Australian Government
Department of Infrastructure, Transport, Cities and Regional Development
Bureau of Infrastructure, Transport and Regional Economics

National profile of Heavy and civil engineering construction workers in 2016

At a glance

- Australia's infrastructure construction sector can usefully be approximated by the Heavy and civil engineering construction (HCEC) industry, which captures construction of transport, energy, water, telecommunications, mining, resources and sports infrastructure. This study provides a national profile of persons employed in the HCEC industry, using data from the Australian Bureau of Statistics' (ABS) *Census of Population and Housing*.
- The HCEC industry contributed 2.0 per cent (or $33 billion) of Gross Value Added (GVA) in 2017-18 and employed 114 600 persons as of May 2019. Significant heavy and civil engineering construction activity also occurs in other industries. Total heavy and civil engineering construction *activity* contributed around 2.5 per cent of Australian GVA in 2016-17, with 70 per cent due to the HCEC industry, and the remaining 30 per cent split across a range of other industries (most prominently, Construction services).
- Between 2011 and 2018, the HCEC industry added 53 000 employed persons, at an average annual growth rate of 4.9 per cent, according to the ABS *Labour Force Survey*. Particularly rapid employment growth was evident between the November quarter of 2016 and the May quarter of 2018.
- The HCEC workforce is predominantly male, with 87 per cent of jobs held by males in 2019, compared to 53 per cent of all jobs. The male employment share of the HCEC industry declined by 3.5 percentage points between 2006 and 2019.
- According to the 2016 census, the great majority of HCEC workers are employed on a full-time basis (89 per cent), and a high proportion work 49 or more hours per week (40 per cent). However, since 2011, there has been a shift towards fewer hours of work, with the proportion working 49 or more hours a week declining by 2.9 percentage points, and the full-time proportion declining by 1.6 percentage points.
- The proportion of the HCEC workforce aged 55 and over rose by 1.4 percentage points between 2011 and 2016, which is similar to the all-industry increase of 1.6 percentage points. However, this was offset by a 1.5 percentage point increase in the proportion of the HCEC workforce aged 25 to 34.
- The principal HCEC occupational categories are Technicians and trade workers (24 per cent), Labourers (21 per cent) and Machinery operators and drivers (19 per cent). From 2011 to 2016, there was an upskilling of the HCEC workforce, due to strong employment growth for Managers and Professionals.
- HCEC workers are less highly educated than the average Australian worker, with 19 per cent holding bachelor degree or higher qualifications in 2016 (compared to 31 per cent of all employed persons). However, HCEC workers are much more likely to hold a vocational qualification (38 per cent, versus 24 per cent for all employed persons). Educational attainment improved from 2011 to 2016, with 6400 additional HCEC workers holding recognised post-school qualifications.
- HCEC workers are well-remunerated, with full-time employed workers earning a median weekly personal income that is 26 per cent higher than the typical Australian full-time worker. Electricians and Fabrication engineering trades workers working in the HCEC industry recorded particularly strong income growth between 2011 and 2016, which may reflect the effects of skill shortages.

Introduction

Australia's infrastructure construction sector can be usefully approximated by the Heavy and civil engineering construction (HCEC) industry. The HCEC industry is a significant contributor to the national economy, accounting for 2.0 per cent (or $33 billion) of value added in 2017–18 (ABS 2018a) and employing 114 600 persons as of May 2019 (ABS 2019a). The HCEC industry captures firms whose primary activity is the construction of infrastructure projects (e.g. roads, bridges, tunnels, railways, airport runways, power stations, pipelines, dams, cable laying, sports stadiums, harbour dredging, mine sites), or the repair of such structures, or the organising or managing of these activities.

This Information Sheet provides a national profile of persons employed in the HCEC industry, based on data from the Australian Bureau of Statistics' (ABS) *Census of Population and Housing* for 2016. This study explores details of the sub-industries in which HCEC workers are employed, their employment status, hours worked, gender, age, occupation, educational qualifications, income, work location and commuting behaviour. In addition to providing this national snapshot of the characteristics of HCEC workers in 2016, the Information Sheet also describes some of the key changes that have occurred since 2011, including the changing gender mix and the upskilling of the HCEC workforce.

A similar employment profile has been prepared for another industry that is fundamental to transport and infrastructure policy, namely the Transport, postal and warehousing industry—see BITRE Information Sheet 104 (BITRE 2019).

Scope of the Heavy and civil engineering construction industry

The aim of this study is to build a profile of persons employed in Australia's infrastructure construction sector. Within the Australian and New Zealand Standard Industrial Classification (ANZSIC),[1] the 2-digit Heavy and civil engineering construction (HCEC) industry[2] provides the best available approximation to the infrastructure construction sector. In addition to transport infrastructure, it captures telecommunications, energy and water infrastructure, as well as some additional types of infrastructure that are detailed later in this section.

Figure 1 shows that the HCEC industry is comprised of three 4-digit sub-industries: Road and bridge construction, Other heavy and civil engineering construction, and Heavy and civil engineering construction not further defined (nfd). In this Information Sheet, some detailed analysis is presented for the Road and bridge construction and Other heavy and civil engineering construction sub-industries. However, while the 'not further defined' category is included in HCEC totals, it is not separately presented in tables or figures.

The Road and bridge construction sub-industry captures businesses that are mainly engaged in the construction or general repair of roads, bridges, aerodrome runways or parking lots, or in organising or managing these activities (ABS 2013a).

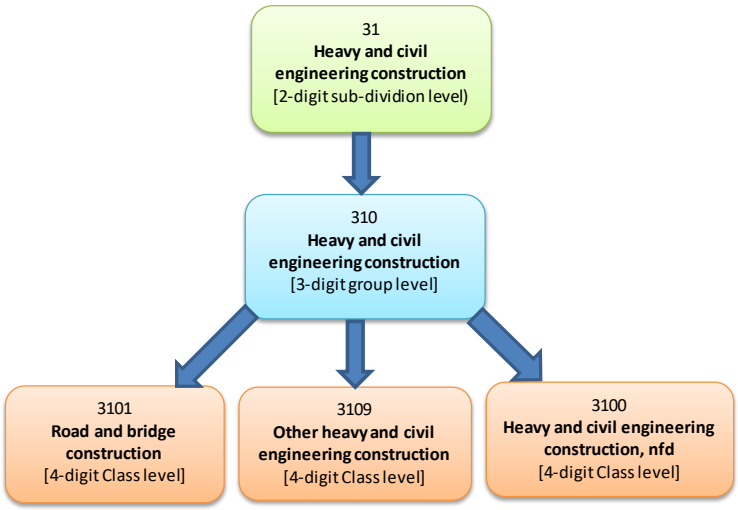
The Other heavy and civil engineering construction sub-industry captures businesses that are mainly engaged in the construction of any of the types of infrastructure listed below, or in the general repair of such structures, machinery or equipment, or in organising or managing these activities (ABS 2013a):

- Railways
- Tunnels
- Dams, irrigation systems, sewage or stormwater drainage systems, water supply systems, sewage treatment plant construction, water tank construction (except for structural steel)
- Harbour or river works, breakwater or canal construction, dredging, jetty construction
- Cable laying
- Electricity power plant construction (except buildings), gas supply systems, electricity distribution lines
- Television or radio transmitting tower construction
- Oil and LPG refineries (except buildings)
- On-site assembly of furnaces or heavy electrical machinery from prefabricated components
- Golf course construction, below-ground swimming pool construction, sports stadiums

[1] For more detail, refer to ABS (2013a).
[2] This 2-digit industry is one of three 2-digit industries within the ANZSIC 1-digit Construction industry. The other two are Building construction and Construction services.

- Mine site construction
- Pipeline construction.

Figure 1 Schematic diagram showing ANZSIC hierarchical structure of Heavy and civil engineering construction at 2-, 3- and 4-digit scales



Notes:
1. Based on ANZSIC 2006 (Revision 2) 2-, 3- and 4-digit industries (ABS 2013).
2. Numerical numbers are ANZSIC codes.
3. nfd – Not further defined.

There are some activities related to infrastructure construction that are not captured within the ANZSIC HCEC industry:

- Firms engaged in manufacturing bituminous surfacing materials for use in road construction are classified to the Other petroleum and coal product manufacturing sub-industry.
- Construction of buildings as part of an infrastructure project is generally excluded from the HCEC industry. For example, although construction of an airport runway is included in the HCEC industry, construction of airport terminal buildings is considered part of the Non-residential building industry.
- Firms that are principally engaged in site preparation services, such as the levelling of construction sites, are not considered part of the HCEC industry sub-division, and are instead classified to the ANZSIC Construction services industry (and specifically the 4-digit Site preparation services sub-industry).

Data sources

The principal data source for this study is the ABS *Census of Population and Housing* for 2016 and 2011 (and in some instances, 2006). Census employment data provides a count of the total number of employed persons aged 15 and over, irrespective of whether they are working on a full-time or part-time basis.

The industry disaggregation of employment is based on the Australian and New Zealand Standard Industrial Classification (ANZSIC) (ABS 2013a), and the analysis focuses on the 2-digit Heavy and civil engineering construction industry. The focus on employment in the HCEC industry means that people whose job involves constructing infrastructure are excluded if they work for a business that is classified to a different industry. The potential implications of this issue are explored in the following section.

Place of usual residence data is used to ensure maximum coverage of people employed in the HCEC industry, many of whom do not have a fixed place of work. While the Information Sheet focuses on place of usual residence data, the analysis of work location does draw on place of work data to a limited extent.

Counts of total employed persons from the ABS census are consistently lower than counts from the ABS *Labour Force Survey*, which provides Australia's official measure of employment.[3] According to the 2016 census, there were 10.7 million employed persons in Australia, which is 10 per cent below the *Labour Force Survey* estimate of 11.9 million for August 2016 (ABS 2019a).[4] The situation is somewhat different for the HCEC industry, as the 2016 census identified 82 900 HCEC employed persons, which was 26 per cent higher than the *Labour Force Survey* estimate of 65 700 employed persons for August 2016. Since then the *Labour Force Survey* estimate of HCEC employed persons has risen strongly, and stood at 114 600 persons in the May quarter of 2019. Given the substantial growth in HCEC employment since August 2016, the census-based worker profile may not be representative of the characteristics of current HCEC workers. However, the census data is nevertheless preferred to *Labour Force Survey* data as the key data source for this study as it is better able to support a wide range of detailed disaggregations of HCEC employment.

While this national profile of HCEC workers in 2016 is primarily based on census data, it will also use the latest ABS' *Australian National Accounts* and *Labour Force Survey* data to summarise the economic significance of the HCEC industry, as well as drawing out some of the relevant insights from the ABS' *Australian National Accounts: Supply Use Tables, 2016-17* regarding the role of infrastructure construction activity in non-HCEC industries.

Economic significance

Heavy and civil engineering construction industry

This Information Sheet provides a national profile of the employment of businesses that are coded by the ABS to the ANZSIC Heavy and civil engineering construction (HCEC) industry.

