely to pursue the same rights for the workers they represent.

## **Company and enterprise level strategies**

At an organisational or enterprise level, a variety of models have been adopted with the aim of reducing or modifying work hours. This section describes a number of the work time reduction schemes and alternative work schedules that have been trialled in industries other than construction. Relevant case studies and/or trials are summarised in Table 1.

Broadly, the working time reduction/modification models implemented at an organisational or enterprise level include the following:

1. reducing the work week e.g., compressed work week such as reducing working week from five to four days
2. reducing daily work hours e.g., reducing shifts from eight to six hours
3. reducing the work month e.g., rescheduling the month such that three weeks of six-day weeks are worked followed by a week off, and
4. reducing the work year e.g., introducing additional free time such as annual leave.

These models are discussed below.

## **Compressed work weeks**

Compressed work weeks have become a popular organisational strategy to mitigate the negative impacts of long work weeks. Compressed work week schedules redistribute rather than reduce hours, such that the length of the workday is increased but the number of days worked per week is decreased. Thus, the compressed work week departs from a standard eight-hour working day, traditionally favoured by trade unions, although a cap may still be applied to the number of hours worked each week. In the European Union, for example, work hours would be capped at 48 per week according to the EU Working Time Directive (Bambra et al. 2008).

Compressed work weeks can take different forms. Bambra et al. (2008) identify three popular forms as follows:

- 12-hour compressed work week, which involves four 12-hour shifts (day, night) over four days with three or four days off
- 10-hour compressed work week, which involves four 10-hour shifts followed by three days off, and
- the Ottawa system, which involves three or four 10-hour morning or afternoon shifts spread over four days, then two days off. This is then followed by a block of seven eight-hour nights, then six days off (Bambra et al. 2008).

Compressed work weeks have been favoured in industries that involve shift work, such as health and policing, but have also been adopted in the manufacturing and energy industries (Bambra et al. 2008). Bambra et al. (2008) undertook a systematic review of intervention studies evaluating the impact of a compressed work week in a variety of industrial contexts, including healthcare, policing, manufacturing, mining and energy. In this review they did not differentiate between the different model of compressed work week adopted. The findings revealed mixed results in terms of self-reported health. In some instances, health and health-related behaviour were reported to improve, but in other instances no changes were found. Bambra et al. (2008) conclude that compressed work weeks do not appear to be detrimental to self-reported health in the short term and could, in fact, be beneficial.

Participants' balance between their work and non-work life was reported to improve as a result of the compressed work week in the majority of studies reviewed. Organisational outcomes, such as morale, job satisfaction, productivity and quality were reported to improve in some studies and other indicators of organisational performance largely remained unchanged. Importantly, Bambra et al. (2008) conclude that employee health and balance between work and non-work may be improved through the introduction of a compressed work week without damaging organisational productivity and competitiveness.

In 2021, a notably large-scale compressed work week trial is set to be undertaken in Spain, where a pilot program for a four-day, 32-hour work week is currently being developed (Farzan 2021). If implemented, this pilot program will be the largest compressed work week trial to be undertaken anywhere in the world (Farzan 2021). Although support for a four-day work week was already gaining momentum before 2020 (Farzan 2021), large-scale efforts such as this demonstrate that the COVID-19 pandemic has made compressed work week strategies appear more viable to many governments and industries.

For the purpose of this review, three case studies were identified that adopted compressed work weeks, two relating to blue-collar workers and one relating to white-collar workers (see Table 1 for a summary of these studies).

The first case study occurred in 1990 in a collection of Western Canadian mining operations. Workers at the mine sites originally worked seven eight-hour day shifts with two days off, seven eight-hour night shifts with three days off or seven afternoon shifts with two days off. These eight-hour shifts were rotated with allowance for a few holidays and weekends. Workers at the mine site were unhappy with the eight-hour shift rotation schedule. This was indicated by safety problems, higher turnover, lower morale and higher absenteeism among these workers. In response, an experimental group of workers' schedules were altered to four 12-hour shifts followed by four days off, rotating night and day. Eight months after the intervention, results from health assessments were mixed. Participants' responses to a survey indicated the extended shift schedule had a positive effect on absenteeism,

morale, health problems, stress, eating habits, family life, and sleep quantity and quality. However, it is noteworthy that, although reported by the majority of participants, these benefits were not reported by all participants.

With the exception of one task, behavioural performance (measured using tracking, grammatical reasoning, choice reaction time and tapping tasks) remained largely unchanged by the 12-hour shifts. Workers did, however, report greater sleep difficulties after night shifts and more minor aches and pains as the work week went on (Duchon et al. 1994). Diary responses also indicated that the 12-hour shift workers experienced fewer wake episodes and higher sleep quality than did the eight-hour shift workers, although this may be attributed to the fact that those working a 12-hour shift slept in accommodation provided at the mine sites. Measures of behavioural and physiological performance indicative of fatigue indicated changes in performance across the 12-hour shift to be comparable with those observed in an eight-hour shift control group suggesting that the extended workdays schedule was not associated with significantly increased fatigue effects. Duchon et al. (1997) suggest this is because workers effectively self-regulated their work pace when working the 12-hour shifts.

The second case study involved two Canadian mines, one with a typical mining five-day shift schedule, with weekends off, and the other with a four-day week with 12-hour days followed by four days off with alternating day or night shift blocks. Prior to the implementation of the 12-hour shift schedule, the second mine operated a five-day schedule which involved five dayshifts, one day off, five afternoon shifts, two days off, then five nightshifts, and two days off (Cunningham 1989). It is not clear if the schedule change was accompanied by any changes in remuneration. Cunningham (1989) explains that, in a post-intervention evaluation, workers at the mine working the compressed work week reported mixed results leading to no significant differences in sleep, tiredness, family satisfaction or satisfaction with work. In addition, no negative effect on workers' general health (measured by respiratory function, reaction time, vigilance, auditory functioning, and blood pressure) was identified. However, compared to workers working at the mine with a standard (i.e., not compressed) schedule, there was a significant decrease in the rate of accidents and absenteeism following the introduction of the compressed work week. Importantly, though, there had been an unusually high rate of accidents and sickness absence immediately before the work schedule was changed and, therefore the magnitude of the positive effect on accidents and sickness absence may be inflated as a result. Productivity outcomes were also measured at both mine sites, however, no clear changes in productivity were reported.

The last case study concerns white-collar professional workers in the Utah State Government. In 2009, Utah State Government altered work schedules such that 17,000 staff worked four ten-hour shifts per week with Friday off, while remuneration remained constant. Although the purpose of the intervention was to reduce overhead costs and conserve energy rather than improve wellbeing for employees, it was reported that staff experienced fewer work-home conflicts than before the change was implemented (Stronge et al. 2019). The government reverted to a traditional nine-to-five week in 2011 after a failure to reduce costs and an increase in public complaints regarding lack of service availability on Fridays. However, some large cities have continued to implement the four-day workweek and have reported improved employee morale and cost savings, suggesting that the altered schedule might be more effective when implemented at a local level (Stronge et al. 2019).

## Reduced working hours - loss of remuneration

In some instances, work hour reductions for people who are paid by the hour have been accompanied by a commensurate reduction in pay.

In 1993, Volkswagen (Germany) introduced a scheme to reduce the work hours of all workers (blue- and white-collar) as a measure to avoid mass redundancies during an economic downturn. Weekly hours were reduced from 36 to 28.5 with a corresponding equivalent loss of income equating to a 20% decrease in wages. In order to offset the significant financial impact for workers, the union (I G Metall) successfully negotiated that the hourly wage of workers would increase by one per cent with the addition of holiday pay and an annual bonus. However, even with these modifications, workers' annual wage would still drop by 16% (which was less than the 20% loss that would have been commensurate with the original reduced work hours) (De Spiegelaere & Piasna 2017).

While productivity was found to increase because of the work hour reduction scheme, the proportions of men and women in the workforce remained stable following the change. Women represented 13% of all employees at Volkswagen. No significant change was reported in workers' participation in domestic work following the work hour reductions, with 43% of women and 37% of men reporting spending their free time undertaking family and housework (Seifert & Trinczek 2000).

Volkswagen workers' health and wellbeing reportedly deteriorated following the working time reduction (De Spiegelaere & Piasna 2017). Seifert and Trinczek (2000) observed high levels of stress were reported by 75% of Volkswagen workers after the work schedule change, with a greater prevalence of stress among white-collar workers. A larger proportion (37%) of white-collar workers indicated they were dissatisfied with the change in work hours when compared to blue-collar workers (12%). As a consequence of the reduced work week, alternate scheduling was also necessary to maintain productivity at Volkswagen. At one point, 150 different work schedules were implemented (Seifert & Trinczek 2000).

This diversity in schedules negatively impacted workers' social wellbeing as they found themselves 'out of sync' with friends and family and unable to socialise. The extent of the social discordance was so great that some reports emerged of an increase in divorce rates among Volkswagen workers, although this is based on anecdotal evidence. Alternately, some workers found that they had greater time to spend socialising, although this group was in the minority (De Spiegelaere & Piasna 2017).

According to De Spiegelaere and Piasna (2017, p. 74), while Volkswagen and I G Metall succeeded in significantly reducing working time in exchange for job security, the costs associated with the avoidance of mass lay-offs were mainly borne by the workforce. It has also been noted that subsequent collective agreements have shifted the focus from the preservation of employment to greater flexibility (Seifert & Trinczek 2000). This has resulted in workers losing a number of benefits. For example, working hours were annualised, with a "time bank" system in place to save up accumulated overtime, and, most controversially, newly recruited workers were employed on a temporary basis with less favourable conditions than other workers. As such, a 'two-tier' wage and benefits system was introduced (De Spiegelaere & Piasna 2017, p. 74). In 1999, the 28.8-hour week was abolished altogether, but in 2006 the company returned to a 33-hour week for blue-collar workers and a 34-hour week for white-collar staff.



De Spiegelaere and Piasna's (2017) evaluation of Volkswagen's experiment with a shorter working week points to some of the complexities involved in introducing reduced working time initiatives. Productivity increased but at the cost of the introduction of a two-tier labour force, with newly hired workers experiencing less favourable employment conditions. Work intensification was also observed to occur, especially for white-collar employees, among whom there was greater dissatisfaction with the reduced work time arrangements than was found among the blue-collar workforce (De Spiegelaere & Piasna 2017, p. 75). The analysis of De Spiegelaere and Piasna (2017) also includes an assessment of some of the factors that made such a radical reduction in working hours possible at Volkswagen, including:

- the prevailing industrial relations culture, which emphasised a consensual approach between management and the workforce
- Volkswagen's workforce being already highly paid, which contributed to workers being prepared to accept a wage cut
- workers having a very specific skill set, which was hard and costly to replace
- management having a predisposition to negotiating alternative arrangements rather than shedding staff, and
- a pre-existing embedded culture of reduced work hours in Germany (De Spiegelaere & Piasna 2017, p. 74).

Another example of a work hour reduction with a reduction in remuneration can be found at the Swedish truck manufacturer, Scania, in response to the global economic crisis of 2008-10. Scania's management adapted to economic pressures resulting from the downturn by signing what has been referred to as a "crisis agreement" with its mainly blue-collar union (I F Metall) (Ahlstrand 2015, p. 457).

This agreement established a 4-day work week at 90% of original wages. This wage cut was offset by management guaranteeing that there would be no job losses during the period covered by the agreement. A subsequent agreement reached in December 2009, stipulated that workers would work four days for a five-day week wage (i.e. no wage reductions), along with a continuation of the commitment not to lay off any workers during the agreement period. Ahlstrand (2015) notes these two agreements were combined with investment in training and skill development for all blue-collar workers. Scania's handling of the economic downturn, was different from other Swedish companies whose agreements did not include investment in skills development or guarantees on job security (Ahlstrand 2015, p. 458).

Ahlstrand (2015) argues that Scania's approach during the economic crisis needs to be viewed within the context of the country's culture of cooperative labour relations. In particular, he stresses it was part of a model of collective bargaining that incorporates measures to boost productivity, referred to as "integrative bargaining" as opposed to a focus on "distributive bargaining" (p. 460). Thus, the company's decision to reduce working hours was accompanied by education and training, as well as a suite of productivity measures that focused on workers' participation in continuous performance improvement at Scania. Ahlstrand (2015) also notes that examples of cooperation between workers and employers in modifying employment conditions to cope with economic downturns can be found in other European countries.

## Reduced working hours - no loss of remuneration

In some instances, work hour reductions have been implemented without any reduction in remuneration. Under these arrangements total work hours are reduced but wages are maintained, such that the worker does not incur any financial loss. The costs to business of this strategy are higher, although these costs may be offset by productivity increases and, in some instances, government incentives or subsidies.

Among the arguments for a reduced working week without a reduction in wages (advanced by Ashford & Kallis 2013, p. 53) is that this strategy has the potential to increase jobs and employment, even when the economy is not growing.

Fewer hours worked may lead to less production per person, but, as Ashford and Kallis (2013) note, it can also reduce workers' fatigue and provide workers with more free time for leisure and improve workers work-life balance. In addition, the environmental benefits of this approach in terms of reduced environmentally harmful activities and carbon emissions have been cited. Furthermore, reduced work hours can enable a more efficient planning of the workday/week (i.e. reducing time spent on "hanging out" in the workplace) and allowing more time invested in training (Ashford & Kallis 2013). It is argued that, in achieving these outcomes, the reduction in work hours without commensurate reduction in pay can contribute to improved productivity.

However, as Kallis et al., (2013) point out, the effects depend on a number of factors, including the way that workers use their free time (e.g., for resting or in environmentally friendly ways), and the way in which work hour reduction would be implemented in different industries, occupation groups, or firms of different sizes. For example, if a work hour reduction strategy can be only implemented in highly regulated sectors, workers in other sectors may lose as a result and the strategy will not provide economic benefits.

One example of a reduction in work hours with no loss of pay occurred at a New Zealand firm that manages company trusts, Perpetual Guardian, in early 2018 (Graham-McLay 2018). The initiative involved the introduction of a four-day work week, reducing work hours from 37.5 to 30 per week. All other employment conditions, including pay levels, remained unchanged during this six-week trial.

In an assessment of the initiative, Jarrod (2018) notes that employees at the firm reported feeling more engaged and empowered and more satisfied with their life, health and leisure under the new arrangements. Workers at Perpetual Guardian also reported experiencing an increased level of collaboration and teamwork, lower stress levels, and improved work-life balance, with 78% of staff reporting that they were able to balance work and home commitments (compared to 54% before the change of work hours). Employees also found new ways to improve productivity while they were in the office, including reducing the length of meetings and improving concentration in the workplace (Graham-McLay 2018).

However, Jarrod (2018) did note some issues regarding work intensification and stress from having to complete tasks in a shorter amount of time. Additional "teething issues" were also reported, relating to the accessibility of absent staff and difficulties in coordinating work activities due to misaligned work schedules and slower response times to work requests. Notwithstanding these challenges, the four-day week without loss of pay became permanent policy at Perpetual Guardian in October 2018 (Venuto 2018).

## Six-hour shifts – The introduction of a two-shift day

Another approach to working time reduction is to introduce a six-hour working day in two shifts or what Peltola (1998, p. 739) refers to as a “6+6 working time model”.

De Spiegelaere and Piasna (2017) state that the 6+6 system is designed to introduce a general two-shift day: one morning shift, a six-hour shift starting at eight a.m. and finishing at two p.m. with the second shift beginning at two p.m. and ending at eight p.m., in a 30-hour week. A different team would work in each six-hour shift. The flexibility of this schedule can also allow for the crossing over of shifts to accommodate busy periods as well as staggered shift times (Peltola 1998).

The 6+6 shift model was originally proposed as a way to reconcile workers' preference for shorter working hours, employers' desire for more flexibility, and consumers' demands for longer service hours (Peltola 1998). The model is not a part-time or work sharing scheme, and is in contrast with ordinary approaches that simply cut the working week or working year without any significant re-organisation of work (Peltola 1998).

Peltola (1998) explains that, in 1995, a series of experiments was implemented by the Ministry of Labour in Finland to encourage 6+6 working time schemes in private enterprises and public services. The experiments were part of a job rotation model and a subsidised part-time program introduced by the government. In these Finnish studies, the 6+6 initiative was trialled on a temporary basis mainly in public sector municipal bodies and some private companies in the manufacturing sector. Peltola (1998) lists several benefits identified in these trials, including:

1. Shifts can vary in terms of start and finish times and, if necessary, overlap.
2. Service hours can be lengthened, having the benefit of reducing working time without sacrificing competitiveness.
3. It is well suited to certain industrial environments, although the focus of this was on childcare and health services rather than industries such as construction.
4. Increased employment, depending on whether the second shift is recruited, partly or wholly from within the existing business.
5. Increased time for leisure and family commitments experienced by workers.
6. It can be applied selectively across an enterprise. Only areas which are considered to benefit from the system need apply it.

One of these experiments was conducted in the health and social service sector across 17 municipalities in Finland. The initiative, called *Flexibility Through Six-Hours Shifts*, was financed by the European Social Fund (ESF) initiative. Under this initiative, workers could voluntarily reduce their regular eight hours shift to six hours. Remuneration for reduced hours was negotiated at the local level within each municipality with an average of 7% income loss from the 20-25% loss in hours. However, some staff experienced no loss of income (Anttila et al. 2005).

The ESF experimental group was compared to workers in the same industries who were working either a standard schedule or workers who were utilising other work hour reduction models (e.g., day or weeks off). According to Anttila et al. (2005), there was a significant decline in work-family conflict for the six-hour group compared to controls ( $p=0.01$ ) and other work hour reduction models ( $p=0.02$ ), driven mainly by a decrease in work overload.

The experiment found that smaller daily reductions in working time, rather than larger reductions, such as whole days off, were the most beneficial for alleviating work-family conflict. Participants reported increased time spent with family and time for relaxation, self-care, and physical activity when working the six-hour shift. The improvement in work-life balance was greatest for those participants with children. Study participants were 94% female and no gender comparisons can therefore be made.

However, the experiment also identified some negative outcomes associated with six-hour shifts. Some participants who experienced work intensification found the new hours unsocial and disruptive and experienced a loss of time autonomy as their schedules were now more closely linked to others' schedules.

The financial impacts of the 6+6 initiative for workers varied between public and private sectors. While the private sector received no financial aid to take part in the trials, public sector bodies received state subsidies to offset the increased wage cost, even though the trial resulted in wage cuts (Anttila et al. 2005). Workers in the private sector who participated in the trial sought various forms of compensation for the reorganisation of shifts and often were not able to receive similar wages for six hours of work as they did previously for eight hours resulting in a reduction in wages (Peltola 1998).

Peltola (1998) cites productivity benefits of between 17% to 52% per man-hour as a result of changing to the 6+6 shift. Research also indicates that the introduction of a 6+6 scheme in a Finnish industrial plant led to a decrease in unit labour costs of 17% and reduced costs related to overtime (Anttila 2005, cited in De Spiegelaere & Piasna 2017).

In addition to its potential positives, Peltola (1998) and Anttila et al., (2005) note disadvantages with the 6+6 model, including the intensification of work pace resulting in less interaction between workers and potential adverse health impacts over the long term (Peltola 1998, p. 742.). Further, De Spiegelaere and Piasna (2017, p.54) note that workers perceived the system to be in the interests of the employer or the client rather than the interests of workers, even when the workers received their full wage. Anttila et al., (2005) also note that the model may present a cultural challenge for some workplaces in involving a considerable reconfiguration of what constitutes the 'normal' working day, with significant impacts on social norms and causing inconvenience for workers who worked 'unsocial' hours (early mornings or later evenings).

Anttila et al., (2005, p. 206-7) highlight the mixed results from trialling the 6+6 initiative and note that some benefits of shorter working hours can only be realised in the longer term (e.g. better health and the prevention of early retirement). Other benefits were identified relating to improved quality, productivity, efficiency or availability of services. However, there was varying evidence regarding the accrued or realised benefits, with both successful and unsuccessful cases. Anttila et al. conclude that the success or otherwise of this approach seems to depend upon the way the initiative is planned and implemented within a particular work context (Anttila et al. 2005).

In 1994 the Swedish spectacle manufacture, Essilor, introduced a similar two-shift system of 6+6 hours. This reduced the working time of employees by two hours but workers were still paid for an eight-hour day (De Spiegelaere & Piasna 2017). The company was able to finance the working time reduction by producing more spectacles using the same amount of machinery, with a reduced capital cost per unit. Furthermore, the company was able to meet customer demands, thereby improving its market position. De Spiegelaere & Piasna (2017, p. 55) also note that both workers and employers were satisfied with the new two-shift arrangement and noted a decline in the traditional resistance to shiftwork with the introduction of relatively shorter (six-hour) shifts being offset by wages remaining at the previous eight-hour shift level.

A 6+6 work reduction strategy was also trialled at Toyota service centres in Gothenburg, Sweden. Thirty-six mechanics took part in this work hour configuration, switching from working a 7am to 4pm day to two six-hour shifts with full pay. In this instance, one worker would clock on at 6am and the other at noon, both with fewer and shorter breaks, yet remaining on full wages (Stronge et al. 2019). Stronge et al. (2019) report that staff at Toyota felt better in general and that the additional time was spent with family on leisure activities. Participants also remarked on having additional free time due to changes in commute times as they were no longer travelling at peak periods. Productivity increased dramatically, with 144% of work previously completed in the original 40 hours now being completed in 30 hours through the 6+6 strategy.

Alderman (2017) and Crouch (2015) describe a two-year trial of a six-hour working day with no pay cut in a municipal nursing home also in Gothenburg, Sweden. In this case, seventeen new nursing positions were created to make up for the reduced hours. Among the benefits, Alderman (2017) notes improvements in workers' efficiency, energy and their perception of health, and a 15 per cent reduction in absenteeism/calling in sick. In comparison, at a nearby municipal retirement home, where a control trial left working conditions unchanged, workers' reported increased blood pressure and said they perceived no improvement in their health, peace of mind or alertness. Nurses with a reduced worktime also reported an additional hour of sleep and lower levels of blood pressure compared to the control group.

The trial ended in January 2017 and was not extended due to political pressure over how best to fund the scheme. Media articles at the time reported that the program, completely subsidised by the municipal government, increased administration costs considerably. This cost increase was mostly attributable to the wage bill for new workers. This cost increase led critics of the scheme to argue that it would be too costly to replicate this model on a larger scale. However, supporters of the scheme argued that these costs were offset by reduced costs to the state from a reduction in payment of unemployment benefits and increasing tax revenue through job creation.

While costs would be borne at the local level, these benefits would be recouped at the national level, indicating the complexity in relation to how working time reduction programs need to be considered within the context of the broader economic climate.

## **Free time options**

Free time options generally reduce work hours by converting employees' annual bonuses into leave or free time as agreed in a collective agreement. This work time arrangement can be utilised to reduce hours on a week-by-week basis or time can be accrued over longer periods such that days or weeks can be taken as leave. As additional free time is considered compensation for pay increases,

the value or quantity is directly dependent on the wage bargaining level of the sector in which the free time option is implemented (Manfred 2015).

An example of a free time option scheme is the *Freizeitoption* scheme which was introduced in Austria in 2013 under a collective agreement. This scheme enabled individual workers to select either an agreed annual pay increase or a corresponding number of paid hours off. While no health evaluations of the scheme could be found, some gender differences in uptake and use were observed. Men more frequently used the free time option than women and chose to accumulate their time and take leave in blocks of consecutive days. In contrast, women used their time off on a regular, even daily, basis as a means of alleviating time pressures associated with their unpaid workloads (Schneider 2018).

A similar free time option scheme was implemented at the national broadcast agency, VRT, in Belgium in 2016. This scheme was implemented in a bid to avoid mass redundancies. VRT workers were able to gain an additional 22 days of leave if they voluntarily sacrificed their annual bonus - as such each additional day of leave reduced their pay by 1/22 of their bonus (De Spiegelaere & Piasna 2017). As in the Austrian case, take-up of the scheme was measured. More women than men opted to take additional days of leave, however, the difference between men and women's take-up was small. Work intensification was experienced by some workers who opted into this scheme.

Table 1 summarises the case examples of working time reductions/modifications including the key features of the working time reduction or modifications implemented in each case, as well as the reported outcomes, benefits and limitations associated with each approach.

*Table 1: Strategies for reducing work hours - trials from industries other than construction*

Strategy and description	Study details (references, country, year, setting)	Intervention	Outcomes	Benefits	Limitations
<b>Compressed work week:</b> work hours redistributed with total weekly work hours unchanged	Duchon et al. (1994); Duchon et al. (1997); Keran et al. (1994)  Canada  1990  Underground metal mines	<u>Experimental group</u> Four 12-hour shifts followed by four days off, rotating night and day  Changed from seven 8-hour shifts and two or three days off  <u>Remuneration</u> Not stated  <u>Duration</u> Eight-month intervention, evaluation ten months since baseline	<u>Health outcomes</u> Worsening of sleep difficulties after night shifts and minor aches and pains  No change in health problems, sleepiness, and sleep length  Improvement in eating habits, family life and morale	Improvements in some health outcomes	Effects likely influenced by external conditions such as commute time (average commute was a three-hour return trip)  Scheme had negative effects on some health outcomes
	Cunningham (1989)  Canada  No date  Coal mines	<u>Experimental group</u> Implemented four 12-hour shifts (day or night) followed by four days off  Changed from a five-day schedule which involved five dayshifts, one day off, five afternoon shifts, two days off, then five nightshifts, and two days off  <u>Control</u> Eight-hour days, five-day schedule with weekends off  <u>Remuneration</u> Not stated  <u>Duration</u> Not stated	<u>Health outcomes</u> No improvement in sleep, tiredness, family satisfaction and satisfaction with work. In addition, there were no negative effect on general health (measured by respiratory function, reaction time, vigilance, auditory functioning and blood pressure)  Compared to the control group, there was a significant decrease in the rate of accidents and absences after the intervention. However, it was noted that there were unusually high rates of accidents and sick day prior to the intervention	Improvement in workplace accident rates and absenteeism	No change in health outcomes  Unclear effect of change on productivity
	Stronge et al. (2019)  United States  2009-2011  Utah State Government	<u>Experimental group</u> Change to 4-day week with 10 hours per shift, no work on Friday  <u>Remuneration</u> Unchanged  <u>Duration</u> More than 2 years	<u>Health outcomes</u> Employees reported fewer work-home conflicts	Employees perceived an improvement in work-life balance	Did not meet goal to curb energy costs  Complaints regarding unavailability of services on Fridays

Strategy and description	Study details (references, country, year, setting)	Intervention	Outcomes	Benefits	Limitations																																
Reduced working hours: No loss of remuneration	Haar (2018); Perpetual Guardian et al. (2019)  New Zealand  2018  Perpetual Guardian, corporate trustee company	<u>Experimental group</u> 240 staff shifted from a 5- to 4- day working week. Reduction from 37.5 hours per week to 30 hours.  <u>Remuneration</u> Unchanged  <u>Duration</u> Eight weeks, become permanent policy in October 2018	<u>Wellbeing and satisfaction</u> <table><tr><th></th><th>Pre</th><th>Post</th><th>p-value</th></tr><tr><td>Life</td><td>74.1%</td><td>79.0%</td><td>(p=.001)</td></tr><tr><td>Health</td><td>67.0%</td><td>74.3%</td><td>(p=.000)</td></tr><tr><td>Leisure</td><td>63.3%</td><td>74.2%</td><td>(p=.000)</td></tr><tr><td>Community</td><td>66.1%</td><td>73.4%</td><td>(p=.000)</td></tr><tr><td>Stress</td><td>45.3%</td><td>38.3%</td><td>(p=.002)</td></tr></table> <u>Work-life balance</u> <table><tr><th></th><th>Pre</th><th>Post</th><th>p-value</th></tr><tr><td>Work-life balance score</td><td>3.36</td><td>3.76</td><td>(p&lt;0.01)</td></tr></table>  78% of staff reported ability to balance work and home commitments (54% of staff reported this ability before the experiment)		Pre	Post	p-value	Life	74.1%	79.0%	(p=.001)	Health	67.0%	74.3%	(p=.000)	Leisure	63.3%	74.2%	(p=.000)	Community	66.1%	73.4%	(p=.000)	Stress	45.3%	38.3%	(p=.002)		Pre	Post	p-value	Work-life balance score	3.36	3.76	(p<0.01)	Significant improvements in health and work-life balance  Increase in team engagement (leadership, commitment, stimulation and empowerment)	Work intensification  “Teething issues” relating to accessibility of absent staff and slower response times to work requests
	Pre	Post	p-value																																		
Life	74.1%	79.0%	(p=.001)																																		
Health	67.0%	74.3%	(p=.000)																																		
Leisure	63.3%	74.2%	(p=.000)																																		
Community	66.1%	73.4%	(p=.000)																																		
Stress	45.3%	38.3%	(p=.002)																																		
	Pre	Post	p-value																																		
Work-life balance score	3.36	3.76	(p<0.01)																																		
Reduced working hours: loss of remuneration	De Spiegelaere & Piasna (2017); Seifert and Trinczek (2000)  Germany  1993-1999  Volkswagen	<u>Experimental group</u> Working week reduced from 36 to 28.8 hours, with a corresponding reduction in employee earnings  In order to offset the significant financial impact for employees', monthly wages would remain stable by increasing the hourly wage by one per cent and with a phased payment of holiday pay and annual bonus  <u>Remuneration</u> 20% reduction in wages  <u>Duration</u> 7 years, return to traditional work schedules in 1999 and in 2006 reduced to 33-hours for blue-collar and 34-hours for white-collar workers	<u>Stress</u> Three in four employees found that their workload was higher in a 28.8-hour week, particularly for white collar workers  <u>Dissatisfaction with arrangement</u> Blue collar: 12%      White collar: 37%  <u>Social outcomes</u> Some workers found the shift to 4-days provided more time to spend socialising and with family. However, due to the volume of different work schedules, social time became desynchronised leading to social problems and higher divorce rates  <u>Gender outcomes</u> 13% of employees were women. No significant change in division of housework between men and women. 43% of women spent their gained time in family and housework compared to 37% of men	Avoided mass lay-offs through economic downturn  Productivity increased	High number of complaints regarding stress levels  Varied work schedules were socially disruptive  Higher divorce rates were attributed to this disruption  Significant wage (and benefits) loss for staff  Worse working conditions and work intensification																																