The Gross Value Added by industry data from the ABS' *Australian National Accounts* provides the best measure of the economic significance of the HCEC industry, while the ABS *Labour Force Survey* (LFS) provides the best aggregate measure of employment in the industry.[5]

- In 2017-18, the Gross Value Added (GVA) of the HCEC industry was $33.1 billion, representing 2.0 per cent of total GVA.
- The latest employment data relates to May 2019, when the HCEC industry had 114 600 employed persons, representing 0.9 per cent of all Australian employment.

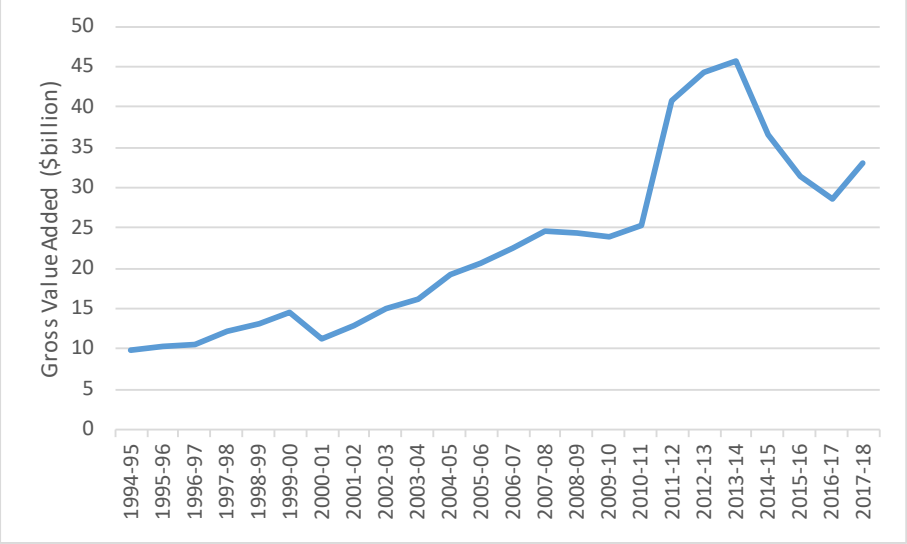
The much larger contribution of the industry to GVA than to employment may reflect a relatively capital-intensive production process in the HCEC industry.

Figure 2 illustrates trends over the last few decades in the GVA of the HCEC industry. The GVA of the industry has trended strongly upwards over the period. Over the last decade (2007-08 to 2017-18), the GVA of the HCEC industry has risen by an average of 3.0 per cent per annum, exceeding the all-industry growth rate of 2.7 per cent per annum.

The industry's GVA rose dramatically between 2010-11 and 2011-12, peaked in 2013-14, and then declined significantly until 2016-17, before returning to positive growth in 2017-18. The recent volatility in the economic contribution of the HCEC industry largely reflects fluctuations in the engineering construction activity being undertaken by the resources sector (i.e. oil, gas, coal and other minerals) (see Figure 5 for more detail).

[3] ABS (2012) outlines the methodology and scope differences between the two collections.
[4] As of May 2019, there were 12.9 million employed persons in Australia and 114 600 employed in the HCEC industry (ABS 2019a).
[5] However, the LFS is a sample survey that is not suitable for detailed disaggregation by worker characteristics and region. Therefore the employment analysis in this Information Sheet is largely based on the ABS *Census of Population and Housing*.

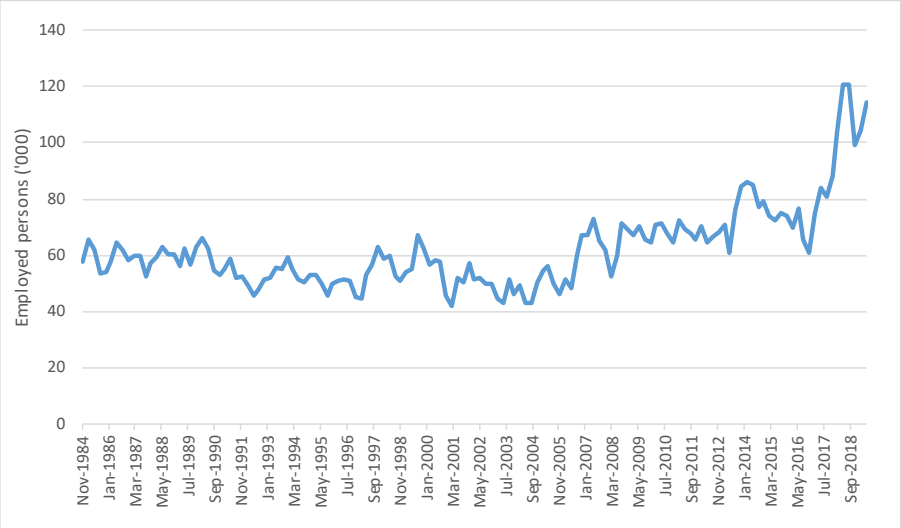
Figure 2 Gross value added of the Heavy and civil engineering construction industry, Australia, 1995 to 2019



Source: ABS Cat. 5204.0 *Australian System of National Accounts, 2017-18*.

Figure 3 shows the long term trends in employment for the HCEC industry. The chart shows much more volatility than Figure 2 as the underlying data is quarterly, and reflects seasonal variation as well as other sources of variation. Between 1984 and 2004, there was a declining trend in employment, but since then, the number of employed persons has grown strongly. In particular, rapid employment growth is evident between the November quarter of 2016 and the May quarter of 2018. Over the ten years ended in the May quarter 2019, the number of persons employed in the HCEC industry increased from 70 100 to 114 600, representing average annual employment growth of 5.0 per cent per annum. This far exceeds the overall employment growth rate of 1.8 per cent per annum over the same period. As a result, the industry's employment share has risen from 0.65 per cent in 2009 to 0.89 per cent in 2019.

Figure 3 Employment in the Heavy and civil engineering construction industry, Australia, 1984 to 2019

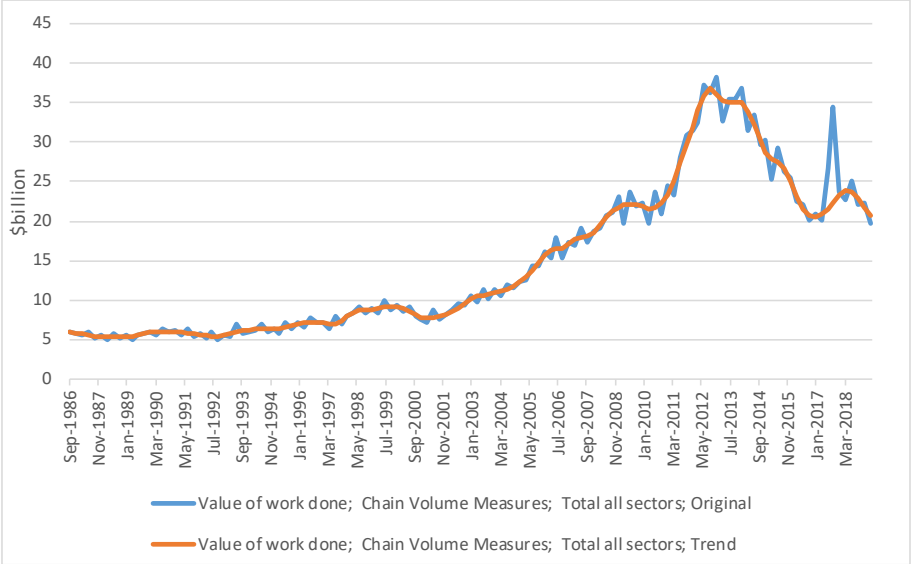


Source: ABS Cat. 6291.0.55.003 *Labour Force, Australia*, Detailed, Quarterly, May 2019.

Figure 4 shows how the value of engineering construction work done varies over time. It shows strong growth in the value of work done since the early-2000s. An acceleration of the growth rate is evident between 2010 and 2012, with activity peaking in late 2012, followed by a significant decline through to the end of 2016. This is consistent with the spike and subsequent decline in GVA displayed in Figure 2, but interestingly these significant changes are not reflected in the employment data. There were also unusually large quarterly increases in

engineering construction work done in the June and September quarters of 2017 which were reversed in the December 2017 quarter[6]. These were likely driven by the importation of floating LNG platforms (Scutt 2018).

Figure 4 Engineering construction activity – value of work done, Australia, 1984 to 2019



Note: Chain volume measure. Reference period is 2016-17.
Source: ABS Cat. 8762.0 *Engineering Construction Activity, Australia, Mar 2019*.

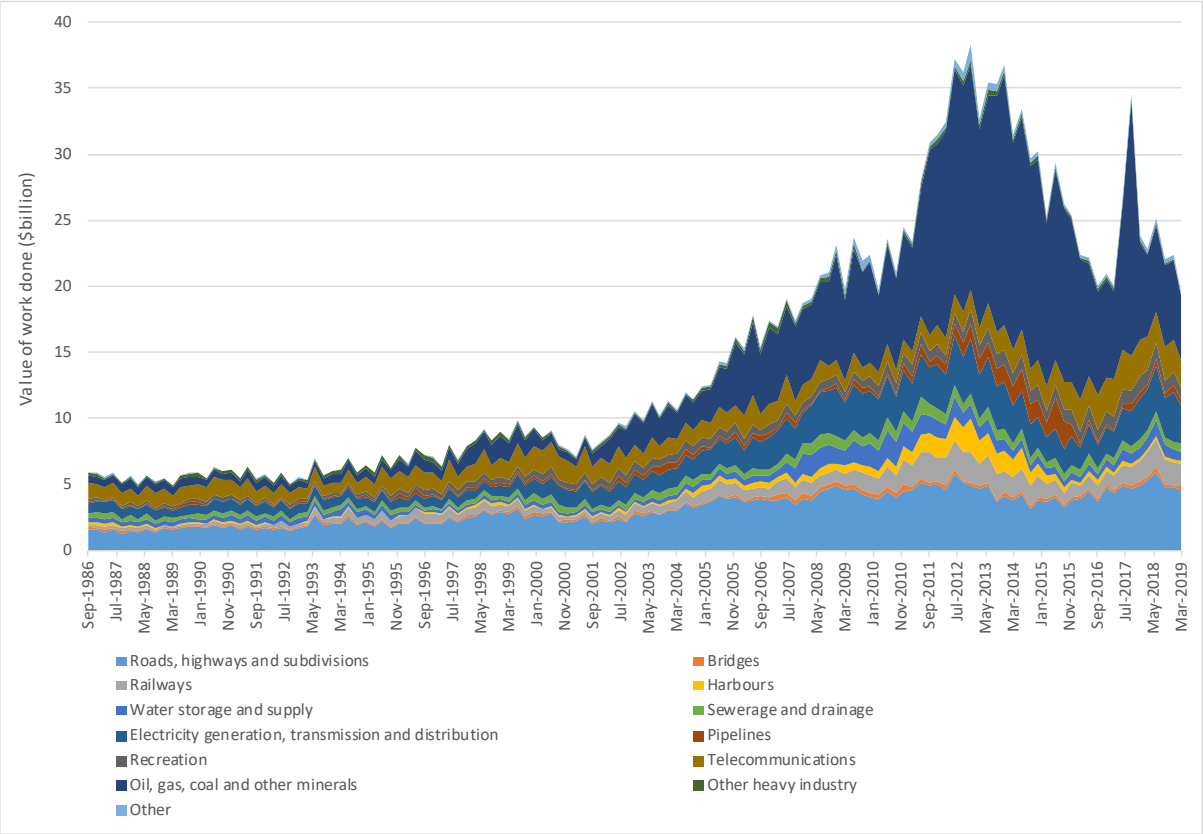
Figure 5 shows how total engineering construction activity is distributed across the different types of construction. It is clear from Figure 5 that the principal contributor to the rapid growth in engineering construction activity between 2010 and 2012 is the resources sector (i.e. Oil, gas, coal and other minerals, shown in dark blue). The value of engineering construction work done in the resources sector increased from an average of $7 billion per quarter in 2010 to an average of $17 billion per quarter in 2012, while total engineering construction activity increased from an average of $22 billion per quarter in 2010 to an average of $36 billion per quarter in 2012.[7] The resources sector was therefore responsible for about two-thirds of the extra engineering construction activity over this period. Roads, highways and subdivisions and Harbour construction activity also made a small contribution to the surge in engineering construction activity between 2010 and 2012.

About 35 per cent of total engineering construction activity was attributable to transport construction in the 2018 calendar year, with roads, highways, subdivisions and bridges representing 24 per cent of engineering construction activity and the remaining 11 per cent due to railways, harbours and pipelines. The transport share has risen in recent years, as the mining boom has subsided.

[6] This is evident in the original (unadjusted) data, but not the trend data.

[7] Consistent with the data presented in Figure 5, all of these figures are expressed in real terms, adjusted for price changes using a deflator calculated by dividing the current value of total engineering construction for each quarter by the equivalent chain volume measure (reference period is 2016-17).

Figure 5 Engineering construction activity – value of work done by type of construction, Australia, 1986 to 2019



Note: This is original data, not seasonally adjusted or trend data. Figure are presented in real terms, adjusted for price changes using a deflator calculated by dividing the current value of total engineering construction for each quarter by the equivalent chain volume measure (reference period is 2016-17).

Source: ABS Cat. 8762.0 *Engineering Construction Activity, Australia, Mar 2019*.

Heavy and civil engineering construction activity

In 2017-18, the HCEC industry directly contributed 2.0 per cent of Australia's Gross Value Added, up from 1.3 per cent in 1997-98. While the great majority (86 per cent) of the output of this industry was due to heavy and civil engineering construction products, firms classified to this industry by the ABS also produced a small amount of non-residential building construction and construction services products.

Significant heavy and civil engineering construction activity also occurs in firms that are coded by the ABS to other industries. For example, an electricity supplier (coded by ABS to the Electricity supply industry sub-division) may construct a power station. Similarly, a business that operates an airport (coded by the ABS to the Transport support services industry sub-division) may construct a new airport runway. The ABS *Australian National Accounts: Supply Use Tables* for 2016-17 (ABS 2018b) show that:

- The total Australian production of heavy and civil engineering construction products (at basic prices) is $90 billion. There are also $9 billion of imports.
- About 63 per cent (or $57 billion) of that Australian production is due to the HCEC industry.
- The other industry responsible for a large share of Australian production is Construction services, at $18 billion[8] (or 20 per cent). The Construction services industry sub-division includes firms that are primarily engaged in providing: Land development and site preparation services, Building structure services (e.g. concreting, structural steel erection services), Building installation services (e.g. electrical services, plumbing services), Building completion services (e.g. carpentry services), or Other construction services (e.g. landscape construction services, hire of construction machinery with operator).

[8] Note that this $18 billion of output represents just 8 per cent of the total output of the Construction services industry.

- Many other industries produce smaller amounts of heavy and civil engineering construction products, including Non-residential building construction ($1.8 billion), Transport support, warehousing and storage services ($1.5 billion), Electricity supply ($4.4 billion), Water supply, sewerage and drainage ($1.4 billion) and Telecommunication services ($2.3 billion).

Consequently, the economic contribution of heavy and civil engineering construction *activity* will be greater than the direct economic contribution of the HCEC industry. The ABS has prepared *An Experimental Transport Satellite Account* (ABS 2018c) that provides a more comprehensive picture of the economic contribution of transport activity.[9] However, there is no equivalent for heavy and civil engineering construction activity.

Using the broad methodology employed in the ABS *Tourism Satellite Account* (ABS 2019c), BITRE has developed a rough estimate of the economic contribution of heavy and civil engineering construction *activity,* based on the data in the ABS *Australian National Accounts: Supply Use* tables for 2016-17 (ABS 2018b).[10] In 2016-17, the HCEC industry contributed 1.7 per cent of Australian GVA (ABS 2018a), while BITRE estimates that total heavy and civil engineering construction *activity* contributed around 2.5 per cent of Australian GVA.[11] Of the total estimated GVA of $41 billion due to heavy and civil engineering construction activity, 70 per cent was due to the HCEC industry, with the remaining 30 per cent split across a range of other industries (most prominently, Construction services).

Supply chain linkages

In addition to this direct contribution to economic activity, infrastructure construction activity supports a downstream supply chain. The preceding analysis excludes the indirect effects that are generated for manufacturers, contractors and professional service providers, who provide the necessary inputs to produce the infrastructure. The ABS *Australian National Accounts: Supply Use* tables for 2016-17 (ABS 2018b) show that:

- The HCEC industry used $38 billion of intermediate inputs from other industries. The most significant intermediate inputs were of Professional scientific and technical services (e.g. consultant engineers, $7.0 billion) and Construction services (e.g. concreting services, site preparation services, structural steel erection services, $14.0 billion). Also notable were Rental and hiring services, except real estate ($1.6 billion) and Employment, travel agency and other administrative services ($1.1 billion).
- The outputs of the Construction services industry that are purchased as intermediate inputs by the HCEC industry only represent 8 per cent of the value of all Construction services outputs. Similarly, only 3 per cent of the value of all Professional, scientific and technical services outputs are used by the HCEC industry. So these two industries make a more important contribution to HCEC, than it does to them.
- The HCEC industry is also a significant source of demand for outputs from Cement, lime and ready-mixed concrete manufacturing (destination of 7 per cent of output), Plaster and concrete product manufacturing (5 per cent), Other non-metallic mineral product manufacturing (8 per cent), Structural metal product manufacturing (6 per cent) and Electrical equipment manufacturing (5 per cent).

9 It brings together the transport activity conducted on a for-hire basis by businesses classified to the Transport, postal and warehousing industry, with in-house transport activity of businesses in other industries.

10 This involves determining what proportion of the domestic output of each industry is attributable to the production of heavy and civil engineering construction (or 'infrastructure') outputs using the data in the 2016-17 Supply Use tables. Direct 'infrastructure' gross value added at basic prices is then calculated for each industry as direct infrastructure output less the intermediate consumption required to produce the direct infrastructure output, and summing for all industries in the economy. It is assumed that patterns of intermediate consumption are the same for the infrastructure and non-infrastructure products produced by an industry.

11 In deriving this estimate, BITRE followed the approach of the ABS *Transport Satellite Account* in assuming that all economic activity within the HCEC industry is assumed to be heavy and civil engineering construction activity, and in making no adjustment to exclude secondary activity undertaken within that industry that is not related to the provision of heavy and civil engineering construction products (ABS 2018c).

National profile for 2016

Sub-industries

Table 1 shows the number of Heavy and civil engineering construction (HCEC) employed persons by 4-digit sub-industry in Australia in 2016. Of the 82 900 persons employed in the HCEC industry, 31 000 were employed in the Road and bridge construction sub-industry (or 37.4 per cent) and 48 500 persons were employed in the Other heavy and civil engineering construction sub-industry (or 58.5 per cent).[12] The remaining 4.1 per cent could not be classified to a 4 digit sub-industry within the HCEC industry.

Table 1 Heavy and civil engineering construction employment by 4-digit sub-industry, Australia, 2016

4-digit sub-industry	Employed persons	Share of total (per cent)
Road and bridge construction	31 000	37.4
Other heavy and civil engineering construction	48 500	58.5
Heavy and civil engineering construction, nfd	3 400	4.1
Total - Heavy and civil engineering construction	82 900	100.0

Notes:
1. Sub-industries classified according to the ANZSIC 2006 (Revision 2) 4-digit industries (ABS 2013a).
2. nfd - Not further defined.
3. Numbers of employed persons are presented to nearest 100.

Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using TablebuilderPro.

Type of employment

Table 2 provides the proportions of full-time employed persons in the HCEC industry disaggregated by 4-digit sub-industries and gender. It also compares the HCEC full-time proportions to the all-industry full-time proportions, based on ABS census and *Labour Force Survey* (LFS) data. The great majority of people who work in the HCEC industry are employed on a full-time basis. Of those employed in the HCEC industry, the census reports that 88.8 per cent worked full-time, compared to 65.5 per cent across all industries. Similarly, the ABS *Labour Force Survey* reports that 93.5 per cent of HCEC employed persons worked full-time, compared to 68.1 per cent across all industries. Both the census and LFS data report much higher proportions of males being employed on a full-time basis, compared to females.

Table 2 Proportion of full-time employed persons in the HCEC industry by 4-digit sub-industries and gender, Australia, 2016

Industry	Male	Female	All persons
ABS Census	Proportion (per cent)		
Road and bridge construction	90.0	70.9	87.4
Other heavy and civil engineering construction	92.7	72.9	89.6
Heavy and civil engineering construction	91.7	72.1	88.8
Total employed persons (all industries)	78.2	51.2	65.5
ABS Labour Force Survey			
Heavy and civil engineering construction	98.9	66.5	93.5
Total employed persons (all industries)	81.1	53.1	68.1

Notes:
1. Sub-industries classified according to the ANZSIC 2006 (Revision 2) 4-digit industries (ABS 2013a).
2. Persons who were employed, but away from work at census time are excluded from the census-based calculation.
3. Heavy and civil engineering construction, not further defined is included in HCEC total, but is not shown separately.
4. Labour Force Survey as at August 2016.

Sources: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using TablebuilderPro, and ABS Cat. 6291.0.55.003 *Labour Force, Australia*, Detailed, Quarterly, May 2019.

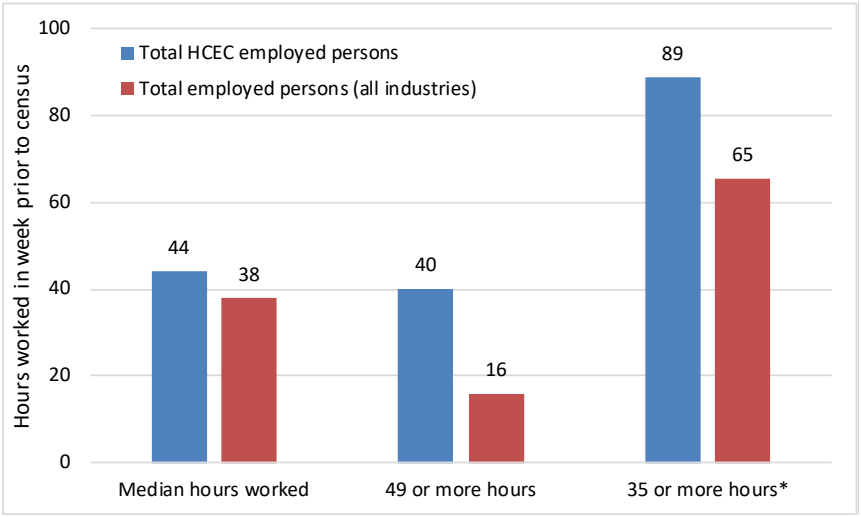
[12] Some employment in this sub-industry will be related to the construction of transport infrastructure (e.g. railways, harbours, pipelines). Data from the ABS *Engineering Construction Survey* suggests that the share of total engineering construction activity (excluding roads and bridges) that is due to construction of railways, harbours and pipelines is of the order of 10-15 per cent.