Strategy and description	Study details (references, country, year, setting)	Intervention	Outcomes	Benefits	Limitations																																	
<b>Six-hour day:</b> one morning six-hour shift, and one afternoon shift, 30-hour week total	De Spiegelaere & Piasna (2017); Lorentzon & Yang (2020).  Gothenburg, Sweden  Feb 2015- Dec 2016  Municipal nursing home	<u>Experimental group</u> Daily work hour reduced from eight hours per day to six. 30- working week at the company level  <u>Control group</u> Two groups: nursing home with no change to work hours and all nursing staff in Gothenburg  <u>Remuneration</u> Nurse wages remained constant. 15 new staff recruited paid by the government  <u>Duration</u> Two-year trial, not extended	<u>Self-reported health</u> <table><tr><td></td><td><b>Experimental</b></td><td><b>Control</b></td></tr><tr><td>Good health</td><td>72%</td><td>60%</td></tr><tr><td>Alertness</td><td>65%</td><td>50%</td></tr><tr><td>Absence of stress</td><td>64%</td><td>45%</td></tr><tr><td>Active lifestyle</td><td>58%</td><td>43%</td></tr></table> <u>Change in satisfaction levels</u> <table><tr><td></td><td><b>Experimental</b></td><td><b>Control</b></td></tr><tr><td>Stress</td><td>+105%</td><td>- 65%</td></tr><tr><td>Energy</td><td>+143%</td><td>- 46%</td></tr><tr><td>Fatigue</td><td>+51.3%</td><td>- 68%</td></tr><tr><td>Physical activity</td><td>+24%</td><td>- 41%</td></tr><tr><td>General health</td><td>+11%</td><td>- 41%</td></tr></table> (+ increase; - decline)  Compared to the control group, the experimental group reported one more hour of sleep and lower levels of blood pressure  Participants in the experimental group called in sick 15% less than pre-intervention		<b>Experimental</b>	<b>Control</b>	Good health	72%	60%	Alertness	65%	50%	Absence of stress	64%	45%	Active lifestyle	58%	43%		<b>Experimental</b>	<b>Control</b>	Stress	+105%	- 65%	Energy	+143%	- 46%	Fatigue	+51.3%	- 68%	Physical activity	+24%	- 41%	General health	+11%	- 41%	Considerable mental and physical health benefits  Quality of service improved with residents reporting more positive experiences at experimental nursing home  Health gain was greater in magnitude for nurses over 50 years of age  Reduced cost in unemployment insurance	Expensive  15-17 new nursing positions were created to make up for the reduced hours contributing to costs
	<b>Experimental</b>	<b>Control</b>																																				
Good health	72%	60%																																				
Alertness	65%	50%																																				
Absence of stress	64%	45%																																				
Active lifestyle	58%	43%																																				
	<b>Experimental</b>	<b>Control</b>																																				
Stress	+105%	- 65%																																				
Energy	+143%	- 46%																																				
Fatigue	+51.3%	- 68%																																				
Physical activity	+24%	- 41%																																				
General health	+11%	- 41%																																				

Strategy and description	Study details (references, country, year, setting)	Intervention	Outcomes	Benefits	Limitations																														
	Anttila et al. (2005)  Finland  1996-1998  European Social Fund initiative in health sector	<u>Experimental group 1</u> European Social Fund (ESF) funded project <i>Flexibility Through 6-Hour Shifts</i> for staff in the health and social services sector in 3 municipalities. Involvement was voluntary.  <u>Experimental group 1</u> Choice of any working time models (e.g. day off or week off etc) across 14 municipalities. Involvement was voluntary  <u>Control group</u> No change in work hours. Participants from within the health and social services sector. Involvement was voluntary  <u>Remuneration</u> Wages for reduced hours were negotiated at the local level  On average, the wage loss was seven per cent from the 20-25% reduction in hours, and in some cases full compensation was paid  <u>Duration</u> 2 years	<u>Work family conflict-mean change</u> <table><tr><th></th><th>Experimental</th><th>Control</th></tr><tr><td>Job interference at home</td><td>-0.50</td><td>-0.23</td></tr><tr><td>Job prevents time with family</td><td>-0.46</td><td>-0.06</td></tr><tr><td>Overload because of work</td><td>-0.53</td><td>-0.07</td></tr><tr><td>Overall</td><td>-0.46</td><td>-0.08</td></tr></table> Work interference with family (p=0.01)  <u>Work family conflict-mean change</u> <table><tr><th></th><th>Exp 1</th><th>Exp 2</th></tr><tr><td>Job interference at home</td><td>-0.35</td><td>-0.20</td></tr><tr><td>Job prevents time with family</td><td>-0.32</td><td>-0.26</td></tr><tr><td>Overload because of work</td><td>-0.46</td><td>-0.25</td></tr><tr><td>Overall</td><td>-0.37</td><td>-0.23</td></tr></table> Work interference with family (p=0.02)  <u>Gender outcomes</u> 94% of participants were women. The more equal and balanced the redistribution of the new free time (daily reductions), the more the work-family interaction was facilitated		Experimental	Control	Job interference at home	-0.50	-0.23	Job prevents time with family	-0.46	-0.06	Overload because of work	-0.53	-0.07	Overall	-0.46	-0.08		Exp 1	Exp 2	Job interference at home	-0.35	-0.20	Job prevents time with family	-0.32	-0.26	Overload because of work	-0.46	-0.25	Overall	-0.37	-0.23	Significant reduction in work-family conflict for those with a six-hour day  Greatest improvement for those with children. More time to spend with family but also more energy and time to complete housework  More time for relaxation, self-care and physical activity	Work intensification  Jealousy between those with shorter hours and those with traditional hours  Difficulties with rostering as permanent staff given desirable morning shifts and new recruits relegated to undesirable night shift  Loss of time autonomy as tied to others' schedules  Difficulty with unsocial hours
	Experimental	Control																																	
Job interference at home	-0.50	-0.23																																	
Job prevents time with family	-0.46	-0.06																																	
Overload because of work	-0.53	-0.07																																	
Overall	-0.46	-0.08																																	
	Exp 1	Exp 2																																	
Job interference at home	-0.35	-0.20																																	
Job prevents time with family	-0.32	-0.26																																	
Overload because of work	-0.46	-0.25																																	
Overall	-0.37	-0.23																																	

Strategy and description	Study details (references, country, year, setting)	Intervention	Outcomes	Benefits	Limitations
	<p>Stronge et al. 2019</p> <p>Gothenburg, Sweden</p> <p>2002-present</p> <p>Toyota service centres</p>	<p><u>Experimental group</u> Two six-hour shifts, one starting at 6am and the other at noon</p> <p><u>Remuneration</u> No change</p> <p><u>Duration</u> Ongoing</p>	<p><u>Health outcomes</u> Staff reported feeling better and happier at work and were able to spend more time with family</p>	<p>Improved general wellbeing</p> <p>Increased productivity and profits (mechanics produced 114% of previous work in 30 hours compared to 40 hours)</p> <p>Reduced commuting time</p>	<p>None stated</p>
<p><b>Free time options/job sharing:</b> Workers may convert the annual pay increases into additional free time or choose a reduction in working time</p>	<p>Schneider (2018)</p> <p>Austria</p> <p>2013 – present</p> <p>Freizeitoption</p>	<p><u>Experimental group</u> Members under a collective agreement that enable individuals to choose between the agreed pay rise or a corresponding number of paid hours of time off</p> <p><u>Remuneration</u> No change</p> <p><u>Duration</u> Ongoing</p>	<p><u>Gender outcome</u> Men use the time off option more frequently than women</p> <p>Women often used the time off option on a regular or daily basis to reduce time-related stress and burdens in everyday life. Men generally saved time credits and used them as consecutive days for family recreation or extended weekends</p>	<p>Greater time available to spend with family</p>	<p>Administrative difficulties</p> <p>Not available to all staff</p> <p>Company management in many organisations has prevented the adoption of this option. Executives feel this choice will reduce motivation</p>
	<p>De Spiegelaere and Pisna (2017)</p> <p>Belgium</p> <p>2016-2020</p> <p>Belgian public broadcast organisation, VRT</p>	<p><u>Experimental group</u> Up to 22 days of additional leave for employees that voluntarily gave up their bonus, nominated in November for the following year</p> <p><u>Remuneration</u> Each additional voluntary day of leave reduced pay by 1/22 of the bonus</p> <p><u>Duration</u> 4 years</p>	<p><u>Gender outcomes</u> Greater uptake of scheme by women than men, although difference was small</p>	<p>Able to avoid mass redundancies</p> <p>No impact on pension, sick leave or annual leave compared to part-time work</p>	<p>Complications in the organisation of work</p> <p>Work intensification</p>

Strategy and description	Study details (references, country, year, setting)	Intervention	Outcomes	Benefits	Limitations
<b>Reduced working week:</b> legislated	De Spiegelaere and Pisna (2017); Stronge et al. 2019  France  1998-2008	<u>Experimental group</u> Official working hours reduced from 39 to 35 hours for most French workers.  <u>Remuneration</u> Wages were not cut; however, 18-month pay freeze after implementation  <u>Duration</u> 1998-2008	<u>Health outcomes</u> Evaluation found mixed results for work-life balance particularly when reduction led to the introduction of non-standard work hours and less control over work hours. Work intensification was often observed, especially in white-collared workers, which likely undermined any health gains achieved by the reduced workweek  <u>Gender outcomes</u> Reduction in female part-time work. Men reported being more involved in caring and domestic work	Increased employment rate for older workers  Job creation	Work intensification- new culture of austerity and time saving

## Conclusion

As the nature of work evolves, work hour reduction strategies must also adapt to address the challenges linked to technology. Technological advancements enabling 24-hour connectivity, such as smartphones, remote conferencing, and email have eroded once definitive boundaries between work and life domains and fuelled discreet and unpaid overtime away from the workplace. This blurring of the boundaries between work and non-work life has become particularly evident during the COVID-19 pandemic in which there has been a widespread and rapid shift to home-based teleworking. Due to the unanticipated and involuntary nature of this shift, many governments and industries are navigating uncharted waters with an increased potential for negative impacts in relation to working time patterns and work-family conflict. In some cases, these negative impacts may be mitigated via strategies for reducing or modifying work hours.

This chapter has outlined the outcomes, benefits and limitations of various strategies for reducing work hours that have been implemented around the world, as a means of presenting potential options for the future of the Australian construction industry. Generally, these strategies have led to improvements in physical and mental health, balance between work and non-work life as well as job creation, safety and productivity in some cases. However, it should be noted that working time regulation must always be understood as part of the broader political context in which these strategies are situated and the limitations of each case study should also be considered.

# Chapter 4. Effectiveness of reducing or modifying work hours in the construction industry

## Introduction

This chapter describes the findings from a rapid review of the literature to identify peer-reviewed research that assessed the effectiveness of implementing strategies to reduce work hours in the construction industry (details on the methods for this review are provided in Appendix 1). The papers identified provide the most relevant and detailed evidence regarding the effectiveness of these strategies in the construction industry. It is noteworthy that, although many peer-reviewed articles could be found that focus on the subject of work hours and the risks inherent in working long and inflexible hours, only a very limited number met the criteria for inclusion, i.e., they included an evaluation of a working time reduction/modification intervention that was implemented in a construction project setting. In itself, this is an important finding as it shows the critical gap in knowledge and research regarding the effectiveness and impacts associated with the reduction of work hours and alternative work scheduling strategies in the construction industry context.

It is also noteworthy that this literature review was produced before results of a rigorous evaluation of the five-day week schedule implemented at the Concord Hospital construction project in New South Wales were available. When available, the results from this trial and evaluation will provide the most recent and comprehensive evidence relating to the impact and effectiveness of a five-day week program implemented in the construction industry.

## Article screening

A total of 1,114 articles were reviewed, from which only six met the selection criteria of peer-reviewed intervention-based evaluation studies published in English and undertaken in the construction industry (see Appendix 2.). Between them, the articles describe the findings at four case study construction projects at which modified work time arrangements were implemented. These projects involved the construction of road, dam, or water treatment infrastructure conducted in Australia between 2004 and 2006.

Importantly, all case study projects at which working time reductions or modifications were implemented and evaluated were delivered through an alliance delivery model and involved a workforce of between 100-300 personnel (Brown et al. 2011). Thus, the findings cannot be generalised to other sectors of the construction industry (e.g. commercial building, residential etc), projects delivered using more traditional delivery methods (e.g. design and construct) or projects of a smaller size.

Participants in the case studies included both waged (blue-collar) and salaried (white-collar) staff in all but one case study (case study 4) which involved only salaried employees. Detailed summaries of the case studies and the outcomes can be found in Table 2.

## Results

Case study one reports the implementation of a five-day week in a water infrastructure construction project. At this project, the leadership team was focused on improving work-life balance and modified the project schedule from a traditional six-day week to a compulsory five-day week (10-hour shifts daily between Monday and Friday). However, this change to the five-day week was not sustained at the project. Anecdotal evidence suggested that waged workers at the project were not happy with the impact of the change on their remuneration as they lost out on penalty rates paid for work on Saturdays ('time and a half' for the first four hours and 'double time' thereafter for Saturday work). The project management team observed that many (approximately 30%) of the waged workers left the site to work at other projects where they could continue to earn penalty rates on Saturdays. Anecdotally, this left less skilled and experienced workers at the case study project which impacted productivity and performance. In response, the project leadership team decided to revert to a six-day work week, but allowed salaried workers to have alternate Saturdays off based on a roster system to ensure adequate site management and supervision. The six-day work week was not compulsory for waged workers, however many reverted to working six days a week when the site changed back.

Townsend et al. (2012) undertook a post-hoc assessment of workers' experiences of the working time modifications at the project. They report that, although waged workers recognised that not working on Saturdays provided them with substantial benefits, including mental and physical recovery and time to spend with their family or engaged in other non-work activities, many (though not all) of these waged workers were unhappy about the impact on their weekly remuneration. In contrast, salaried workers for whom working on Saturday did not attract overtime payments or penalty rates, strongly favoured the five-day week.

Townsend et al. (2012) conclude that negotiating and implementing modified working time arrangements in the construction industry is complicated due to the presence of two distinct groups of workers: white-collar salaried workers and blue-collar waged workers. Although neither of these groups are homogeneous, they do have conflicting motivations for establishing modified work hour arrangements that impact the work-life balance and satisfaction of both groups.

Case study two reported the introduction of a compressed work week at another water infrastructure construction project (a dam upgrade). The evaluation was a post-hoc evaluation in which the researchers collected data only after the introduction of the intervention. However, data were also collected from a control group of workers engaged at another construction site being delivered by the construction partner in the case study project alliance. This 'control' site was working a standard six-day week. The compressed work week involved eliminating an eight-hour Saturday shift but extending the working hours from Monday to Friday from 10 to 11.5 in summer months. In winter months the daily work hours were reduced from 11.5 to 10.5 (Lingard et al. 2007).

In the post-hoc evaluation of the compressed work week, 42 workers completed a survey. Of these, 23 were waged and 19 were salaried workers. The survey captured data relating to preferences for the compressed work week, the extent to which workers believed the balance between their work and non-work lives had changed since the introduction of the compressed week, well-being, satisfaction with balance between work and non-work life, and perceptions of work-life conflict. Survey participants' self-reported well-being and satisfaction with balance between work and non-work life were generally high. On a 7-point scale, with "7" representing the highest level of well-being and "1" representing the lowest level of wellbeing, salaried workers' mean well-being rating was 5.44 (SD=0.74) and waged workers' mean well-being rating was 5.49 (SD=1.12). After the shift to the compressed work week, both waged and salaried participants also reported high levels of satisfaction

with their work life (mean scores of 5.77 and 5.38 respectively), their non-work life (mean scores of 6.41 and 6.06 respectively) and the balance between their work and non-work lives (mean scores of 5.86 and 5.00 respectively). Respondents also indicated a strong collective preference for the 5-day week with an average preference score of 1.79 (SD=1.55), scored on a 7-point scale, where “1” reflects a “very strongly prefer 5-day week” and “7” reflects a “very strongly prefer 6-day week.” Importantly, no salaried workers but a small number of waged workers indicated they preferred a six-day week. Note the strength of evidence provided in this case study is limited by the lack of baseline (i.e., pre-compressed work week) measurement.

Interview data in case study two supported the positive benefits of the compressed work week on family life and the opportunities afforded by having a two-day weekend. Interviews with workers at the ‘control’ site revealed lower levels of satisfaction with the balance between work and non-work life than at the case study construction project. Workers at the control project were cynical about the construction contractor’s commitments to improving the balance between work and non-work life, which they saw as paying ‘lip service’ to the issue, because they did not experience any tangible changes to working time practices. Alternately, the case study project workers were appreciative of efforts made to address working time in support of improving work-life experiences. It is also noteworthy that, without prompting, 38% of waged staff and 20% of salaried staff interviewed at the case study project observed that the alliancing project delivery model provided the context in which these changes could have been made. These participants commented that it would be difficult to modify or reduce work hours in a more traditional ‘hard dollar’ contracting environment.

This case study project was also completed six months ahead of schedule and significantly under budget. While the compressed work week cannot be said to have caused these positive project outcomes, neither did it appear to hinder them. The project manager also indicated that he believed the compressed work week had improved workers’ morale, commitment to the project, and health and safety performance, as well as reduced disputes (union and individual).

Case study three involved a road construction project. At this project, survey data were collected from workers both before and after the implementation of a compressed work week. In December 2006, a pre-intervention survey was completed by 95 workers at the project before the site changed from working a six-day working week to a five-day working week. The revised roster followed a four-week cycle, such that workers enjoyed two ‘two-day’ weekends, one ‘one-day’ weekend, and one ‘three-day’ weekend every four weeks. Site hours were extended to 6.30am to 5pm on weekdays (a 30-minute earlier start) and from 6.30am to 3pm on the one Saturday worked each month. In December 2007, follow-up surveys were conducted to determine whether work–life experiences were different under the new roster. Workers’ perceptions of managerial support for work–life balance were not significantly different between the pre-and post-intervention surveys. In addition, there was no significant change in the perception of home-to-work conflict. A reduction in perceived work-to-home conflict between the pre- and post-intervention surveys was found to be statistically significant (Lingard et al. 2008).

Qualitative data collected at case study three before the introduction of the compressed work week revealed concerns that work negatively impacted non-work life among waged and salaried workers. Post-intervention interviews revealed that waged and salaried workers were generally happy with the revised working time arrangements, although waged workers still indicated concerns about loss of pay associated with giving up regular Saturday work (Townsend et al. 2011).

Case study four involved another road construction project. At the commencement of the research the site was working a standard six-day week. Workers at this project were surveyed before the



introduction of an intervention to identify their baseline perceptions of the balance they experienced between their work and non-work life. The survey data indicated that most workers at this project believed that their home life did not interfere with work to a great extent (mean home-to-work conflict score 2.58), but their work life was perceived to interfere with home life to a far greater extent (mean work-to-home conflict score 4.88).

The management team in case study four decided to introduce an optional five-day week. This decision was taken because, although the project was ahead of schedule, the management team was concerned about negative impacts of modified work time arrangements on the project timeline. At this project, the five-day week was only available to workers who could demonstrate a 'personal need' for the change. To utilise the option, workers also had to demonstrate that their work would not be adversely affected by the changed work schedule. Unlike the compressed work week implemented at the other case study projects, work hours between Monday and Friday were not extended. This meant that waged workers who decided to work five days would sacrifice a portion of their take-home pay.

Fewer than 20 out of more than 300 workers engaged at the project opted to change their work schedules. All workers who changed their schedule were salaried workers. Eight of those who made the change were interviewed after they had done so. Their comments suggest that work-life balance was not significantly improved and that the culture of long hours was maintained at the project of case study four.

## **Effectiveness in relation to wellbeing**

Balance between work and non-work life was the most used measure of wellbeing across the case studies reported in Table 2, with three of the four case studies reporting an improvement in workers' self-reported life balance. Interview data from case studies one to three reported improved balance between work and non-work life. This was reflected in participants' describing how the modified arrangements enabled them to spend time with partners, children, and friends. Case study two compared participants to controls (employees from other projects who worked a six-day week) and found greater levels of satisfaction and life balance in workers working the five-day (compressed) week. Quantitative results in case study three found a statistically significant reduction ( $p=0.04$ ) in perceived work-to-home conflict post-intervention compared to baseline (pre-intervention) measurements.

Participants in case studies one and three also reported experiencing an improvement to their physical health which was associated with greater time to rest and recuperate over the weekends. Both waged and salaried workers reported improved physical recovery, and a reduction in fatigue, both at work and home, enabling them to feel fresh, alert, and ready for work.

## **Gender outcomes**

Workforce gender composition was largely undescribed in the construction case studies reported. Only case study one documented the inclusion of four women in interview data. Comparisons between male and female responses to the work hour modifications and/or gender diversity outcomes were not reported in any of the case studies. This reflects a significant knowledge gap in relation to understanding how work time reductions or modifications are likely to impact gender diversity in the construction industry.

## Cost-benefit analysis

The case studies presented in Table 2 did not include an analysis of cost-benefit associated with implementing reduced or modified work hours in construction projects. This is therefore also an area where work is urgently needed so that these costs and benefits are better understood.

While not included in the peer-reviewed literature the below scenario reports on a cost-benefit analysis undertaken in the US construction industry in relation to the introduction of working time modifications. In this case study, the loss of productivity for working a 4/40 schedule is considered as a trade off against the annual financial benefits that can accrue to companies adopting the reduced schedule.

### Scenario 1: Cost-benefit analysis of implementing 4/40 work schedules in construction firms of different sizes in USA

Berman (2009) undertook a cost-benefit analysis of implementing a compressed 40-hour work week schedule comprising 4 workdays of 10-hour shifts each week (also known as a 4/40 work schedule) in three construction organisations. These organisations represented firms of different sizes in the US construction industry, including: a small firm (less than 20 employees), a medium firm (20 – 100 employees), and a large firm (more than 100 employees).

Using work hours and output data from the U.S. Department of Labour, Berman projected a 2% productivity loss associated with increased daily working hours (as a result of the compression of the work week). He assumed that workers can only sustain very high productivity for a few hours in one shift, therefore reducing the number of shifts in a week would lead to reduced overall productivity. Data provided by the U.S. Department of Labour indicates loss of efficiency as the number of work hours and workdays increase, compared to a baseline of 40 work hours (five 8-hour work days per week). Correlating the efficiency loss with work hours, he estimated a 2% productivity loss for a 4/40 schedule. He estimated the cost of this productivity loss for each organisation using the following formula:

Realised productivity loss (per week) = efficiency loss \* number of employees \* average hourly cost.

He compared this cost with estimates of the following savings:

(1) travel savings: cost savings from reduced travel between sites and head offices (e.g., time, fuel consumption, vehicle maintenance, etc.)

Realised travel savings (per week) = 2 \* [(number of field employees \* average hourly cost \* average time to commute from office/branch) + (number of company vehicles \* average cost per mile (including fuel, maintenance, etc.) \* average number of miles from office to jobsite)]

(2) start/end savings: cost savings from reduced set-up (moving material, tools and equipment) and clean-up (store material, secure tools and equipment).

Realised set up and clean-up savings (per week) = (set-up time including material lay-out, tool layout, etc. + clean-up time including storing material, tools, etc. and cleaning) \* average number of projects ongoing \* average hourly cost

When calculating the above savings, the following assumptions were made:

(1) A small firm would have 15 employees, 5 vehicles each traveling 50 miles on average for 0.7 hour each day. Each vehicle would incur \$0.48 cost per day for fuel, maintenance, etc. Each day, the crew on each job site would spend one hour on set up and one hour on

cleanup.

(2) A medium firm would have 50 employees, 25 vehicles each traveling 35 miles on average for one hour each day. Each vehicle would incur \$0.47 cost per day for fuel, maintenance, etc. Each day, the crew on each job site would spend one hour on set up and 1.5 hours on clean up.

(3) A large firm would have 300 employees, 125 vehicles each traveling 25 miles on average for 0.5 hour each day. Each vehicle would incur \$0.46 cost per day for fuel, maintenance, etc. Each day, the crew on each job site would spend 1.5 hours on set up and 2 hours on clean up.

The total annual cost/benefit for each organisation was then estimated as follows:

Total annual cost-benefit of 4/40 work schedule =  $52 * (\text{realised travel savings} + \text{realised set up and clean-up savings} + \text{realised productivity losses})$

The analysis indicated the estimated annual cost savings (gains) associated with implementing a 4/40 work schedule for a small firm could be over \$62,000, while a medium-sized firm could realise annual cost savings of over \$155,000 and a large firm could save over \$492,000 annually. However, Berman also notes that small or specialised trade firms have the greatest potential for implementing a 4/40 work schedule as it is easier to compress their specific work activities. In addition, these small firms may gain the highest benefits from implementing a 4/40 work schedule due to their lower running costs.

It is noteworthy that Berman's cost-benefit analysis did not consider potential indirect savings associated with increased employee morale, reduced absenteeism, reduced employee turnover and tardiness, and reduced overtime which are benefits reported in studies of compressed work schedules in contexts other than construction (e.g., in the U.S. public sector by Gilbert (1997) and in an equipment manufacturing firm by Griffin (2008)).

Furthermore, higher employee morale and improved balance between work and non-work life may contribute to a safer workplace which, in turn, can lead to additional cost savings (Berman 2009).

**Berman, 2009**

## Conclusion

While a great deal is written on the subject of the harmful impacts of long and inflexible working hours, the review revealed there is very little peer-reviewed academic literature that reports on intervention studies in which working time reductions or modifications have been implemented in the construction industry. The studies that are reported are now quite old and considered a narrow range of outcome variables. They also focus heavily on compressed work weeks as the working time modification strategy. Notably, although the compressed work weeks appear to have a positive impact on project-based construction workers' balance between work and non-work lives, impacts in relation to physical or mental health and gender diversity are not reported.

The case studies of work week compression that have been published also reveal a difference between waged and salaried workers' preferences for work hour reductions and working time arrangements. Waged workers expressed concerns about loss of income under some of the working time models implemented.

Given the limited evidence available for the impact of working time modifications in the construction industry, it is critical that future studies using robust experimental designs/evaluation strategies and the capture of a broader range of outcome variables, be undertaken.

*Table 2: Interventions in the construction industry to reduce or redistribute work hours*

Study (Author, year, year of intervention and country)	Project details (setting, design, standard work schedule)	Population	Intervention	Outcomes	Barriers
<b>Case study 1</b>  2005  Australia  Townsend et al. 2012	<u>Setting</u> Water-treatment plant  <u>Project design</u> An alliance of public- and private-sector organisations  <u>Standard schedule</u> 58-hour week (6 days). Weekdays: 10 hours Saturday: 8 hours	<u>Intervention</u> N=60 (at peak) Salaried and waged  <u>Age</u> 22-63 years  <u>Gender</u> Male: 28 Female: 4	<u>5-day working week</u> Weekdays: 10 hours a day Weekend: none  (Reverted to non-compulsory 6-day week. Rosters changed for salaried employees allowing them to work between one-in-two to one-in-four Saturdays each month)	<u>Interview (10 waged and 22 salaried staff)</u> There are mixed responses from waged workers. Workers recognise that there were substantial benefits such as improved mental and physical recovery and time to spend with their family or on other non-work commitments, however, many struggled with the loss of income  The salaried employees were affected more substantially and reported greater time for themselves and their families, in particular the ability to spend time with children and family on Saturday	Waged workers were unable to be compensated adequately during the week for lost Saturday hours and reduced daylight hours though the winter and were dissatisfied with the intervention  Unexpected events and project interruptions put pressure on salaried workers to extend hours and make up lost time
<b>Case study 2</b>  2005  Australia  Lingard et al. 2007 and Brown et al. 2010	<u>Setting</u> Water infrastructure construction (a dam upgrade)  <u>Project design</u> An alliance of public- and private-sector organisations  <u>Standard schedule</u> 58-hour week (6 days) Weekdays: 10 hours Saturday: 8 hours	<u>Intervention</u> N= unknown Salaried and waged  <u>Control</u> N= unknown Staff engaged at other construction projects being delivered by the construction partner from the alliance, salaried and waged  Gender and age demographics unknown	<u>5-day week (compressed)</u> Weekdays: 11.5 hours per day Weekend: none  (Winter: hours reduced to 10.5 hours per day)	<u>Interviews (23 waged and 19 salaried staff)</u> Both waged and salaried employees supported the move from a 6 to a 5-day week. It was perceived to have several benefits and was regarded very positively. Benefits included: <ul style="list-style-type: none"> <li>- improved productivity</li> <li>- increased involvement with home/family and other non-work activities</li> <li>- increased opportunity for rest and recuperation from the long working week</li> <li>- increased organisational commitment</li> </ul> <u>Control comparison (3 on site staff and 3 head office staff)</u> The case study project workers' work-life balance and satisfaction were reported as high relative to members of the control group	Waged employees expressed concerns about the maintenance of their income

Study (Author, year, year of intervention and country)	Project details (setting, design, standard work schedule)	Population	Intervention	Outcomes	Barriers
<b>Case study 3</b>  2006  Australia  Lingard et al. 2008; Townsend, et al. 2011 and Brown et al. 2011	<u>Setting</u> Road construction  <u>Project design</u> An alliance of public- and private-sector organisations  <u>Standard schedule</u> Weekdays: 7am- 5pm Saturday: unknown	<u>Intervention</u> N= unknown salaried and waged workers  Gender and age demographics unknown	<u>5-day week (compressed)</u> Weekdays: 6.30am to 5pm, Saturday: once a month 6.30am to 3pm  Revised roster followed a four-week cycle, two 'two-day' weekends, one 'one day' weekend, and one 'three-day' weekend	<u>Pre- and post-intervention survey results (Pre- waged: n = 52; salaried n = 4; Post- waged: n = 68; salaried n = 42</u> Statistically significant (t=52.1, p=0.04) reduction in perceived work-to-home conflict between the pre- and post-intervention. Home to work conflict not significant  <u>Interview (waged n = 5; salaried n = 6)</u> Increased leisure time on the weekends to spend with friends, family and simply resting and recovering  Flow on from the increased recuperation time – the reduction in fatigue at the workplace. Employees report arriving at work after a weekend refreshed, more alert and more ready to work – particularly given they have five days ahead of them, rather than six  No obvious negative relationship between absenteeism and turnover due to the roster change	Waged workers expressed some concern about the impact of the revised schedule on their pay
<b>Case study 4</b>  2004  Australia  Lingard et al. 2008; Townsend, et al. 2011 and Brown et al. 2011	<u>Setting</u> Road construction  <u>Project design</u> An alliance of public- and private-sector organisations  <u>Standard schedule</u> Weekdays: 7am- 5pm Saturday: unknown	<u>Intervention</u> N=20 salaried workers only  Gender and age demographics unknown	<u>Optional 5-day week</u> Work hours between Monday and Friday were not extended  Employees sacrificed a portion of take-home pay	<u>Interviews (salaried n=8)</u> Mixed findings across case series  Work-life balance was not significantly improved and the culture of long hours was maintained  Substantial improvements in their non-working lives and perceived that the increased non- work time each weekend provided greater rest and recuperation that boosted energy levels and productivity at work	Employees refer to a negative aspect of the roster change – the increased length of the Monday to Friday working days

## Chapter 5. Support for work hour reduction in the construction industry

This chapter outlines the role of key stakeholder groups in the construction industry including the industry's clients, construction contracting organisations, subcontractors and smaller suppliers, trade unions, and workers (both waged and salaried) and, where possible evidence relating to their experiences and level of support for work hour reduction/modification.