Table 2 also shows that the Other heavy and civil engineering construction sub-industry had slightly higher proportions of both male and female full-time employment compared to the Road and bridge construction sub-industry.

Figure 6 shows how the HCEC industry compares to the all-industry total across three different measures of working hours, whilst Table 3 presents the proportion working 49 or more hours per week by HCEC sub-industries and gender.

A relatively large proportion of HCEC employed persons report working 49 or more hours per week (40 per cent, compared to 16 per cent of employed persons nationally). Similarly, 89 per cent of HCEC workers worked 35 or more hours per week, compared to 65 per cent of employed persons nationally. The median hours worked in the HCEC industry was 44 hours, which is higher than the median of 38 hours for all employed persons.

Figure 6 Working hours for Heavy and civil engineering construction and all employed persons, Australia, 2016



Notes:
1. Asterisk (*) denotes ABS definition of full-time.
2. All measures exclude employed persons who worked zero hours in week prior to census night.
3. nfd - not further defined.
Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using TablebuilderPro.

Long working hours are particularly prevalent in the Other heavy and civil engineering construction sub-industry, where 43 per cent of employed persons work 49 or more hours per week. This is higher than the proportion of employed persons in the Road and bridge construction sub-industry working long hours (35 per cent) (Table 3). Long working hours are much more prevalent for males than for females in both these sub-industries.

Table 3 Proportion of employed persons who work 49 or more hours per week by Heavy and civil engineering construction sub-industries and gender, Australia, 2016

HCEC 4-digit sub-industries	Male	Female	All persons
	Proportion (per cent)		
Road and bridge construction	38	17	35
Other heavy and civil engineering construction	47	19	43
Total HCEC employed persons	44	19	40

Notes:
1. Sub-industries classified according to the ANZSIC 2006 (Revision 2) 4-digit industries (ABS 2013a).
2. Heavy and civil engineering construction, not further defined is included in HCEC total, but is not shown separately.
3. Calculation of proportion excludes employed persons who worked zero hours in week prior to census night.
Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using TablebuilderPro.

Nationally, in 2016, more than 98 per cent of HCEC workers were employed in the private sector, much higher than all employed persons (85 per cent) (Table 4). Among government sectors, the proportion of HCEC workers

employed by the national government was only 0.1 per cent, which was lower than state/territory governments (0.3 per cent) and local governments (1.4 per cent).

Further analysis reveals that almost all Other heavy and civil engineering construction workers are employed by the private sector (99.7 per cent), whilst just less than 96 per cent of Road and bridge construction workers are employed by the private sector (data not shown).

Table 4 Heavy and civil engineering construction employed persons by sectors, Australia, 2016

	Private	Government			All sectors
		National	State/Territory	Local	
	Proportion (per cent)				
Total HCEC employed persons	98.3	0.1	0.3	1.4	100.0
Total employed persons (all industries)	84.6	4.0	9.9	1.5	100.0

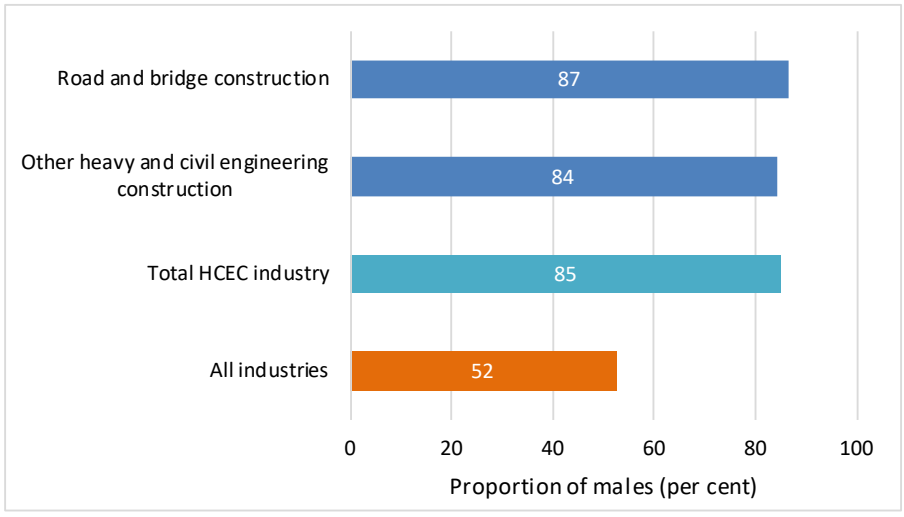
Notes:
1. Sub-industries classified according to the ANZSIC 2006 (Revision 2) 4-digit industries (ABS 2013a).
2. Heavy and civil engineering construction, not further defined is included in HCEC total, but is not shown separately.
Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using TablebuilderPro.

In terms of employment status, 91 per cent of people working in the HCEC industry are employees and another 4 per cent are an 'Owner manager of unincorporated enterprise without employees'. The respective proportions for all-industry workers are 84 per cent and 6 per cent. There was virtually no difference in the proportion of employees between the Road and bridge construction and Other heavy and civil engineering construction sub-industries (91.2 versus 91.0 per cent).

Demographics

The HCEC industry has a predominantly male workforce, with 85 per cent of jobs being held by males, according to the 2016 census, compared to 52 per cent of jobs in the overall economy (Figure 7). The Road and bridge construction sub-industry had a higher proportion of male workers (87 per cent) compared to the Other heavy and civil engineering construction sub-industry (84 per cent).

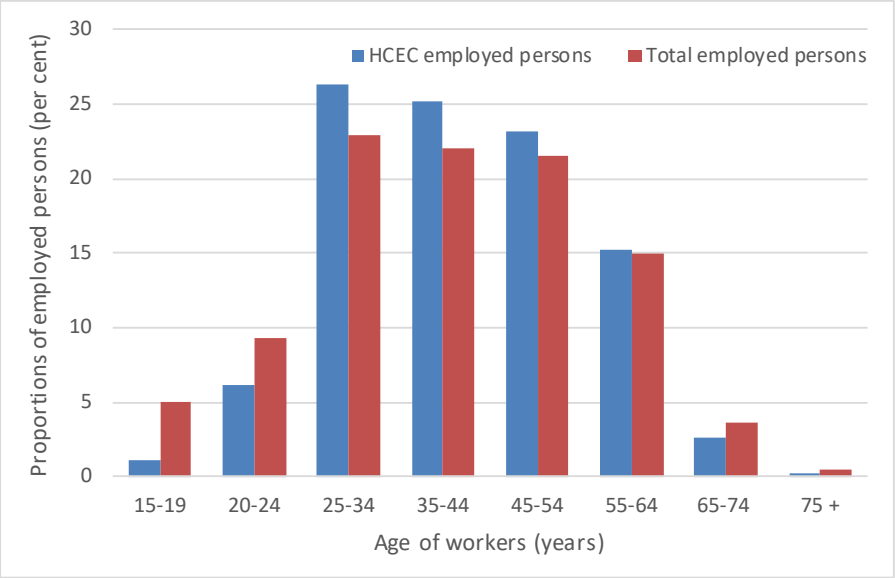
Figure 7 Gender split of Heavy and civil engineering construction employment by sub-industry, Australia, 2016



Notes:
1. Sub-industries classified according to the ANZSIC 2006 (Revision 2) 4-digit industries (ABS 2013a).
2. Heavy and civil engineering construction, not further defined is included in HCEC total, but is not shown separately.
Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using TablebuilderPro.

The age composition of the HCEC industry is significantly different to that of the overall workforce. As Figure 8 shows, the younger age groups (up to age 24) are under-represented in HCEC, whereas 25 to 54 year olds are over-represented. As of 2016, 18.0 per cent of HCEC workers nationally were aged 55 and over, which is slightly lower than the all-industry figure of 19.2 per cent.

Figure 8 Heavy and civil engineering construction employment by age category, Australia, 2016



Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using TablebuilderPro.

The median age of HCEC employed persons in 2016 was 41 years, which is similar to the all-industry median age of 40 years (Table 5). In terms of the 4-digit HCEC sub-industries, an older age structure is evident for Road and bridge construction (which has a median age of 42, with 21.3 per cent of workers aged 55 and over), compared to Other heavy and civil engineering construction (which has a median age of 40 and 16.3 per cent of workers aged 55 and over) (Table 5).

Table 5 Age indicators for Heavy and civil engineering construction employed persons by sub-industry and gender, Australia, 2016

4-digit HCEC sub-industry	Male	Female	All persons
	Median age (years)		
Road and bridge construction	43	41	42
Other heavy and civil engineering construction	40	41	40
Total HCEC industry	41	41	41
Total employed persons (all industries)	41	40	40
	Share aged 55 years and more (per cent)		
Road and bridge construction	21.9	17.7	21.3
Other heavy and civil engineering construction	16.3	16.4	16.3
Total HCEC industry	18.3	16.6	18.0
Total employed persons (all industries)	20.0	18.3	19.2

Notes:
1. Sub-industries classified according to the ANZSIC 2006 (Revision 2) 4-digit industries (ABS 2013a).
2. nfd - Not further defined.
3. Heavy and civil engineering construction, not further defined is included in HCEC total, but is not shown separately.

Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using TablebuilderPro.

There was no difference in the median age between male and female HCEC workers, but the median age is higher for male workers in the Road and bridge construction sub-industry (43 years) compared to female workers (41 years). The opposite pattern was evident for Other heavy and civil engineering construction sub-industry (the median ages of male and female workers were 40 and 41 years, respectively).

Male HCEC workers are more likely to be aged 55 and over than female HCEC workers (18.3 versus 16.6 per cent). Both HCEC shares were lower than the all-industry proportions of 20.0 per cent for males and 18.3 per cent for females.

The median age of HCEC employed persons was 40 years in the capital cities and 43 years for the rest of Australia (Table 6). This is similar to the all-industry medians of 39 years for capital cities and 43 years for the rest of Australia.

For the HCEC industry, Hobart has a higher median age (44 years) than the other capital cities, while Regional South Australia has the highest overall median age (47 years). Darwin and Canberra have the youngest HCEC workers, with median ages of 37 and 38 years, respectively.

Table 6 Median age of Heavy and civil engineering construction workers by capital cities and rest of states, Australia, 2016

GCCSA and Rest of states	HCEC industry	All industries
	Median age (years)	
Greater Sydney	39	39
Greater Melbourne	40	39
Greater Brisbane	40	39
Greater Adelaide	42	41
Greater Perth	39	40
Greater Hobart	44	42
Greater Darwin	37	38
Canberra	38	38
Rest of New South Wales	43	43
Rest of Victoria	44	43
Rest of Queensland	43	42
Rest of South Australia	47	45
Rest of Western Australia	41	43
Rest of Tasmania	45	44
Rest of Northern Territory	40	40
All capital cities	40	39
Total Rest of States	43	43
Australia	41	40

Notes:
1. Excluded No fixed work address and Migratory-Offshore-Shipping.
2. Australian Capital Territory is the same as Canberra and was included in the Capital cities total.
Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using TablebuilderPro.