The evidence is based upon information that is available in the public domain. However, it is important to note that stakeholder perceptions and support for work hour reduction/modification will be explored in depth in the Delphi study associated with the CICT research activity stream.

### Clients

The construction industry's clients play an important role in establishing project timelines and creating the procurement and tendering context within which project programs are developed. Clients also establish the commercial regimes that determine who bears the risk of project delays and time overruns. The academic literature does not directly address the extent to which work hour reduction or modification strategies are supported by construction clients and this remains an important knowledge gap. However, construction clients are increasingly taking steps to improve work health and safety in the construction projects they procure. Addressing the issue of work hours (as an important determinant of health) can therefore be seen to be an extension of this work. Clients' interest in addressing the issue of working time is evidenced by the involvement of public sector client organisations in the CICT.

There is evidence to indicate that large client organisations in other parts of the world are seeking to address the issue of work hours. The two scenarios below describe examples of client leadership in driving work hour reductions in the construction industries of New Zealand and the UK respectively.

#### **Scenario 2: Reducing work hours during the construction of a food manufacturing facility**

The client, an organisation undertaking a NZ\$73 million factory expansion, made workers' health and safety its first priority. This is unlike most construction projects, which are largely driven by time and budget. A senior manager explained the client's approach to the project:

*"We wanted to create a legacy that health and safety are the most important things. We had a slogan that emerged that we pushed throughout the length of the project which was safety one, quality second and timeline third. But I think we didn't just want to say these things, we wanted to actually act on them. We wanted our contractors to regain some type of life balance. There has been a history where contractors have worked hard, big hours. We wanted to give them the opportunity to regain life balance which would have a positive impact on how they approached the project. We wanted to also strive towards creating a positive safety culture. We wanted to have a very clear picture of what was acceptable and what was not acceptable."*

The senior management team implemented a program to support the 'safety first, quality second, timeline third' approach that was applied during the 18-month construction project. The

program's intent was to create an integrated approach to wellness for workers, and the key components of the program were leadership, culture, communication, policy, and practice. The program was supported at all levels of the organisation, from board to supervisors. The client also acknowledged the key role of leaders in the performance of their teams, and so invested in a leadership development program.

During high stress times, such as commissioning, strategies were implemented to create opportunities for communication, such as daily meetings and barbeque lunches. A Fatigue Management Policy (FMP) was implemented at the site, which stated that working time should not exceed 60 hours per week. The policy was incorporated into the procurement strategy. At the front-end of contract management, contractors were made aware of expectations of hours due to the wellness focus at the project. Given the FMP's emphasis, contractors were invited to negotiate timelines with the client to ensure safety and quality standards were maintained. A senior manager explained:

*"Rather than dictating to them a date that it had to be completed by, we negotiated with them as to how many people we can put on the work front and how that worked out to a timeline."*

If more than 60 hours were planned, the client asked contractors to advise in advance how they would manage that week. The client challenged contractors to consider extra resources to support the tail-end of such weeks and identify which activities could be brought to the front of the week so that only low-risk work was undertaken at the end of the week. While a key aim of the policy was to prevent fatigue, it was also acknowledged that enforcing the policy enabled workers to spend time with their families. A worker explained:

*"I've done 55 hours this week. I'm going home, and I'm going to spend the weekend with my family. I haven't done that before on a project."*

There were various benefits of the program for the client, and some of these are summed up by a senior manager who reflected on what usually happens on a project, and how this project differed:

*"Usually, the last two weeks before start-up, people are running in all directions and there's rubbish all over the floor, there's electrical cables, you know there's people stressed. At this project it looked like everything was calm and in control ... people were having good quality conversations about how to install things, about how to wire something up, about how to weld. So you know that people are not fatigued. People have got time to think quietly about the best approach in how to install something. You know I saw a quality of workmanship and I think that we've spent \$75 million dollars on this project. I don't believe we've replaced one valve, pipe, or instrument in \$75 million dollars, which is extraordinary. We were well resourced, but a good part of that is that we look after people and when people are looked after they can think properly and think clearly and make good quality decisions."*

Construction contractors engaged at the project reported it was the best project they had ever worked on due to the focus on health and safety. A senior manager commented:

*"We've had people coming up to us and saying this is the best project that they've ever worked on and they've been in the industry for fifteen, twenty years."*

The client aimed to leave a legacy that workers' health and safety is the most important factor on a project. The client challenged contractors to rethink their approach to construction-related activity, with a clear message that timeline should not drive activity. A senior manager reflected:

*"I think people will be talking about this project for a while. There's already people talking about changes to what they do now."*

**Lingard and Turner, 2018**



### **Scenario 3: Managing work hours at Thames Tideway Tunnel**

The Thames Tideway Tunnel project involves constructing a 25 km tunnel for London's sewerage system to increase its capacity. The project comprises 21 sites along the tunnel route and involves an ambitious timeline with an expected completion date in 2023 allowing the asset to become operational in 2024.

At a very early stage of the project, the project team at Tideway initiated an innovative health and safety management program with a health and safety vision about "zero harm, zero incidents and zero compromise in delivering a transformational health and safety performance" (Safety and Health Practitioner 2015). The program involves regular reviews and reflections on health and safety on every site, developing health and safety plans (including a 24-week look ahead), immersive inductions for employees and early safety engagement and health and safety communication assessment.

The project team at Tideway was particularly keen to manage on-the-job fatigue. Reducing shift length was considered as a safety measure but mandating shorter work hours was more complicated.

It was noted that shorter shifts would be only beneficial to workers who used the extra time for restful activities. The benefits from reduced shift time depend on other factors such as the distance which workers travel to arrive at sites, the location of sites and the way that workers spend their free time. While the contractors who lived near the site were more accepting of shorter shifts, those who lived far from the sites preferred to work longer hours. By working 12 hours or more in one shift, the contractors could work shorter weeks, i.e., completing their work hours in fewer days, commute less and return home for a longer rest period. Working shorter shifts at Tideway sites meant that workers needed to spend more time in rented accommodation. Being away from their family and friends, the workers spent their free time on social activities, spent more money on leisure and rested less. The consequence was increased workers' dissatisfaction with the new work time arrangements, and it became difficult for Tideway to maintain and recruit the workforce needed for tunnelling. An additional issue was the reduced pay that workers received as a result of working shorter shifts. The reduced pay made tunnelling jobs less desirable (Smale 2018)

In 2018, Park Health (specialists in occupational hygiene and fatigue risk management) was engaged to the project to effectively monitor the shift patterns, manage fatigue and explore the possibility of safely extending work shifts to 12 hours. Based on the analysis of the project data, it was decided to enforce a maximum ten-hour shift length instead of eight hours. It was specified that workers must not spend more than 10 hours underground. The ten-hour shift included one-hour pre-shift to prepare workers for healthy and safe work and one-hour post shift, so workers could go home equally as healthy and safe. In addition, the contractors needed to develop a fatigue management plan and provide it to the project team at Tideway to ensure measures were in place to prevent workers becoming overly tired.

Other factors to consider were shift rotation and the number of consecutive night shifts or day shifts that contractors worked. As shift rotations can increase fatigue, it was necessary to allocate recovery time to workers.

A key aspect of implementing the change was developing a positive culture of supporting wellbeing on the project which was reinforced by working closely with shift leaders and providing training to develop an awareness of their own fatigue management. As a

representative from Park Health explained:

*“Reducing the length of a shift is not a silver bullet when it comes to managing fatigue. The social, cultural and financial needs of the workforce have to be considered alongside their personal wellbeing but, equally, it is the duty of every employee to ensure they get enough rest. An employer cannot make an employee sleep but recognising that and each of us taking responsibility for getting enough rest means we all contribute to a safer working environment for everyone.”* (Park Health 2020).

## Construction contracting organisations

The case studies presented in Chapter 4 indicate that some Australian construction contracting organisations recognise the importance of enabling workers to experience a balance between work and other aspects of their lives. This is also evidenced by the introduction of the five-day week by Roberts Pizzarotti (now Roberts Co) at the Concord Hospital project in Sydney. Several other construction companies are adopting similar work hour reduction/modification regimes at their sites. This is reported to be in recognition of the fact that young Australian engineers and graduates are unwilling to work 12-hour days, six days a week (Wiggins 2019).

However, other construction companies appear to be concerned that changing work hours will potentially increase costs or expose companies to the risk of program slippage and financial penalties. It is therefore extremely important that case study evidence is collected from projects across a diversity of industry sectors, and delivered using a variety of commercial arrangements, in order to measure and document the benefits, as well as the costs associated with work hour reduction/modification measures.

The case study evidence from the Concord Hospital project is eagerly awaited and the replication of this work in other ‘live’ construction projects is critically important.

## Subcontractors

Construction relies on a complex, multi-level system of subcontracting. Principal contractors, usually larger players in the market, acknowledge that their actions have an impact on subcontractors. For example, in a review of factors impacting mental health in the construction industry, one industry leader observed: *“...we’re often required or requested to meet ridiculous timetables and timeframes which, in an effort to win the work, you will say yes to, and then you just simply pass it down onto your subcontractor workforce.”*

Importantly, some principal contractors are trying to alleviate this pressure. For example, at the Concord Hospital project, Roberts Pizzarotti (now Roberts Co) reduced the imposition of liquidated damages on its subcontractors and suppliers engaged at the project to ease time pressure and stress (Wiggins 2019).

Subcontractors may also have concerns about the cost implications of reducing or modifying work hours in projects. In the published literature, subcontractors’ experiences or preferences are rarely reported. However, in a study relating to working time and work-life impacts in small-to-medium sized

construction enterprises, Lingard et al. (2015) report that subcontractors attribute long work hours to the pressures imposed upon them by their clients (principal contractors) which result in long work days of up to 15 hours, and little opportunity for time off. For example, one crane operator described how it was not unusual for him to work 14 days “*straight*”.

Exploring the experiences and perceptions of subcontractors will form an important part of the Delphi study component of the CICT research activity stream.

## Workers

As was evidenced by the construction industry case studies presented in Chapter 4, workers (both waged and salaried) responded positively to a modified weekly work schedule that allowed them to have two days off at the weekend. The benefits of this were perceived to be more opportunity to rest and recover from work, as well as the ability to spend time with family and friends.

However, a critical factor shaping workers’ responses to working time modifications related to whether work schedule changes were accompanied with reductions in remuneration or not. For salaried workers, work hour reductions typically do not result in lost income because salaries are fixed irrespective of hours worked. However, for waged workers, working time reductions or modifications can have significant implications for remuneration. This is particularly the case when Saturday work is eliminated in situations where working on Saturdays is paid at a higher hourly rate.

It was evident in case studies one and four (presented in Table 2) that, where a five-day week was introduced without commensurate lengthening of the working days, the impacts on remuneration acted as a disincentive for waged workers to opt into the five-day week schedule (case study 4) or resulted in workers seeking alternative employment at a project where a six-day week could be worked (case study 1).

These cases show the possible unintended consequences that can arise as a result of working time reduction interventions and highlight the importance of understanding the experiences and priorities of waged and salaried workers when designing working time regimes. It is likely that an extension of the working day and a reduction of the working week (such as has been implemented at the Concord Hospital project) may be easier to implement than a straight reduction in work hours.

Exploring the experiences and perceptions of construction industry workers (both waged and salaried) will form an important part of the Delphi study component of the CICT research activity stream.

## Unions

Unions are fundamental to changing workplace attitudes and conditions concerning work hours. This is evidenced by international case studies. For example, IG Metall, one of the largest unions in Germany, and the Communications Workers Union in the UK both successfully negotiated reduced working weeks to improve workers’ health and encourage employers to move away from traditional gender roles and improve gender equity (Stronge et al. 2019).

For many years, working time in the Australian construction industry (at least in large projects in the commercial building and engineering sectors) has been determined by enterprise bargaining processes and trade unions are therefore key stakeholders in the consideration and introduction of modified working time arrangements.

In 2018, the Construction, Forestry, Maritime, Mining, and Energy Union (CFMMEU) Queensland branch negotiated a landmark deal reducing weekly hours from 58 to 50 per week. Under the revised schedule Saturday work was eliminated and a new normal work week of ten-hour weekdays was introduced. This change was made in response to growing demand from workers to reclaim their weekends for leisure and spending time with family (O'Sullivan 2018). More recently agreements between the construction union and a number of large construction companies in the NSW construction industry have also paved the way for the introduction of a five-day week in some projects (see Chapter 1).

Given their critical role in shaping industry working time practices, as well as their representation of a large proportion of waged workers in the construction industry, understanding the perspective of construction industry trade unions will form an important part of the Delphi study component of the CICT research activity stream.

## Conclusion

A variety of industry stakeholders are involved in the procurement and delivery of construction projects and have an interest in or are impacted by project timelines and/or working time regimes. Examples are emerging of client-led interventions to place upper limits on hours worked during project delivery. Often these are driven by fatigue management programs. Concerns about mental health and wellbeing have also led a number of construction contracting organisations to implement a five day (Monday to Friday) work week in some of their projects. Anecdotal evidence suggests this is favourably received by both waged and salaried workers. Importantly the option to introduce a five-day week have been formalised in recently signed enterprise agreements between construction unions and a number of large principal contracting organisations in New South Wales. Key to the reduction or modification of work hours is the consideration of impacts on remuneration, i.e. the extent to which work hour reductions (or changes) are associated with commensurate pay reductions or not. It is noteworthy that, maxima weekly work hour thresholds imposed by some clients (see scenario 2) are still in excess of the threshold above which work hours are reported to impact mental health (47 for men and 34 for women). The gendered nature of the relationship between working time and health also raises questions about the viability of long work hours (albeit in compressed work week form) for women with substantial caring responsibilities.

The design of optimal working time regimes in the construction industry is likely to require a deep understanding of stakeholder values, expectations and preferences, and an open and honest conversation about where trade-offs can be made.

## Chapter 6. Discussion

In this chapter the findings from the literature and rapid review are synthesised and summarised to consider what strategies, policies or guidelines have been developed and implemented to address work hours to date and with what outcomes. Consideration is given to the available evidence relating to the need for change, the various models of working time reduction/modification that were discovered in the reviews and come important considerations in the design or implementation of working time modification/reduction strategies.

### Work hours, health and gender

There is a strong body of evidence to indicate that long and inflexible work hours are harmful to workers' health and wellbeing, both physical and mental. Among the adverse outcomes associated with long work hours are: poor mental health, depression and anxiety, stress at work and at home, fatigue, disrupted sleep, insufficient recovery opportunity, cardiovascular disease, diabetes and an increased risk of workplace injury.

Long work hours are also closely related to work interference with home or family life (work-family conflict) which is also a strong and consistent predictor of health outcomes, as well as health-related behaviours. The relationship between work hours, health and various aspects of wellbeing (including work-family conflict) have been demonstrated in international studies in many industries, as well as construction industry-specific research in the construction industry. Indeed, some Australian research revealed that work-family conflict among Australian construction workers is higher than many other occupational groups in international studies (Lingard et al. 2010b).

There is therefore a very strong health and wellbeing-based argument to be made for addressing long hours. The importance of work hour reduction is evidenced by analysis of a large Australian cohort study showing that mental health is negatively impacted when people work more than 39 hours a week. People working in project-based roles are reported to regularly, if not consistently, work more hours than 39 each week. Further, the relationship between work hours and health is gendered. On average women's mental health begins to decline above 34 hours of work per week, while, on average, men can work 47 hours a week before their mental health is adversely impacted. This is attributed to the larger proportion of domestic work undertaken by Australian women compared to men (Dinh et al. 2017b).

Thus, long work hours are not only an impediment to women's participation in project-based construction industry roles, but they are likely to produce significant inequalities in terms of health outcomes for project-based construction workers.

The industry's adherence to long and rigid hours of work is likely to reinforce traditional gender role stereotypes in the household. For families to manage female partners are likely to scale back their involvement in paid work and to absorb the largest share of the domestic/household workload. This will perpetuate salary inequity and the gap between women's and men's retirement savings accrued through superannuation contributions. The persistence of long work hours can therefore be seen as a source of structural economic disadvantage for women over time even while it reinforces gender-based work-care divisions within families.

On the basis of this evidence, the equity/diversity case for reducing work hours in the construction industry also appears to be very strong. However, questions as to how work hours should be reduced or modified are harder to answer based on the extant literature.

## **Working time interventions in construction**

To date, very limited research has been conducted (or at least published in peer-reviewed outlets) that evaluates working time reduction or modification interventions in the construction industry. The few published intervention studies that could be found had some common characteristics. They were all undertaken in the construction industry in Queensland, in civil engineering projects that were being delivered as project alliances. This means that the findings from these intervention-studies cannot be generalised to the construction industry as a whole. In two of these projects, the working time modification implemented involved the compression of the work week, i.e., lengthening daily work hours but reducing the number of days worked each week. The evaluation studies suggest some positive impacts associated with the work hour modification, including reduced work-family conflict and increased satisfaction with the balance between work and non-work life. Given the links between work-family conflict and health, this is a positive result.

However, these intervention studies also revealed that waged workers were supportive of the modified work hours only to the extent that their income was not impacted. Waged workers repeatedly mentioned their dissatisfaction and concerns regarding the loss of income as a result of no weekend work and therefore no weekend penalty pay rates. Although waged workers experienced improvements in their health, this was considerably less than their salaried counterparts (who experience no change in remuneration). Where construction projects changed to a five-day week without extending the working days (thereby impacting the pay of workers paid an hourly wage), the interventions were not supported.

This finding highlights the balance that needs to be struck when designing working time regimes in construction between the costs and benefits associated with the different approaches implemented. In this case, there is a need to fully understand the value that different segments of the workforce place on being on-the-job and off-the-job and the trade-offs people are willing to make between leisure time and income.

It is also noteworthy that research in industries other than construction suggests that reducing work hours with a commensurate reduction in pay can negate the health benefits of the work hour reduction and, in some instances, negatively affect health and/or increase stress (De Spiegelaere & Piasna 2017; Seifert & Trinczek 2000).

## General strategies for reducing/modifying working time

The review documents a broader range of working time reduction/modification interventions that have been implemented and evaluated outside the construction industry. Table 3 summarises the advantages and disadvantages of six working time reduction/modification general strategies.

Table 3: General strategies for reducing work time (advantages, disadvantages and comments)

Strategies	Advantages	Disadvantages	Comments
Compressed work week	<ul style="list-style-type: none"> <li>- Improved work-life balance and family life</li> <li>- Improvement in eating habits</li> <li>- Decline in workplace accidents and absenteeism</li> <li>- No loss of pay to workers</li> <li>- Minimal cost to employers and contractors</li> <li>- The favoured strategy in construction to date</li> </ul>	<ul style="list-style-type: none"> <li>- No change in sleep outcomes</li> <li>- Physical fatigue (aches and pains) worsened</li> <li>- Unlikely to improve gender equity</li> <li>- Potential increase in work intensification</li> </ul>	<ul style="list-style-type: none"> <li>- This is the strategy most favoured by the construction industry</li> <li>- This is not a reduced hour strategy but a reduced day strategy</li> <li>- It will enable better rest and recovery time on weekends but unlikely to achieve gender equity goals</li> <li>- Productivity impacts are currently unknown</li> <li>- Workloads need to be addressed so as to reduce the risk of intensification and overload</li> </ul>
Reduced working hours: no loss of remuneration	<ul style="list-style-type: none"> <li>- Improved work-life balance</li> <li>- Improved general health and stress levels</li> <li>- Increased productivity</li> <li>- Address worker and unions concerns (especially male workers)</li> </ul>	<ul style="list-style-type: none"> <li>- Work intensification</li> <li>- High financial burden to employers or government</li> </ul>	<ul style="list-style-type: none"> <li>- Depending on degree of the reduction likely to improve gender equity and work-life balance, as well as health</li> <li>- Costs borne mostly by employers</li> <li>- Government supports or incentives likely to be needed</li> </ul>
Reduced working hours: loss of remuneration	<ul style="list-style-type: none"> <li>- Increased productivity</li> <li>- Job retention</li> </ul>	<ul style="list-style-type: none"> <li>- Increased stress</li> <li>- Work intensification</li> <li>- Significant wage loss/financial cost to workers and families</li> <li>- No change in unpaid work distribution by gender</li> <li>- Some cost to employers</li> </ul>	<ul style="list-style-type: none"> <li>- If significant financial stress occurs this is unlikely to improve health and may lead to multiple job holding undermining benefits</li> <li>- However, may attract more women into the industry</li> <li>- As per above, financial supports or incentives for workers needed</li> </ul>
Six-hour day	<ul style="list-style-type: none"> <li>- Improved mental and physical health (stress, energy, fatigue, physical activity, general health)</li> <li>- Improved work-life balance</li> <li>- Greater time for relaxing and recuperating</li> <li>- Creation of new jobs</li> </ul>	<ul style="list-style-type: none"> <li>- Increased productivity</li> <li>- Work intensification</li> <li>- May introduce rostering or scheduling difficulties</li> <li>- Increased costs to employers</li> </ul>	<ul style="list-style-type: none"> <li>- Likely to improve health, productivity, work-life balance and gender diversity</li> <li>- Offers better use of capital and ability to meet timelines. If pay remains as per before major financial costs to employers</li> </ul>
Free time options/job sharing	<ul style="list-style-type: none"> <li>- Greater time with friends and family</li> <li>- May increase non routine health behaviours</li> </ul>	<ul style="list-style-type: none"> <li>- Scheduling and administrative difficulties</li> </ul>	<ul style="list-style-type: none"> <li>- Minor benefits, but free time unlikely to deliver major benefits to health, work-life balance or gender equity</li> <li>- Job sharing has similar pros and cons to the six-hour day (above)</li> </ul>
Reduced working week through industry standard	<ul style="list-style-type: none"> <li>- Job creation</li> <li>- Improved work-life balance</li> <li>- Reduction in part-time work by women</li> <li>- Level playing field for contracts and less pressure on timeline</li> </ul>	<ul style="list-style-type: none"> <li>- Work intensification and potential health/fatigue risk</li> </ul>	<ul style="list-style-type: none"> <li>- An industry wide standard would put all contracts on the same footing, allowing for corresponding shifts in costing and timelines that are consistent</li> <li>- Project programs need to be carefully considered and workloads need to be reduced to avoid intensification</li> </ul>

The first point to make is that no single strategy can be identified as the best or most effective. Each of these strategies has advantages and disadvantages.

Generally speaking, the evidence suggests these strategies all produce benefits relating to improvements in health, wellbeing, satisfaction with the balance between work and non-work life and reductions in work-family conflict. In some cases, productivity was reported to increase, and accidents and absenteeism were reduced. The majority of these studies did not report differences between the experience of men and women in relation to these working time reductions or modification approaches. Neither were gender diversity outcomes assessed in the evaluation studies, possibly because these changes are likely to be observed over the longer term than the study permitted.

Some studies reported that women were more likely to use free time work hour reduction options on a regular (sometimes daily basis) to reduce time pressure and help them to accommodate domestic and caring responsibilities. In contrast, men more frequently chose to accumulate time and take leave in blocks of consecutive days. This finding reveals an important difference in the type of working time reduction/modification strategy that women need to balance their paid and unpaid workloads and the types of work time reduction that male workers would prefer. It is critical that the preferences of female and male workers are understood and considered in the design of work time reduction/modification interventions.

In the interests of promoting a diverse construction workforce, the preferences of workers in different age groups should also be considered. There is some evidence from the international (non-construction) research that the provision of work hour reduction interventions had a positive impact in the retention of older workers. Given the aging Australian workforce, the extent to which working time reduction can facilitate successful and healthy aging at work should be considered in the construction industry context.

## **Who bears the cost of working time reductions/modifications?**

Kümmerling and Lehdorf (2014) note that the question of who pays for working time reductions or modifications is one of the most contentious issues in their design and implementation.

The costs and benefits of the various approaches are differentially borne by parties involved in their implementation. In some arrangements, employers' costs may increase, but these may be offset by other benefits, such as increased productivity and reduced presenteeism or sickness absence. In other models, workers may bear costs in terms of wage reductions, raising questions about the wage-leisure trade-offs that people are willing to make. As noted above, when waged workers lose income they are often unsupportive of working time reductions, irrespective of the potential health and wellbeing benefits associated with the reductions.

Some international working time reduction regimes have been implemented with the support of government subsidies to offset the implementation costs experienced by employers or workers. For example, in Sweden, a change from an eight to a six-hour day was funded by the government. This study reported impressive improvements in stress, general health, physical activity and fatigue in those working the shorter shifts. However, the scheme was deemed financially unsustainable and was subsequently discontinued. This study highlights the importance of thorough cost-benefit analyses and the challenges associated with achieving the delicate balance between avoiding income loss for workers, and financial viability of work hour reduction strategies.



The review highlights the critical importance of undertaking a rigorous analysis of the costs and benefits associated with working time reductions or modifications to fully understanding the impacts and success of these strategies. The questions of who pays for working time reductions, what are the benefits/trade-offs, and what outcomes flow from the implementation of these strategies was not comprehensively examined in the previous construction industry studies - although more detailed work is currently underway at the Concord Hospital construction project.

Before firm conclusions can be drawn about the financial viability of the various models of working time reduction/modification in the construction context, more in-depth and comprehensive analysis than is available in the published literature, is required.

This analysis is made more complex because some of the benefits associated with working time reductions, such as improved worker health (particularly across the lifespan) will not manifest for a relatively long time and will produce beneficial cost reductions to stakeholders outside the enterprise or organisation within which the working time reduction or modification strategy was implemented. This can be seen for example, in the reduction of medical costs and/or social welfare payments associated with poor health, work disability and early retirement from work.

Other benefits, associated with improving the quality of jobs and employment in the construction industry, increasing gender diversity and the industry's ability to retain older workers and attract young workers are immensely important, but likely to occur over the longer term and are also difficult to attribute a monetary value to.

Another important consideration relates to how the costs and benefits associated with working time reductions/modifications filter down through the construction industry's supply chains and networks. The vast majority of firms in the construction industry are small-to-medium sized enterprises and it is important to also consider how these firms will practically implement working time changes, particularly in the context of a multi-tiered subcontracting system that can place undue time and production pressures on operators at lower levels in the supply chain.

## **Lack of data on stakeholder viewpoints**

The paucity of published literature regarding key stakeholders' perceptions or experiences of working time reductions/modifications is concerning. Very little publicly available analysis of industry or workers' viewpoints could be found, beyond a few recent reports in the mainstream media. Many key perspectives are therefore yet to be rigorously investigated, particularly in relation to client, subcontractor and union viewpoints, preferences and experiences. This is urgently needed because the success of a work hour reduction strategy will ultimately hinge on understanding and addressing the concerns and barriers specific to each group and working to overcome these to reach a consensus about suitable models for implementation. Furthermore, if gender inequality is to be addressed in the industry, both men and women must be represented and given a voice in this research. Workers in different age brackets and life stages, as well as young people considering entry into the industry should also be canvassed.

Importantly, the role played by the contracting strategy and commercial framework underpinning the delivery of a construction project in shaping what is possible in relation to working time modification also needs further investigation. Previous work hour reduction/modification strategies have been implemented and evaluated at projects delivered using an alliance method of delivery. Arguably the basis in which risks and rewards are shared between clients and construction organisations under

these project delivery arrangements make these conditions ideal for the implementation of alternative work schedules. However, opportunities to implement work hour reduction or modification strategies in more traditionally procured 'hard dollar' projects have been questioned by some industry participants in previous evaluation studies. It is therefore critical that working time reduction or modification strategies are understood in a broader framework of industry reform that consider commercial arrangements and equitable and fair risk allocation in client-contractor contracts.

## Limitations

On the basis of the available research evidence it is very difficult to clearly identify what sorts of reductions would deliver the gains needed for the industry (through increased diversity, productivity, innovation) and its workforce (through improved health, work-life balance and financial security).

Our analysis and comments are limited by the small number of trials reported in the literature, particularly in relation to the construction industry. Where we were able to access evaluations there was strong evidence for potential benefits associated with working time reductions, especially for workers' health and wellbeing, including the balance between work and non-work life.

The studies that were found in the construction industry, in which working time modifications had been implemented and evaluated were all relatively old and the research was narrowly focused in terms of the outcomes that were examined.

For this reason, contemporary live case study projects are urgently required at which more detailed data can be collected, including an analysis of implementation costs and benefits (as well as how these are borne by different stakeholders), as well as productivity and project performance data. Critically, there is currently a severe lack of evidence associated with the impacts of work time reduction/modification strategies on women's experiences and ultimately gender diversity within the sector. Future studies must seek to over-sample women in data collection to fully understand their experiences, preferences and the way that work hour reduction/modification strategies impact their work and non-work lives, health and care outcomes.

The Concord Hospital study currently being undertaken by researchers from the University of New South Wales will provide important fresh evidence regarding the costs and benefits of a five-day week when the results of this study are publicly available.

Methodological and time restrictions limited the scope of both the rapid review and broader literature review such that the evidence presented is not exhaustive. Secondly, the screening in the rapid review was primarily undertaken by one author and is therefore subject to bias. Finally, no quality assessment of the evidence was undertaken in the rapid review.