The HCEC industry's representation of culturally diverse groups—such as Indigenous people, the overseas born, and those who do not speak English well—differs slightly from the all-industry average (Table 7). In 2016:

- About 2.6 per cent of HCEC workers identified as Indigenous, which is above the all industry average of 1.7 per cent.
- The proportion of HCEC workers who were born overseas (27.2 per cent) is lower than for all employed persons (30.6 per cent).
- Only 0.6 per cent of HCEC workers speak another language and report speaking English not well or not at all. This is well below the all industry average of 1.6 per cent, suggesting that language problems are less prominent in HCEC than other industries.
- Around 3.5 per cent of Road and bridge construction workers identified as Indigenous, which is above the Other heavy and civil engineering construction sub-industry proportion of 2.1 per cent.
- The proportion of Road and bridge construction workers who were born overseas (21.5 per cent) is lower than for Other heavy and civil engineering construction workers (30.6 per cent).
- Only 0.3 per cent of Road and bridge construction workers speak another language and report speaking English not well or not at all, which is much lower than Other heavy and civil engineering construction workers (0.8 per cent).

Table 7 Other demographic characteristics of Heavy and civil engineering construction employed persons, Australia, 2016

Cultural characteristics	Heavy and civil engineering construction (HCEC)			All industries
	Road and bridge construction	Other heavy and civil engineering construction	Total HCEC	
	Share (per cent)			
Indigenous people	3.5	2.1	2.6	1.7
Overseas born	21.5	30.6	27.2	30.6
People who do not speak English	0.3	0.8	0.6	1.6

Notes:
1. 'Not stated' responses are excluded from the denominator, when calculating proportions.
2. Heavy and civil engineering construction, not further defined is included in HCEC total, but is not shown separately.
Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using TablebuilderPro.

Skills

Occupation

The ABS' Australian and New Zealand Standard Classification of Occupations (ANZSCO) categorises workers into eight top-level (or 1-digit) occupational categories[13]. The main three HCEC occupational categories are Technicians and trades workers (23.7 per cent), Labourers (20.6 per cent) and Machinery operators and drivers (19.2 per cent) (Figure 9). Each of these three occupations represent a much higher proportion of HCEC workers than of total employed persons. All other 1-digit occupational categories are under-represented, particularly Professionals, Community and personal service workers, and Sales workers.

There are some notable differences in the occupational mix of the two HCEC sub-industries. Machinery operators and drivers are the dominant occupational category within the Road and bridge construction sub-industry, accounting for 30.8 per cent of the sub-industry's employment. In contrast, in the Other heavy and civil engineering construction sub-industry, Machinery operators and drivers represent only 11.7 per cent of employment, and the dominant occupational category is Technicians and trades workers, which accounts for 30.0 per cent of employment. Figure 9 points to Other heavy and civil engineering construction having a more highly skilled workforce overall than Road and bridge construction, with greater representation of the higher-skill categories of Managers, Professionals and Technicians and trades workers, and less representation of the lower-skill categories of Machinery operators and drivers and Labourers.

[13] The eight major groups are formed by grouping together more detailed occupations using information on skill level and skill specialisation (ABS 2013b).

Figure 9 Occupations of Heavy and civil engineering construction workers, Australia, 2016

Note: Occupational mix based on ANZSCO 1-digit occupations (ABS 2013b). Proportions calculated after deducting 'not stated' and 'inadequately described' responses from total.

Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using TablebuilderPro.

ANZSCO defines the skill level of an occupation based on the range and complexity of the set of tasks performed in the particular occupation (ABS 2013b). It assigns occupations to one of five skill levels, with one being the highest skill level and five the lowest. The Professionals occupational category is predominantly classified to skill level one, whilst the Technicians and trades workers occupational category is predominantly classified to skill levels two and three, and the Labourers category is predominantly classified to skill levels four and five. ANZSCO does not measure the skill level of an individual—it refers to the level of skill that is typically required to competently perform the tasks of the specific occupation (ibid).

Table 8 identifies the most common 3-digit occupations within the HCEC industry, together with their predominant skill levels, as assessed by ANZSCO (ABS 2013b). The three most important occupations are Construction and mining labourers (14.3 per cent), Mobile plant operators (9.4 per cent) and Engineering professionals (7.3 per cent). Engineering professionals[14] are classed as having a predominant skill level of one, which is commensurate with a bachelor degree or higher qualification (ABS 2013b). Mobile plant operators[15] are classed as having a predominant skill level of four, which is commensurate with a Certificate Level II or III qualification, while at least one year of relevant training may substitute for the formal qualification. The Construction and mining labourers[16] 3-digit occupation contains a mix of occupations with predominant skill levels of four and five.[17] Skill level five occupations are commensurate with a Certificate I qualification or compulsory secondary education, but in some instances no formal qualifications or training is required (ibid).

14 This occupational category includes Chemical and materials engineers, Civil engineering professionals, Electrical engineers, Electronics engineers, Industrial, mechanical and production engineers, Mining engineers, Other engineering professionals (i.e. Aeronautical engineer, Agricultural engineer, Biomedical engineer, Engineering technologist, Environmental engineer, Naval architect etc.).

15 This occupational category includes Agricultural, forestry and horticultural plant operators, Earthmoving plant operators, Forklift drivers and Other mobile plant operators (i.e. Linemarker, Paving plant operator, Railway track plant operator, Road roller operator etc.).

16 This occupational category includes Building and plumbing labourers, Concreters, Fencers, Insulation and home improvement installers, Paving and surfacing labourers, Railway track workers, Structural steel construction workers and Other construction and mining labourers (i.e. Crane chaser, Mining support worker and Surveyor's assistant).

17 For example, the 4-digit occupations of Railway track workers, Structural steel construction workers, Fencers and Insulation and home improvement installers are classed as skill level four occupations, while Building and plumbing labourers, Concreters and Paving and surfacing labourers are classed as skill level five occupations.

Table 8 Major occupations in the Heavy and civil engineering construction industry and their predominant skill levels, Australia, 2016

Main 3-digit occupations (from most to least prevalent)	Proportion of HCEC jobs	Predominant skill levels	Examples
Construction and mining labourers	14.3	4,5	Builder's labourer, Concreter, Railway track worker, Scaffolder, Earthmoving labourer
Mobile plant operators	9.4	4	Earthmoving plant operator, Forklift driver, Line marker, Bulldozer operator
Engineering professionals	7.3	1	Chemical engineer, Civil engineer, Quantity surveyor, Transport engineer, Structural engineer, Electrical engineer, Mechanical engineer, Mining engineer
Construction, distribution and production managers	6.5	1	Construction project manager, Project builder, Engineering manager, Procurement manager
Building and engineering technicians	6.4	2	Architectural draftsperson, Building inspector, Safety inspector, Surveying or spatial science technician, Civil engineering draftsperson
Truck drivers	4.0	4	Truck driver
Fabrication engineering trades workers	3.2	3	Metal casting trades worker, Welder, Metal fabricator, Sheetmetal trades worker
Mechanical engineering trades workers	3.1	3	Fitter, Engineering pattern maker, Toolmaker, Metal machinist
Electricians	2.8	3	Electrician, Lift mechanic
Miscellaneous labourers	2.6	4,5	Caretaker, Handyperson, Railways assistant, Road traffic controller
Accounting clerks and bookkeepers	2.4	4	Accounts clerk, Bookkeeper, Payroll clerk
Stationary plant operators	2.1	4	Crane, hoist or lift operator, Driller, Railway signal operator, Train controller, Engineering production worker, Concrete pump operator
Cleaners and laundry workers	2.0	5	Commercial cleaner, Laundry worker
Contract, program and project administrators	1.9	2	Contract administrator, Program or project administrator
Plumbers	1.8	3	Plumber, Gasfitter
Electronics and telecommunications trades workers	1.7	3	Air-conditioning and refrigeration mechanic, Electrical line worker, Cabler, Telecommunications technician
Machine operators	1.7	4	Concrete products machine operator, Industrial spraypainter, Plastic cablemaking machine operator, Plastics fabricator
Business administration managers	1.6	1	Corporate services manager, Finance manager, Human resource manager
Bricklayers, and carpenters and joiners	1.6	3	Bricklayer, Stonemason, Carpenter
General clerks	1.5	4	General clerk

Notes:

1. Proportions calculated after deducting 'not stated' and 'inadequately described' responses from total.
2. Occupations and predominant skill levels based on ANZSCO 3-digit occupations (ABS 2013b). ANZSCO assigns occupations to one of five skill levels, with one being the highest skill level and five the lowest. Occupations at skill level one have a level of skill commensurate with a bachelor degree or higher qualification, while at least five years of relevant experience may substitute for the formal qualification. Skill level five occupations have a level of skill commensurate with a Certificate Level I qualification or compulsory secondary education, although in some instances no formal qualification or on-the-job training may be required.

Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using TablebuilderPro.

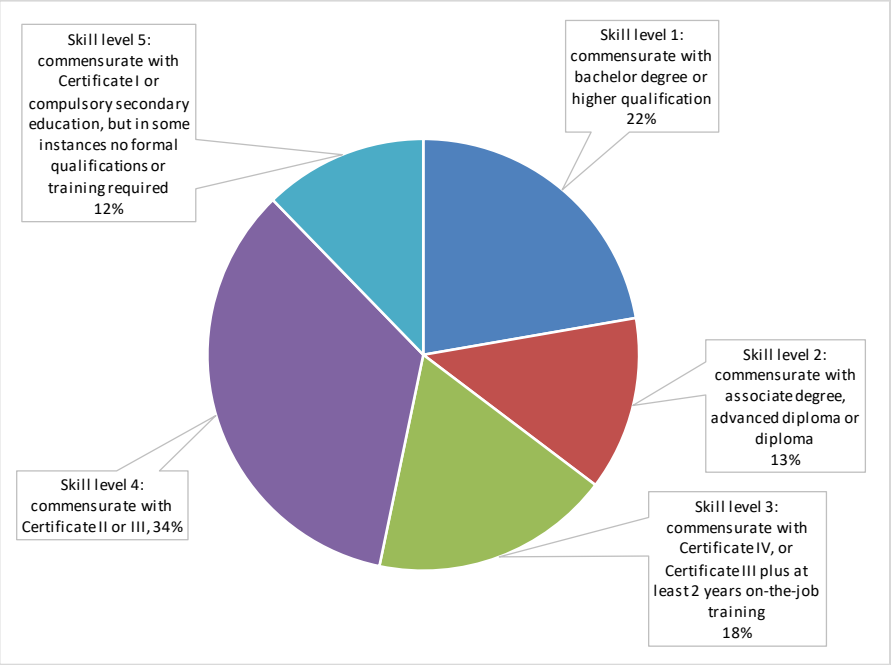
Table 8 reveals that the main occupations in HCEC cover the full range of skill levels. Skill level three and four occupations are most prevalent—of the 20 listed occupations, 6 are skill level three occupations and 6 are skill level four occupations (with a further two containing a mix of skill level four and five occupations). However, there are also 3 skill level one occupations listed in Table 8, alongside 2 skill level two occupations, and 1 skill level five occupation.