# References

- Adam, B 1995, *Timewatch: the Social Analysis of Time*, Cambridge, UK: Polity.
- Ahlstrand, R 2015, 'Integrative strategy, competitiveness and employment: A case study of the transition at the Swedish truck manufacturing company Scania during the economic downturn in 2008–2010', *Economic and Industrial Democracy* 36 (3), pp. 457-477.
- AI Group 2015, 'AI Group Australia's Construction Industry: Profile and Outlook', July 2015.
- Alvanchi, A, Lee, S, & AbouRizk, S 2012, 'Dynamics of working hours in construction', *Journal of Construction Engineering and Management*, 138 (1), pp. 66-77.
- Amagasa, T, Nakayama, T. & Takahashi, Y 2005, 'Karojisatsu in Japan: characteristics of 22 cases of work-related suicide', *Journal of Occupational Health* 47 (2), pp. 157-164.
- Anttila, T, Nätti, J & Väisänen, M 2005, 'The experiments of reduced working hours in Finland: impact on work–family interaction and the importance of the sociocultural setting', *Community, Work and Family* 8 (2), pp. 187-209.
- Artazcoz, L, Cortès, I, Escribà-Agüir, V, Cascant, L & Villegas, R 2009, 'Understanding the relationship of long working hours with health status and health-related behaviours', *Journal of Epidemiology & Community Health* 63 (7), pp. 521-527.
- Ashford, N, & Kallis, G 2013, 'A Four-day Workweek: a Policy for Improving Employment and Environmental Conditions in Europe', *The European Financial Review*, pp. 53-59.
- Askenazy, P 2013, 'Working time regulation in France from 1996 to 2012', *Cambridge Journal of Economics*, 37 (2), pp. 323-347.
- Bambra, C, Whitehead, M, Sowden, A, Akers, J & Petticrew, M 2008, '"A hard day's night?" The effects of Compressed Working Week interventions on the health and work-life balance of shift workers: a systematic review', *Journal of Epidemiology & Community Health* 62 (9), pp. 764-777.
- Bannai, A, & Tamakoshi, A, 2014, 'The association between long working hours and health: a systematic review of epidemiological evidence', *Scandinavian Journal of Work, Environment & Health*, 40 (1), pp. 5-18.
- Beckers, D. G, van der Linden, D, Smulders, P. G, Kompier, M. A, Taris, T. W, & Geurts, S. A, 2008, 'Voluntary or involuntary? Control over overtime and rewards for overtime in relation to fatigue and work satisfaction', *Work & Stress*, 22 (1), pp. 33-50.
- Berg, P, Bosch, G & Charest, J 2014, 'Working-time configurations: A framework for analyzing diversity across countries', *ILR Review* 67 (3), pp. 805-837.
- Berggren, C, Söderlund, J & Anderson, C 2001, 'Clients, contractors, and consultants: The consequences of organizational fragmentation in contemporary project environments', *Project Management Journal* 32 (3), pp. 39-48.
- Berman, D 2009, 'Cost-benefit analysis of a four 10-hour day work week in construction (Unpublished thesis, University of Florida, Florida)', Retrieved from University of Florida Digital Collections <<https://ufdc.ufl.edu/UFE0024436/00001>>.
- Bosch, G & Lehnendorff, S 2001, 'Working-time reduction and employment: experiences in Europe and economic policy recommendations', *Cambridge Journal of Economics*, 25 (2), pp. 209-243.

Boschman, J, Van der Molen, H, Sluiter, J & Frings-Dresen, M 2013, 'Psychosocial work environment and mental health among construction workers', *Applied Ergonomics* 44 (5), pp. 748-755.

Bouziri, H, Smith, D. R, Descatha, A, Dab, W, & Jean, K 2020, 'Working from home in the time of covid-19: how to best preserve occupational health?', *Occupational and Environmental Medicine*, 77 (7), pp. 509-510.

Bowen, P, & Zhang, R. P 2020, 'Cross-Boundary Contact, Work-family conflict, antecedents, and consequences: Testing an integrated model for construction professionals', *Journal of Construction Engineering and Management*, 146 (3).

Bowen, P, Govender, R, Edwards, P, & Cattell, K 2018, "Work-related contact, work–family conflict, psychological distress and sleep problems experienced by construction professionals: An integrated explanatory model", *Construction Management and Economics*, 36 (3), pp. 153-174.

Brauner, C, Wöhrmann, A, Frank, K & Michel, A 2019, 'Health and work-life balance across types of work schedules: A latent class analysis', *Applied Ergonomics*, 81.

Brettschneider, A 2014, 'Intergenerational Bargaining-National Report', *InGenBar*, Germany, <[http://intergenerationalbargaining.eu/uploads/backbone/upload/asset/90/INGENBAR\\_-\\_Country\\_report\\_Germany\\_FINAL\\_jan15.pdf](http://intergenerationalbargaining.eu/uploads/backbone/upload/asset/90/INGENBAR_-_Country_report_Germany_FINAL_jan15.pdf)>

Brin, D 2019, 'France and Spain: Right to Disconnect Spreads', available from <<https://www.shrm.org/resourcesandtools/legal-and-compliance/employment-law/pages/global-france-spain-right-to-disconnect.aspx>>.

Brown, K, Bradley, L, Lingard, H, Townsend. K, & Ling, S 2010, 'Working time arrangements and recreation: making time for weekends when working long hours', *Australian Bulletin of Labour*, 36 (2), p. 194.

Brown, K, Bradley, L, Lingard, H, Townsend. K, & Ling, S 2011, 'Labouring for leisure? Achieving work-life balance through compressed working weeks', *Annals of Leisure Research*, 14 (1), pp. 43-59.

Bridges, D, Wulff, E, Bamberry, L, Krivokapic-Skoko, B, & Jenkins, S 2020, 'Negotiating gender in the male dominated skilled trades: a systematic literature review', *Construction Management and Economics*, 14 (1), pp. 1-23.

Bryce, T, Far. H, & Gardner, A 2019, 'Barriers to career advancement for female engineers in Australia's civil construction industry and recommended solutions', *Australian Journal of Civil Engineering*, 17 (1), pp. 1-10.

Burke, R. J, Singh, P, & Fiksenbaum, L, 2010, 'Work intensity: potential antecedents and consequences', *Personnel Review*, 39 (3), pp. 347–360.

Butt, J 2021, 'EU to protect the "Right to Disconnect" from Work', *HSEQ*, available at <<https://myosh.com/blog/2021/02/12/europe-to-protect-the-right-to-disconnect-from-work/>>.

Cabinet Office 2020, 'The Construction Playbook: Government Guidance on sourcing and contracting public works projects and programmes', UK Government, <<https://www.gov.uk/government/publications/the-construction-playbook>> (Version 1.0).

Cahuc, P & Carcillo, S 2011, "Is short-time work a good method to keep unemployment down?" *Nordic Economic Policy Review*, 1 (1), pp. 133-165.

Caligiuri, P, De Cieri, H, Minbaeva, D, Verbeke, A, & Zimmermann, A 2020, 'International HRM insights for navigating the COVID-19 pandemic: Implications for future research and practice', *Journal of International Business Studies*, 1.

- Campbell, K & Mínguez-Vera, A 2008, 'Gender diversity in the boardroom and firm financial performance', *Journal of Business Ethics*, 83 (3), pp. 435-451.
- Caruso, C. C 2006, 'Possible broad impacts of long work hours', *Industrial Health*, 44 (4), pp. 531-536.
- Cattell, K, Bowen, P, Cooper, C & Edwards, P 2017, 'The State of Well-Being in the Construction Industry', *The Chartered Institute of Building*, < <https://www.ciob.org/industry/research/state-Wellbeing-Construction-Industry>>.
- Charlesworth, S, Strazdins, L, O'Brien, L, & Sims, S 2011, 'Parents' jobs in Australia: Work hours polarisation and the consequences for job quality and gender equality', *Australian Journal of Labour Economics*, 14 (1), pp. 35-57.
- Cunningham, J 1989, 'A compressed shift schedule: Dealing with some of the problems of shift-work', *Journal of Organizational Behaviour*, 10 (3), pp. 231-245.
- De Spiegelaere, S & Piasna, A 2017, *The why and how of working time reduction*, European Trade Union Institute.
- Dembe, A. E 2011, 'Factors shaping the development of working time regulation in the United States and Europe', *International Labour Review*, 150 (3-4), pp. 419-429.
- Dembe, A. E, Erickson, J. B, Delbos, R. G, & Banks, S. M 2005, 'The impact of overtime and long work hours on occupational injuries and illnesses: new evidence from the United States', *Occupational & Environmental Medicine*, 62 (9), pp. 588-597.
- Devine, C. M, Stoddard, A. M, Barbeau, E. M, Naishadham, D & Sorensen, G 2007, 'Work-to-family spillover and fruit and vegetable consumption among construction laborers', *American Journal of Health Promotion*, 21, pp. 175-181.
- Díaz-García, C, González-Moreno, A & Jose Saez-Martinez, F 2013, 'Gender diversity within R&D teams: Its impact on radicalness of innovation', *Innovation* 15 (2), pp. 149-160.
- Dinh, H, Cooklin, A. R, Leach, L. S, Westrupp, E. M, Nicholson, J. M & Strazdins, L 2017a, 'Parents' transitions into and out of work-family conflict and children's mental health: Longitudinal influence via family functioning', *Social Science & Medicine*, 194, pp. 42-50.
- Dinh, H, Strazdins, L & Welsh, J 2017b, 'Hour-glass ceilings: Work-hour thresholds, gendered health inequities', *Social Science & Medicine*, 176, pp. 42-51.
- Dixon, J, Banwell, C, Strazdins, L, Corr, I & Burgess, J 2019, 'Flexible employment policies, temporal control and health promoting practices: A qualitative study in two Australian worksites', *PloS one* 14 (12).
- Dong, X 2005, 'Long workhours, work scheduling and work-related injuries among construction workers in the United States', *Scandinavian Journal of Work, Environment & Health*, pp. 329-335.
- Duchon, J. C, Keran, C. M & Smith, T.J 1994, 'Extended workdays in an underground mine: a work performance analysis', *Human Factors*, 36 (2), pp. 258-268.
- Duchon, J. C, Smith, T. J, Keran, C. M & Koehler, E. J 1997, 'Psychophysiological manifestations of performance during work on extended workshifts', *International Journal of Industrial Ergonomics*, 20 (1), pp. 39-49.
- Fagan, C & Walthery, P 2011, 'Job quality and the perceived work-life balance fit between work hours and personal commitments: A comparison of parents and older workers in Europe', S. Drobnič & A. Guillén, *Work-Life Balance in Europe*, Palgrave Macmillan, London. pp. 69-94.

- Farzan, A 2021, 'Spain to trial a four-day work week', *Sydney Morning Herald*, 16 March, <<https://www.smh.com.au/world/europe/spain-to-trial-a-four-day-work-week-20210316-p57b23.html>>.
- Francis, V 2017, 'What influences professional women's career advancement in construction?', *Construction Management and Economics*, 35 (5), pp. 254-275.
- Galea, N, Abigail, P, Loosemore, M & Chappell, L 2015, 'Designing robust and revisable policies for gender equality: lessons from the Australian construction industry', *Construction Management and Economics*, 33 (5-6), pp. 376-389.
- Galea, N, Powell, A, Loosemore, M & Chappell, L 2016, *Demolishing gender structures*. Retrieved from <<https://www.humanrights.unsw.edu.au/news/demolishing-gender-structures>>.
- Galea, N, Powell, A, Loosemore, M & Chappell, L 2018, 'Demolishing gender structures', *UNSW*, <[https://www.humanrights.unsw.edu.au/sites/default/files/2018-09/Construction\\_Report\\_Final.pdf](https://www.humanrights.unsw.edu.au/sites/default/files/2018-09/Construction_Report_Final.pdf)>.
- Gällstedt, M 2003, 'Working conditions in projects: perceptions of stress and motivation among project team members and project managers', *International Journal of Project Management*, 21 (6), pp. 449-455.
- Garritty, C, Gartlehner, G, Nussbaumer-Streit, B, King, V. J, Hamel, C, Kamel, C, Affengruber, L & Stevens, A 2020, 'Cochrane Rapid Reviews Methods Group offers evidence-informed guidance to conduct rapid reviews', *Journal of Clinical Epidemiology*.
- Gilbert, M 1997, 'Longer days, shorter weeks: compressed work weeks in policing', *Public Personnel Management*, 26 (3), pp. 391-403.
- Gingerich, S. B, Seaverson, E. L & Anderson, D. R 2018, 'Association between sleep and productivity loss among 598 676 employees from multiple industries', *American Journal of Health Promotion*, 32 (4), pp. 1091-1094.
- Golden, L, Wiens-Tuers, B, Lambert, S. J, & Henly, J. R 2011, 'Working time in the employment relationship: Working time, perceived control and work-life balance', in K Townsend and A Wilkinson (eds), *Research handbook on the future of work and employment relations*, Edward Elgar, Cheltenham. pp. 188-211.
- Goldenhar, L. M, Hecker, S, Moir, S, & Rosecrance, J 2003, 'The "Goldilocks model" of overtime in construction: not too much, not too little, but just right', *Journal of Safety Research*, 34 (2), pp. 215-226.
- Griffin, I. 2008, 'Jobs saved as workers agree to reduced hours', *Leicester Mercury*, November 17, 12.
- Haar, J 2018, 'Overview of the perpetual guardian 4-day (paid 5) work trial [Industry report]', *Auckland University of Technology*.
- Hallin, H 2020, 'Home-Based Telework During the Covid-19 Pandemic', *School of Health, Care and Social Welfare*, Mälardalen University Sweden.
- Härmä, M 2006, 'Workhours in relation to work stress, recovery and health', *Scandinavian Journal of Work, Environment & Health*, pp. 502-514.
- Hayden, A 2006, 'France's 35-hour week: Attack on business? Win-win reform? Or betrayal of disadvantaged workers?', *Politics & Society* 34 (4), pp. 503-542.
- Hayford, O 2020, 'Where to next for risk allocation on Australian mega projects and PPPs?', *Society of Construction Law Australia*.
- Heller, T. S, J. L Hawgood & D. D Leo 2007, 'Correlates of Suicide in Building Industry Workers', *Archives of Suicide Research*, 11(1), pp. 105-117.

Holdsworth, S, Turner, M, Scott-Young, C.M, & Sandri, K 2020, 'Women in Construction: Exploring the Barriers and Supportive Enablers of Wellbeing in the Workplace', *RMIT University*, Melbourne.

ILO 2019, 'Guide to developing balanced working time arrangements', Geneva, International Labour Office.

Kecklund, G 2005, 'Long workhours are a safety risk — causes and practical legislative implications', *Scandinavian Journal of Work, Environment & Health*, 31 (5), pp. 325-327.

Keran, C. M, Duchon, J. C & Smith, T.J 1994, 'Older workers and longer work days: are they compatible?', *International Journal of Industrial Ergonomics*, 13(2), pp. 113-123.

Kotera, Y, Green, P, & Sheffield, D 2019, 'Work-life balance of UK construction workers: Relationship with mental health', *Construction Management and Economics* 38 (4).

Koukoulaki, T 2014, 'The impact of lean production on musculoskeletal and psychosocial risks: An examination of sociotechnical trends over 20 years', *Applied Ergonomics*, 45 (2), pp. 198-212.

Kristensen, T. S, Bjorner, J. B, Christensen, K. B, & Borg, V 2004, 'The distinction between work pace and working hours in the measurement of quantitative demands at work', *Work & Stress*, 18 (4), pp. 305-322.

Kümmerling, A & Lehndorff, S 2014, 'The use of working time-related crisis response measures during the Great Recession', *Conditions of Work and Employment Series*, 44, International Labour Office, Geneva.

Lehndorff, S 2007, 'Flexibility and control: New challenges for working-time policy in the European Union', *Labour & Industry: a journal of the social and economic relations of work*, 17 (3), pp. 9-28.

Lingard, H, Brown, K, Bradley, L, Bailey, C, & Townsend, K, 2007, 'Improving employees' work-life balance in the construction industry: Project alliance case study', *Journal of Construction Engineering and Management*, 133 (10) pp. 807-815.

Lingard, H & Francis, V 2004, 'The work-life experiences of office and site-based employees in the Australian construction industry', *Construction Management and Economics*, 22 (9), pp. 991-1002.

Lingard, H & Francis, V 2008, 'An exploration of the adaptive strategies of working families in the Australian construction industry', *Engineering, Construction and Architectural Management*, 15 (6), pp. 562-579.

Lingard, H & Francis, V 2009, *Managing Work-Life Balance in Construction*. Independence: Routledge, 2009.

Lingard, H Francis, V & Turner, M 2010a, 'Work-family conflict in construction: Case for a finer-grained analysis', *Journal of Construction Engineering and Management*, 136 (11), pp. 1196-1206.

Lingard, H, Francis, V & Turner, M 2010b, 'The rhythms of project life: a longitudinal analysis of work hours and work-life experiences in construction', *Construction Management and Economics*, 28(10): pp. 1085-1098.

Lingard, H, Francis, V, & Turner, T 2012, 'Work-life strategies in the Australian construction industry: Implementation issues in a dynamic project-based work environment', *International Journal of Project Management*, 30, pp. 282-295.

Lingard, H & Harley, J 2020, 'Mental health in the construction industry', (submission to the Australian Government Productivity Commission).

Lingard, H, Townsend, K, Bradley, L & Brown, K 2008, 'Alternative work schedule interventions in the Australian construction industry: a comparative case study analysis', *Construction Management and Economics* 26 (10), pp. 1101-1112.

Lingard, H & Turner, M 2015, 'Improving the health of male, blue collar construction workers: a social ecological perspective', *Construction Management and Economics*, 33 (1), pp. 18-34.

Lingard, H & Turner, M 2018, 'Construction workers' health: Occupational and environmental issues', in F. Emuze and J. Smallwood (Eds), *Valuing people in construction*, Routledge, Abingdon: pp. 23-40.

Lingard, H Turner, M & Charlesworth, S 2015, 'Growing pains: Work-life impacts in small-to-medium sized construction firms', *Engineering, Construction and Architectural Management*. 22 (3), pp. 312 - 326.

Lombardi, D.A, Folkard, S, Willetts, J.L & Smith, G.S 2010, 'Daily sleep, weekly working hours, and risk of work-related injury: US National Health Interview Survey (2004–2008)', *Chronobiology international*, 27 (5), pp. 1013-1030.

Loosemore, M & Galea, N 2008, 'Genderlect and conflict in the Australian construction industry', *Construction Management and Economics*, 26 (2), pp. 125-135.

Lorentzon, B & Yang, F. 2020. Longitudinal, experimental evaluation of reduced weekly working hours for assistant nurses, ResearchGate.

Manfred, K 2015, 'Austria: Free time option in collective agreements', available at <<https://www.eurofound.europa.eu/publications/article/2015/austria-free-time-option-in-collective-agreements>>.

Marin-Guzman, D 2020, 'CFMEU claims deals with Lendlease, Multiplex', *Financial Review*, December 21, <<https://www.afr.com/work-and-careers/workplace/cfmeu-claims-deals-with-lendlease-multiplex-20201218-p56on3>>.

Marin-Guzman, D 2020, 'CFMEU faces historic challenge as builders refuse to buckle', *Financial Review*, December 22, <<https://www.afr.com/work-and-careers/workplace/cfmeu-faces-historic-challenge-as-builders-refuse-to-buckle-20201222-p56pio>>.

Marin-Guzman, D 2020, 'Lendlease becomes first major builder to strike deal with CFMEU', *Financial Review*, December 21, <<https://www.afr.com/work-and-careers/workplace/lendlease-becomes-first-major-builder-to-strike-deal-with-cfmeu-20201221-p56pc0>>.

Mates in Construction 2020, 'Why mates exists: The problem', <<https://mates.org.au/the-problem>>.

Mayhew, C, Quintan, M & Ferris, R 1997, 'The effects of subcontracting/outsourcing on occupational health and safety: survey evidence from four Australian industries', *Safety Science*, 25(1-3), pp. 163-178.

McDermott, V & Hayes, J 2018, 'Risk shifting and disorganization in multi-tier contracting chains: The implications for public safety', *Safety Science*, 106, pp. 263-272.

Milner, A, Spittal, M.J, Pirkis, J, Chastang, J.F, Niedhammer, I, & LaMontagne, A.D 2017, 'Low control and high demands at work as risk factors for suicide: an Australian national population-level case-control study', *Psychosomatic Medicine*, 79 (3), pp. 358-364.

Mirage 2021, 'NSW construction workers secure new EBAs with major builders', *Mirage News*, February 14, <<https://www.miragenews.com/nsw-construction-workers-secure-new-ebas-with-513979/>>

Naoum, S & Egbu, C 2015, 'Critical review of procurement method research in construction journals', *Procedia Economics and Finance*, 21, pp. 6-13.



- Smale, K 2018, 'Changing tunnellers' shift patterns', *New Civil Engineer*, January 16, <<https://www.newcivilengineer.com/archive/changing-tunnellers-shift-patterns-16-01-2018/>>.
- Nordqvist, S., Hovmark, S., & Zika-Viktorsson, A. (2004). Perceived time pressure and social processes in project teams. *International Journal of Project Management*, 22 (6), 463-468.
- NSW Government 2018, 'Construction procurement methods' (industry discussion paper), *Construction leadership group*.
- OECD 2021, 'GDP per hour worked', doi: 10.1787/1439e590-en, accessed on 22/2/2021.
- O'Sullivan, T 2018, 'CFMEU scraps weekend work in landmark deal over building code', *Masonry Contractors Australia*, <<https://masonrycontractors.com.au/2018/03/cfmeu-scraps-weekend-work-landmark-deal-building-code/>>.
- Ornstein, D 2019, 'More Countries Consider Implementing a "Right to Disconnect"', *The National Law Review*, Proskauer Rose LLP, 11.
- Park Health 2020, 'Shifting working hours to help stop fatigue', *Parks HS*, <<https://parkhs.co.uk/shifting-working-hours-to-help-stop-fatigue>>.
- Peltola, P 1998, 'Working time reduction in Finland', *Transfer: European Review of Labour and Research*, 4 (4), pp. 729-746.
- Persson, R, Helene Garde, A, Schibye, B, & Ørbæk, P 2006. 'Building-site camps and extended work hours: A two-week monitoring of self-reported physical exertion, fatigue, and daytime sleepiness', *Chronobiology International*, 23 (6), pp. 1329-1345.
- Productivity Commission 2019, 'Mental Health: Overview and Recommendations (Draft report)', Australian Government, Canberra.
- Recchi, E, Ferragina, E, Helmeid, E, Pauly, S, Safi, M, Sauger, N, & Schradie, J 2020. 'The "Eye of the Hurricane" Paradox: An Unexpected and Unequal Rise of Well-Being During the Covid-19 Lockdown in France', *Research in Social Stratification and Mobility*, 68, pp.100508-100508.
- Rosa, J. E, & Hon, C. K. H 2017, 'Challenges, success factors and strategies for women's career development in the Australian construction industry', *Construction Economics and Building*, 13 (3), pp. 27-46.
- Safety and Health Practitioner 2015, 'A vision of safety at Thames Tideway Tunnel', <<https://www.shponline.co.uk/transport-safety/thames-tideway-tunnel/>> (accessed 9/2/2021).
- Serrador, P & Turner, R 2015, 'The relationship between project success and project efficiency', *Project Management Journal*, 46 (1), pp. 30-39.
- Schneider, R 2018, 'Innovative working time policy in the service sector: Responses to working time policy challenges by service sector unions', (Working Paper) Forschungsförderung.
- Seifert, H & Trinczek, R 2000, 'New approaches to working time policy in Germany: the 28, 8 hour working week at Volkswagen company.' *WSI Working Papers*, 80.
- Sharkey, J, Greenham, P, Bell, M, Jovic, W, Korolkova, J & Hu, D 2020, 'The Health of the Australian Construction Industry', *University of Melbourne*, <<http://hdl.handle.net/11343/243044>>.
- Soderlund, J, 2005, 'What project management really is about: alternative perspectives on the role and practice of project management', *International Journal of Technology Management*, 32 (3-4), pp. 371-387.

- Spencer, D 2020, 'To reduce unemployment, companies should cut hours instead of laying off staff', *The Conversation*, August 10, <<https://theconversation.com/to-reduce-unemployment-companies-should-cut-hours-instead-of-laying-off-staff-143941>>.
- Strazdins, L, Baxter J. A & Li, J 2017, 'Long hours and longings: Australian children's views of fathers' work and family time', *Journal of Marriage and Family*, 79(4), pp. 965-982.
- Strazdins, L, D'Souza, R. M, Clements, M, Broom, D. H, Rodgers, B, & Berry, H. L 2011, 'Could better jobs improve mental health? A prospective study of change in work conditions and mental health in mid-aged adults', *Journal of Epidemiology & Community Health*, 65 (6), pp. 529-534.
- Stronge, W, Harper A & Guizzo, D 2019, 'The shorter working week: a radical and pragmatic proposal', *Autonomy*, London.
- Sunindijo, R. Y & Kamardeen, I 2017, 'Work stress is a threat to gender diversity in the construction industry', *Journal of Construction Engineering and Management* 143 (10).
- Swaen, G, Van Amelsvoort, L, Bültmann, U & Kant, I 2003, 'Fatigue as a risk factor for being injured in an occupational accident: results from the Maastricht Cohort Study', *Occupational and Environmental Medicine*, 60 (suppl 1), pp. 88-92.
- Takahashi, M, Iwasaki, K, Sasaki, T, Kubo, T, Mori, I, & Otsuka, Y 2011, 'Worktime control-dependent reductions in fatigue, sleep problems, and depression' *Applied Ergonomics*, 42 (2), pp. 244-250.
- Tammelin, M 2018, 'Introduction: Working time, family and wellbeing', in M Tammelin (Ed), *Family, Work and Well-being: Emergence of New Issues*, Springer, Cham, Switzerland, pp. 1-7.
- Tijani, B, Osei-Kyei, R & Feng, Y 2020, 'A review of work-life balance in the construction industry', *International Journal of Construction Management*, pp. 1-16.
- Townsend, K, Lingard, H, Bradley, L & Brown, K 2011, 'Working time alterations within the Australian construction industry', *Personnel Review*.
- Townsend, K, Lingard, H, Bradley, L & Brown, K 2012, 'Complicated working time arrangements: Construction industry case study', *Journal of Construction Engineering and Management* 138 (3), pp. 443-448.
- Tüchsen, F, Hannerz, H, & Spangenberg, S 2005, 'Mortality and morbidity among bridge and tunnel construction workers who worked long hours and long days constructing the Great Belt Fixed Link' *Scandinavian Journal of Work, Environment & Health*, 31 (Supp. 2), pp. 22-26.
- Turner, M, Lingard, H & Francis, V 2009, 'Work-life balance: an exploratory study of supports and barriers in a construction project', *International Journal of Managing Projects in Business*. Vol.2 (1), pp. 94-111.
- van der Hulst, M 2003, 'Long Workhours and Health', *Scandinavian Journal of Work, Environment & Health* 29 (3), pp. 171-188.
- Van Wanrooy, B & Wilson, S 2006, 'Convincing the toilers? Dilemmas of long working hours in Australia', *Work, Employment and Society* 20 (2), pp. 349-368.
- Venn, D & Strazdins, L 2017, 'Your money or your time? How both types of scarcity matter to physical activity and healthy eating', *Social Science & Medicine* 172, pp. 98-106.
- Vrijhoef, R & Koskela, L 2000, 'The four roles of supply chain management in construction', *European Journal of Purchasing & Supply Management* 6 (3-4), pp. 169-178.
- Walker, D. H, Hampson, K & Peters, R 2002, 'Project alliancing vs project partnering: a case study of the Australian National Museum Project', *Supply Chain Management: An International Journal*.

Walker, D. H & Lloyd-Walker, B. M 2016, 'Understanding the motivation and context for alliancing in the Australian construction industry', *International Journal of Managing Projects in Business*, Vol.9 (1), pp.74-93.

Watts, J. H 2009, "Allowed into a Man's World" Meanings of Work–Life Balance: Perspectives of Women Civil Engineers as "Minority" Workers in Construction', *Gender, Work, Organisation*, 16 (1), pp. 37-57.

Wiggins, J 2019, 'Rethink urged on construction schedules' *The Australian Financial Review*, November 25, p.15.

Zhang, M, Murphy, L. A, Fang, D & Caban-Martinez, A. J 2015, 'Influence of fatigue on construction workers' physical and cognitive function', *Occupational Medicine* 65 (3), pp. 245-250.

Ziffer, D 2021, 'Right to disconnect looms as massive work change giving lives back to employees', *ABC News*, 6 April, < <https://www.abc.net.au/news/2021-04-06/right-to-disconnect-gives-workers-their-lives-back/100040424>>.

Zika-Viktorsson, A, Sundström, P, & Engwall, M 2006, 'Project overload: An exploratory study of work and management in multi-project settings', *International Journal of Project Management*, 24 (5), pp. 385-394.

# Appendix 1. Methods

## Literature review

The evidence summarised in this document were identified by searching relevant databased: Medline, PsycINFO, Web of Science, ProQuest, PubMed, Scopus, and Cochrane Library. Google Search and RMIT Library search were used to identify other grey literature. Data was gathered using a combination of search terms that were relevant to population, industry, and exposure to strategies and initiatives aimed at reducing working hours.

## Inclusion and exclusion

Studies were excluded if they were conducted in low- or middle-income countries appeared in a language other than English or were not applicable to adults.

## Rapid review

A comprehensive rapid review (Garritty et al. 2020) of the literature was conducted to identify trials of reducing work hours in the construction industry and evidence of their effectiveness

## Search strategy

The search terms developed and piloted prior to the completion of the search. Two databases were searched (Scopus and Business Source Complete) in November 2020. No limits were applied.

### Scopus - 11/11/2020

TITLE-ABS-KEY ("Construction industry" OR "construction worker\*" OR "building industry" OR "trade industry") AND TITLE-ABS-KEY ("compressed work\*" OR "compressed week\*" OR "work hour red\*" OR workload OR "long work\*" OR "work schedul\*" OR "rotating schedul\*" OR "Flexitime schedul\*" OR "day week" OR "hours of work" OR "hour workday" OR "work\* time\*")

Result: 670

### Business Source Complete (EBSCOHost) - 25/11/2020

"Construction industry" OR "construction worker\*" OR "building industry" OR "trade industry" AND "compressed work\*" OR "compressed week\*" OR "work hour red\*" OR workload OR "long work\*" OR "work schedul\*" OR "rotating schedul\*" OR "Flexitime schedul\*" OR "day week" OR "hours of work" OR "hour workday" OR "work\* time\*"

Results: 520

## **Inclusion and exclusion criteria**

### **Inclusion**

- (a) Intervention to directly or indirectly reduce or redistribute work hours
- (b) Set in the construction or related industry
- (c) Intervention conducted in high-income countries
- (d) Must be published in English

### **Exclusion**

- (a) No intervention undertaken
- (b) Set outside the construction or related industry
- (c) Intervention conducted in low- or middle-income countries
- (d) Published in a language other than English
- (e) Full text not available

## **Screening**

Search results were exported into Endnote, moved into Covidence and the duplicates removed. To ensure consistency in screening, 50 papers were independently screened by two reviewers. Conflicts were discussed to reach a consensus. There were eleven conflicts from this initial round of screening. Due to the high number of conflicts (22%), an additional 50 papers screened by both reviewers with 98% concordance. All remaining articles were screened by a single reviewer.

## **Data extraction**

Data extraction of the articles was undertaken by one researcher and imputed into a table. The data extraction template will be piloted to ensure all the relevant information is being collected for this review. Information extracted from each study included:

- Study design
- Sample size
- Participation details (ages, sex, job description)
- Setting
- Description of work hour intervention
- Health, work-life balance, and equity outcomes
- Barriers or limitations

## **Strategy for data synthesis**

A systematic realist review will be provided with information presented in text and tables to summarise and explain the characteristics and findings of the included studies.

## Appendix 2. PRISMA diagram-rapid review