In the Road and bridge construction sub-industry, employment is heavily concentrated in two 3-digit occupations: Mobile plant operators (17.6 per cent of employment) and Construction and mining labourers (17.2 per cent). Other occupations that make a significant contribution include Truck drivers (8.1 per cent) and Engineering professionals (7.0 per cent). In the Other heavy and civil engineering construction sub-industry, employment is more evenly dispersed across occupations, with the top occupations being Construction and mining labourers (12.7 per cent), Engineering professionals (7.1 per cent), Construction, distribution and production managers (6.6 per cent) and Building and engineering technicians (6.2 per cent) (data not shown).

Figure 10 assigns all HCEC occupations with more than 100 employed persons to a predominant skill level using ANZSCO (ABS 2013b). It shows that 34 per cent of all HCEC employed persons are working in occupations that have a predominant skill level of four, corresponding to a Certificate Level II or III qualification. There is also a sizeable proportion of HCEC workers employed in skill level one occupations (22 per cent) and skill level three occupations (18 per cent).

Overall, this chart shows that the skill levels of HCEC workers cover a wide spectrum, with significant representation of very highly skilled workers (e.g. Engineering professionals, Construction project managers), together with many technicians and trades workers in the middle of the skill spectrum. However, the largest concentration of workers is towards the lower end of the skill spectrum, with over a third of workers employed in skill level four occupations, reflecting the prevalence of Machinery operators, drivers and labourers in the HCEC industry.

Figure 10 Skill level of the occupations of Heavy and civil engineering construction workers, Australia, 2016



Notes:
1. Proportions calculated after deducting 'not stated' and 'inadequately described' occupations from total.
2. Predominant skill levels based on ANZSCO 3-digit occupations (ABS 2013b). ANZSCO assigns occupations to one of five skill levels, with one being the highest skill level and five the lowest. All 3-digit occupations with 100 or more HCEC employed persons were classified to one or more predominant skill levels based on ABS (2013b), capturing 99.6 per cent of all HCEC employed persons with a stated and adequately described occupation. Where an occupation had multiple skill levels, workers were evenly apportioned across the relevant skill levels.

Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using TablebuilderPro.

Table 9 shows how the skill levels of workers vary across the two HCEC sub-industries. The Other heavy and civil engineering construction sub-industry is more highly skilled than the Road and bridge construction sub-industry, as it has significantly higher representation of skill level three occupations (e.g. electricians, plumbers) and significantly lower representation of skill level four occupations (e.g. mobile plant operators).

Table 9 Skill level of occupations in Heavy and civil engineering construction sub-industries, Australia, 2016

4-digit HCEC sub-industry	Proportion of employed persons at each skill level (per cent)					
	1	2	3	4	5	Total
Road and bridge construction	20	12	8	48	12	100
Other heavy and civil engineering construction	23	13	25	26	13	100

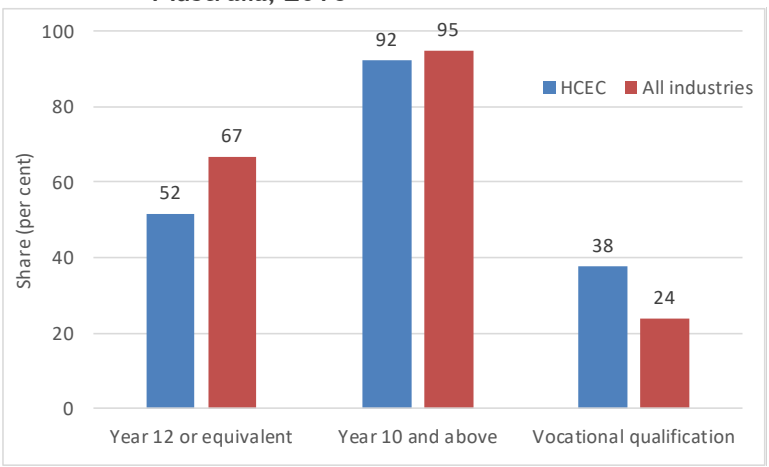
Notes:
1. Proportions calculated after deducting 'not stated' and 'inadequately described' occupations from total.
2. Predominant skill levels based on ANZSCO 3-digit occupations (ABS 2013b). ANZSCO assigns occupations to one of five skill levels, with one being the highest skill level and five the lowest. All 3-digit occupations with 50 or more employed persons in the sub-industry were classified to one or more predominant skill levels based on ABS (2013b), capturing 97 per cent of all Road and bridge construction employed persons with a stated and adequately described occupation and 99 per cent of all Other heavy and civil engineering construction employed persons with a stated and adequately described occupation. Where an occupation had multiple skill levels, workers were evenly apportioned across the relevant skill levels.

Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using TablebuilderPro.

Education

People employed in the HCEC industry are generally less highly educated than the average Australian worker, in terms of both schooling and post-school education. About 52 per cent of those who work in the HCEC industry have Year 12 or equivalent qualifications, compared to 67 per cent of all employed persons (Figure 11). The HCEC industry also has a smaller proportion with Year 10 or higher qualifications (92 per cent versus 95 per cent). However, HCEC workers have a much greater prevalence of vocational qualifications compared to all employed workers.

Figure 11 Schooling and vocational education of Heavy and civil engineering construction workers, Australia, 2016



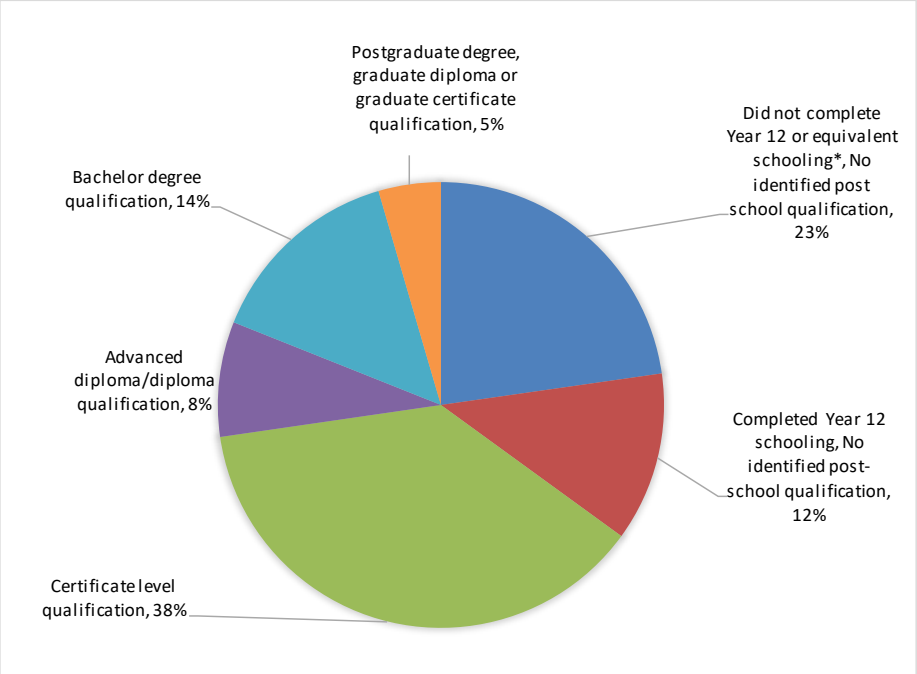
Notes:
1. Vocational qualification includes Certificate I & II Level, Certificate III & IV Level and Certificate Level (not further defined).
2. Percentage shares calculated after excluding not stated and inadequately described responses from total.

Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using TablebuilderPro.

Figure 12 shows that the main form of post-school qualification in the HCEC industry is a certificate, which is held by a much higher proportion (38 per cent of workers) than in the general workforce (24 per cent). More than 97 per cent of these are certificate III or IV qualifications, rather than the less advanced certificate I or II qualifications. However, 35 per cent of HCEC workers report no post-school qualification (or a qualification outside the scope of ASCED), similar to the 34 per cent in the general workforce. The HCEC industry has fewer workers with bachelor degrees (14 per cent versus 21 per cent in the national workforce), and fewer with

bachelor degree or higher qualifications (19 per cent versus 31 per cent). Female HCEC workers are considerably more likely to have a bachelor degree or higher qualification, than are males (28 versus 17 per cent) (data not shown).

Figure 12 Educational qualifications of Heavy and civil engineering construction workers, Australia, 2016



Notes:
1. Asterisk (*) includes not stated level of schooling.
2. Percentage shares calculated after excluding not stated and inadequately described post-school qualifications from total.
Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using TablebuilderPro.

Table 10 presents information on post-school educational qualifications for the HCEC 4-digit sub-industries. The proportion of employed persons with no post-school qualifications is much higher for the Road and bridge construction sub-industry (44 per cent) than the Other heavy and civil engineering construction sub-industry (30 per cent). Road and bridge construction workers are less likely to have a Bachelor degree or higher qualification, Advanced diploma/diploma or Certificate level qualification than workers in the Other heavy and civil engineering construction sub-industry.

Table 10 Post-school qualifications of Heavy and civil engineering construction workers by sub-industry, Australia, 2016

4-digit HCEC sub-industry	Bachelor degree or higher	Advance diploma and diploma level	Certificate level	No post-school qualification
		Share (per cent)		
Road and bridge construction	16.8	7.3	32.2	43.6
Other heavy and civil engineering construction	20.0	9.0	41.3	29.7
Total HCEC industry	19.0	8.3	37.7	35.0

Notes:
1. Based on ANZSIC 2006 (Revision 2) 2 -digit industries (ABS 2013).
2. HCEC not further defined is included in the total, but not shown separately.
Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using Tablebuilder Pro.

According to the ABS 2016 census, the main fields of study in which HCEC workers had gained their post-school qualifications were Engineering and related technologies (34 per cent of HCEC workers), Architecture and building (10 per cent) and Management and commerce (9 per cent).

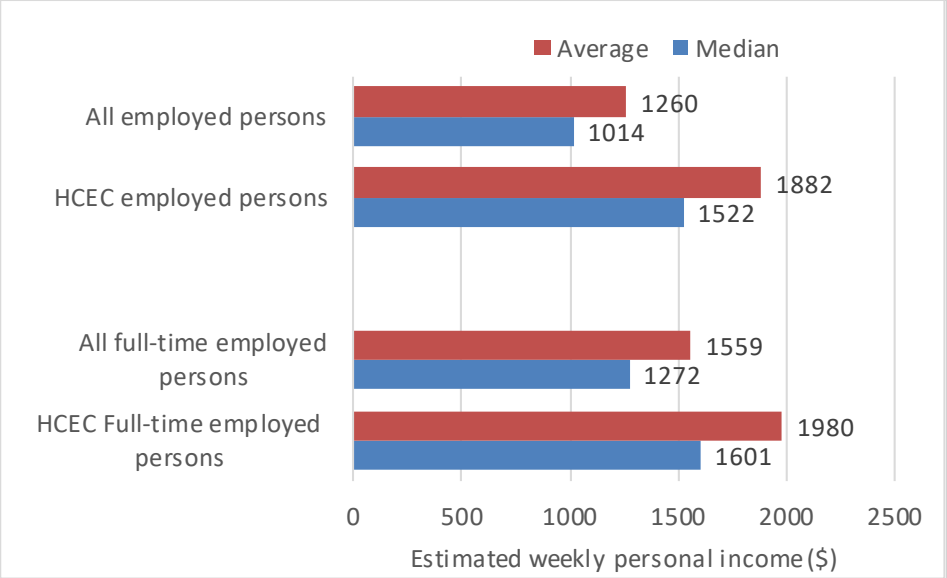
HCEC has a very low rate of workers who currently attend an educational institution (4 per cent), compared to 12 per cent across all employed persons. Amongst the HCEC sub-industries, the Other heavy and civil engineering construction sub-industry had a slightly higher proportion of its workers currently attending an educational institution (4.7 per cent) than the Road and bridge construction sub-industry (3.8 per cent).

Income

Based on responses to the 2016 census, 30.5 per cent of HCEC workers had total personal incomes[18] of more than $104 000 per annum, compared to 13.8 per cent of all employed persons. Only 6.3 per cent of HCEC workers had incomes of less than $33 800 per annum, compared to 26.3 per cent of all employed persons. This reflects the relatively high proportion of HCEC workers employed on a full-time basis,

Figure 13 displays BITRE's estimates of the average (and median) weekly personal income of HCEC employed persons and how that compares to the all-industry average (and median). The median income figures are considerably lower than the average income figures. Based on this 2016 census data, BITRE estimates that average and median weekly incomes in the HCEC industry are about 50 per cent higher than the all-industry average and median.

Figure 13 Estimated average and median weekly personal income of Heavy and civil engineering construction workers, Australia, 2016



Notes:

1. Total personal income includes income from sources other than employment (e.g. family benefits, investment income). BITRE has estimated median and average weekly income based on the categorical income responses in the census. For median income, a specific point estimate within the median income category is derived using a simple pro-rata approach. The approach to estimating average income involved excluding negative income responses and assigning an average value to each income category. The average value was set as the midpoint of the income range for all categories, apart from the top income category, where the average was set at $4500, based on results from the ABS' *Survey of Income and Housing 2009–10* and *2015-16* (which shows that a multiple of 1.5 times the lower limit of the top income category is a conservative midpoint for the top income category).
2. Full-time employed persons are defined as those who work 35 or more hours per week.

Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using TablebuilderPro.

[18] Total personal income includes income from sources other than employment (e.g. family benefits, investment income).

A likely reason for the higher incomes in HCEC is the greater number of hours being worked by persons employed in the HCEC industry (see Figure 6). Figure 13 shows that average and median weekly incomes of full-time workers are 25-27 per cent higher in the HCEC industry, compared to the all-industry average. This income premium for full-time HCEC workers could reflect a higher hourly rate of pay or higher overtime payments (due to longer working hours), or a combination of both of these factors.

Table 11 shows that employed people in the Road and bridge construction sub-industry had lower incomes than those who were employed in the Other heavy and civil engineering construction sub-industry. For full-time employed persons, those employed in the Other heavy and civil engineering construction sub-industry earnt 20-24 per cent more per week. While these higher incomes are consistent with the generally higher skill and education levels of workers in the Other heavy and civil engineering construction sub-industry (see Tables 8 and 10), the difference in incomes may also reflect greater overtime payments due to the greater incidence of very long working hours in the Other heavy and civil engineering construction sub-industry (see Table 3).

Table 11 Estimated average and median weekly personal income of Heavy and civil engineering construction workers by sub-industry, Australia, 2016

4-digit HCEC sub-industry	Average income ($)	Median income ($)
	All employed persons	
Road and bridge construction	1622	1351
Other heavy and civil engineering construction	2038	1653
Total HCEC industry	1882	1522
	Full-time employed persons	
Road and bridge construction	1720	1430
Other heavy and civil engineering construction	2132	1723
Total HCEC industry	1980	1601

Notes:

1. Total personal income includes income from sources other than employment (e.g. family benefits, investment income). BITRE has estimated median and average weekly income based on the categorical income responses in the census. For median income, a specific point estimate within the median income category is derived using a simple pro-rata approach. The approach to estimating average income involved excluding negative income responses and assigning an average value to each income category. The average value was set as the midpoint of the income range for all categories, apart from the top income category, where the average was set at $4500, based on results from the ABS' *Survey of Income and Housing 2009–10* and *2015-16* (which shows that a multiple of 1.5 times the lower limit of the top income category is a conservative midpoint for the top income category).
2. Full-time employed persons are defined as those who work 35 or more hours per week.

Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using TablebuilderPro.

Commuting behaviour

Table 12 shows that HCEC workers were more likely to travel to work by private vehicle on census day 2016 (81.9 per cent), compared to employed persons as a whole (75.9 per cent). In particular, they were more likely to travel by car as a driver (73.5 versus 69.2 per cent) and by other private vehicles which include trucks and motorcycles (4.0 versus 1.6 per cent). They were less likely to travel by car as a passenger (4.4 versus 5.2 per cent). Public transport use is very similar for HCEC workers and all employed persons, but active travel use and working from home are less common for HCEC workers.

Table 12 Transport modes for journey to work by Heavy and civil engineering construction workers, Australia, 2016

Transport modes	HCEC industry	All industries
	Share (per cent)	
Private vehicles	81.9	75.9
Car as driver	73.5	69.2
Car as passenger	4.4	5.2
Other private vehicles	4.0	1.6
Public transport	12.6	13.1
Train	4.0	8.0
Bus	8.2	3.9
Other public transport	0.5	1.1
Active travel	2.1	5.0
Worked at home	1.9	5.3
Other	1.3	0.8
All transport modes	100.0	100.0

Notes:
1. Total may not add total of each main mode due to rounding.
2. Other private vehicle includes truck and motorcycles.
3. Other public transport includes train, ferry and taxi.
4. Active travel includes bicycle and walk.
5. Mode share calculated after excluding not stated and did not go to work responses.

Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using TablebuilderPro.

Work location

In 2016, people employed in the HCEC industry were more likely to report in the census that they have no fixed work address[19] (8.9 per cent, compared to 4.4 per cent across all industries). This most probably reflects the project-based nature of HCEC work, with work sites potentially changing quite frequently. Nevertheless, the great majority of HCEC workers do report a usable place of work address in the census.

The following three tables (Tables 13, 14 and 15) provide information on the place of work of HCEC employed persons, with respect to states, capital cities, rest of states, Significant Urban Areas (SUAs)[20] and Statistical Area Level 2s (SA2s).[21] The spatial patterns of work location revealed by these tables will reflect the major infrastructure projects that were under construction at that particular point in time (i.e. August 2016), and may not be a useful guide to longer-term spatial differences in the size of the HCEC industry.

Tables 13, 14 and 15 show that HCEC jobs are concentrated within certain parts of Australia:

- HCEC makes a significant contribution to Northern Territory employment (3.0 per cent), a relatively minor contribution in Victoria and South Australia (each 0.6 per cent), and a very small contribution to the ACT's employment (0.2 per cent) (Table 13).
- Most HCEC jobs are concentrated in Australia's main population centres, with 69 per cent of people employed in HCEC working in Australia's capital cities. However, the proportion employed in HCEC is lower for the capital cities than it is for the rest of Australia (0.7 versus 1.0 per cent) (Table 13).
- Greater Sydney had the highest number of HCEC jobs, but Greater Darwin has the highest proportion of employed persons working in the HCEC industry (4.1 per cent). The very high representation of the HCEC industry in Darwin reflects the Ichthys LNG project, including the construction of an onshore LNG processing plant at Bladin Point near Darwin (Inpex 2019). Regional WA also has a relatively high proportion

19 Includes Migratory-Offshore-Shipping responses.

20 Significant Urban Areas (SUAs) represent significant towns and cities of 10 000 people or more. A single SUA can represent either a single urban centre or a cluster of related urban centres. They are defined by combining one or more Statistical Area Level 2s (SA2s) (ABS 2017).

21 SA2s are a small area geographic unit and key building block within the ABS' Australian Statistical Geography Standard (ASGS). There are 2310 SA2s in Australia in 2016 and SA2s typically have a population of between 3 000 and 25 000 (ABS 2017).

of HCEC employment at 2.6 per cent, reflecting the contribution of the mining and resources sector to Other heavy and civil engineering construction employment (Table 13).

- The SUAs that had the most HCEC jobs in 2016 were Sydney (12 100 jobs), Melbourne (10 300), Perth (7 700), Brisbane (7 000), Adelaide (3 300), Newcastle-Maitland (2 200) and Gold Coast-Tweed Heads (1 700) (Table 14).
- The SUAs with the highest proportion of HCEC jobs were Ulverstone (TAS), Gladstone-Tannum Sands (QLD), Grafton (QLD), Karratha (WA) and Port Hedland (WA). HCEC represented between 2.0 per cent and 2.5 per cent of total jobs in each city (Table 14). While Road and bridge construction is driving the high HCEC employment shares in Ulverstone and Grafton, Other heavy and civil engineering construction (and specifically the mining sector) is driving the high HCEC shares in Gladstone-Tannum Sands, Karratha and Port Hedland.
- Of the ten largest SA2 concentrations of HCEC jobs, eight are located in one of the five major capital cities. The exceptions are Ashburton (in WA's Pilbara) and Ormeau-Yatala (on QLD's Gold Coast) (Table 15). The Weddell SA2 near Darwin is home to the Ichthys gas processing plant (Inpex 2019).
- Of the ten SA2s that have the highest proportion of HCEC jobs, four are located in capital cities (i.e. Austins Ferry-Granton in Hobart, Henderson in Perth, and Ripley and Deagon in Brisbane), while the remainder are located in a diverse mix of regional areas (Table 15).

Table 13 Heavy and civil engineering construction employment by place of work, Australia, 2016

Geography	HCEC employed persons	HCEC share of all employed persons in location (per cent)
Greater Sydney	13 000	0.6
Greater Melbourne	10 600	0.5
Greater Brisbane	7 200	0.7
Greater Adelaide	3 300	0.6
Greater Perth	7 800	1.0
Greater Hobart	590	0.6
Greater Darwin	2 800	4.1
Canberra	417	0.2
Rest of New South Wales	8 500	0.9
Rest of Victoria	4 000	0.7
Rest of Queensland	8 800	0.9
Rest of South Australia	924	0.6
Rest of Western Australia	6 400	2.6
Rest of Tasmania	834	0.8
Rest of Northern Territory	280	0.9
New South Wales	21 500	0.7
Victoria	14 600	0.6
Queensland	16 000	0.8
South Australia	4 200	0.6
Western Australia	14 200	1.3
Tasmania	1 400	0.7
Northern Territory	3 100	3.0
All capital cities	45 700	0.7
Total Rest of states	29 800	1.0
Australia	75 500	0.8

Notes:
1. HCEC employed persons rounded to nearest 100.
2. No fixed address, Migratory-Offshore-Shipping and Other Territories are excluded from the total.
3. HCEC share calculated after excluding industry not stated and inadequately described from total.
4. Australian Capital Territory is the same as Canberra and was included in the Capital cities total.
Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of work data), extracted using TablebuilderPro.

Table 14 Top 10 Significant Urban Area's of work for Heavy and civil engineering construction employed persons, Australia, 2016

Significant Urban Area (SUA)	HCEC employed persons	Significant Urban Area (SUA)	HCEC share of SUA employment (per cent)
Sydney (NSW)	12 100	Ulverstone (TAS)	2.5
Melbourne (VIC)	10 300	Gladstone - Tannum Sands (QLD)	2.3
Perth (WA)	7 700	Grafton (QLD)	2.1
Brisbane (QLD)	7 000	Karratha (WA)	2.1
Adelaide (SA)	3 300	Port Hedland (WA)	2.0
Newcastle - Maitland (NSW)	2 200	Camden Haven (NSW)	1.9
Gold Coast - Tweed Heads (QLD)	1 700	Maryborough (QLD)	1.6
Darwin (NT)	900	Darwin (NT)	1.6
Townsville (QLD)	800	Port Augusta (SA)	1.5
Wollongong (NSW)	700	Parkes (NSW)	1.4

Notes:
1. HCEC employed persons rounded to nearest 100.
2. Excluded Not in SUA, No fixed work address and Migratory-Offshore-Shipping from the total, when calculating proportions.
3. HCEC share calculated after excluding industry not stated and inadequately described from total.
Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of work data), extracted using TablebuilderPro.

Table 15 Top 10 Statistical Area 2's of work for Heavy and civil engineering construction workers, Australia, 2016

Statistical Area 2 (SA2)	HCEC employed persons	Statistical Area 2 (SA2)	Share of SA2 employment (per cent)
Ashburton (WA)	3 900	Ashburton (WA)	17.3
Weddell (NT)	1 800	Austins Ferry-Granton (TAS)	15.6
Perth City (WA)	1 400	Ripley (QLD)	13.0
North Sydney - Lavender Bay (NSW)	900	Miles-Wandoan (QLD)	11.7
Dandenong (VIC)	646	Deagon (QLD)	10.4
Sydney - Haymarket - The Rocks (NSW)	600	Henderson (WA)	9.7
Victoria Park - Lathlain - Burswood (WA)	600	Longford-Loch Sport (VIC)	9.4
Parramatta - Rosehill (NSW)	600	Seymour Region (VIC)	9.4
Ormeau - Yatala (QLD)	600	Telina-Tooloa (QLD)	9.2
Melbourne (VIC)	600	Nambucca Heads Region (NSW)	8.6

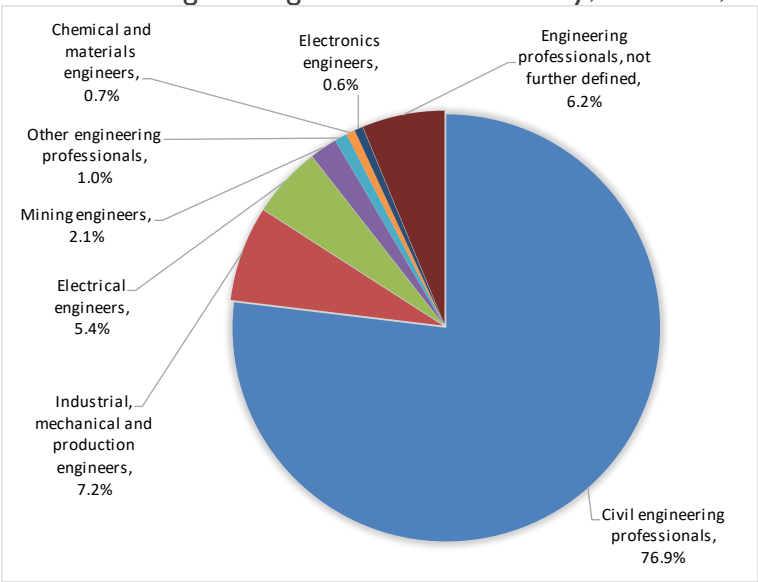
Notes:
1. HCEC employed persons rounded to nearest 100.
2. Excluded Not in SA2, No fixed work address and Migratory-Offshore-Shipping from the total, when calculating proportions.
3. SA2s with less than 200 employed persons were excluded.
4. HCEC share calculated after excluding industry not stated and inadequately described from total.
Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of work data), extracted using TablebuilderPro.

Box A: Profile of HCEC Engineering professionals in Australia

This breakout box provides a profile of Engineering professionals working in the Heavy and civil engineering construction (HCEC) industry, based on national data from the ABS' *Census of Population and Housing* for 2016. Some of the key changes that have occurred since 2011 are also discussed.

The profile is based on the ABS' ANZSCO 3-digit occupation of Engineering professionals, which can be disaggregated into eight ANZSCO 4-digit sub-occupations (ABS 2013b). Figure B1 shows the contribution of each Engineering professional sub-category. There were 5976 Engineering professionals in Australia's HCEC industry in 2016. Of these, more than three-quarters (nearly 77 per cent or 4174 persons) were Civil engineering professionals. Industrial, mechanical and production engineers as well as Electrical engineers also made notable contributions (7.2 per cent and 5.4 per cent, respectively). The remaining sub-occupations made a very small contribution (totalling 4.3 per cent).

Figure B1 Contribution of Engineering professionals sub-occupations in the Heavy and civil engineering construction industry, Australia, 2016



Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using TablebuilderPro.

There was an increase of 1124 Engineering professionals within the HCEC industry between 2011 and 2016, representing 4.3 per cent average annual growth. Strong increases in the number of Civil engineering professionals were behind this growth.

In 2016, 91 per cent of HCEC Engineering professionals were male, down slightly from 92 per cent in 2011.

The median age of all Engineering professionals in the HCEC industry was 33 years, being higher for males (34 years) than their female counterparts (30 years). A relatively high proportion of the female Engineering professionals are aged 35 and under (67 per cent), compared to 52 per cent of males. Ten per cent of the male Engineering professionals are aged 55 years and over, compared to just 2 per cent of the females (Figure B2). The proportion of all HCEC Engineering professionals aged 55 and over declined from 11.3 per cent in 2011 to 9.7 per cent in 2016.

Civil engineering professionals in the HCEC industry have a particularly youthful age structure, with 55 per cent aged 35 and under, and only 9 per cent aged 55 and over.

Forty four per cent of HCEC Engineering professionals were born overseas, compared to 31 per cent of all Australian workers. Just over half of the overseas-born Engineering professionals arrived in Australia between 2006 and 2016, which points to Australia's migration intake being a key source of HCEC Engineering professionals.

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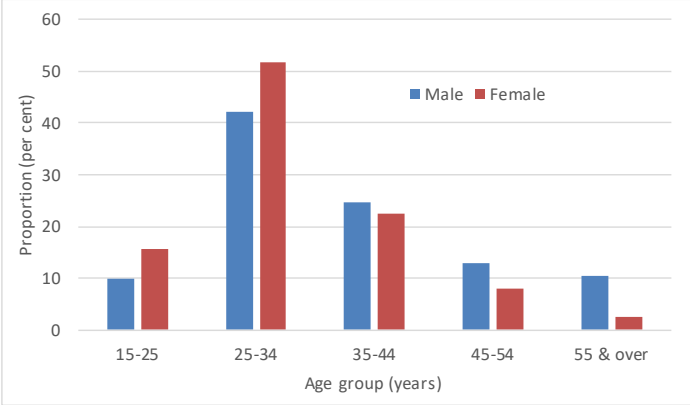
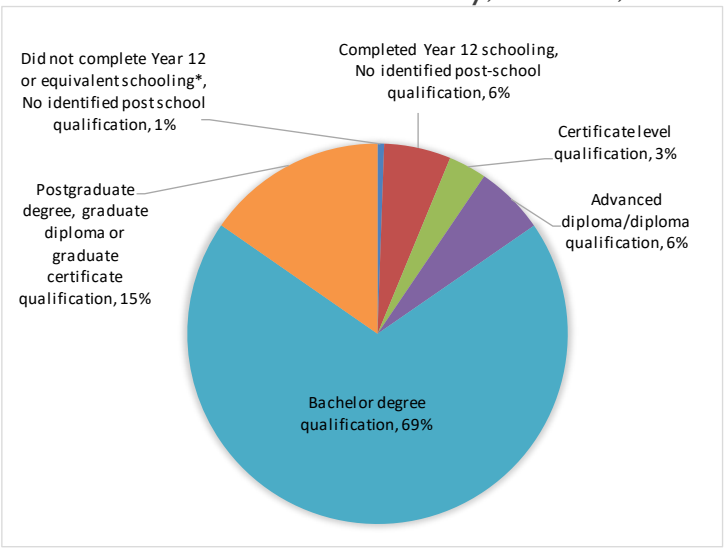
Figure B2 Comparison of Engineering professionals' age by gender in the Heavy and civil engineering construction industry, Australia, 2016



Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using TablebuilderPro.

Figure B3 shows that the most common post-school qualification for HCEC Engineering professionals is a Bachelor degree, which is the highest qualification held by 69 per cent of HCEC Engineering professionals (compared to 21 per cent of all employed persons). A further 15 per cent of Engineering professionals hold a postgraduate qualification. Only 6 per cent of Engineering professionals reported no post-school qualifications or a qualification outside the scope of the Australian Standard Classification of Education (ASCED).

Figure B3 Educational qualifications of Engineering professionals in the Heavy and civil engineering construction sub-industry, Australia, 2016



Notes:
1. Asterisk (*) includes not stated level of schooling completion.
2. Percentage shares calculated after excluding not stated and inadequately described post-school qualification responses from total.

Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using TablebuilderPro.

Figure B4 shows that a relatively large proportion of HCEC Engineering professionals report working 49 or more hours per week (52 per cent, compared to 16 per cent of all employed persons). Ninety three per cent are full-time employed, compared to 65 per cent of all employed persons. The proportion working 49 hours or more per week has risen by 3.5 percentage points since 2011, while the proportion working full-time has fallen by 0.7 percentage points. Ninety one per cent of engineering professionals are employees.

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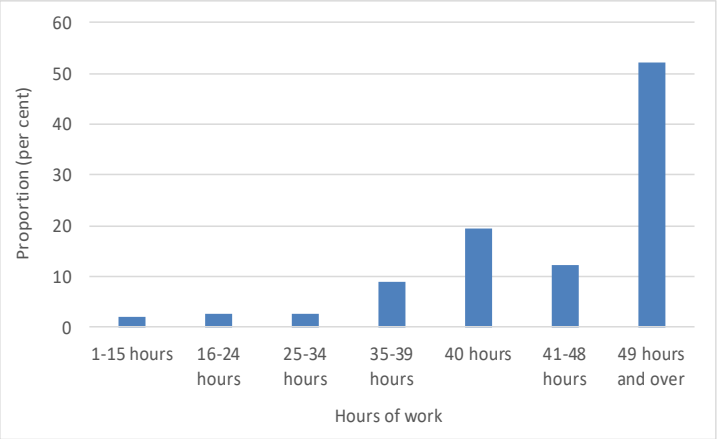
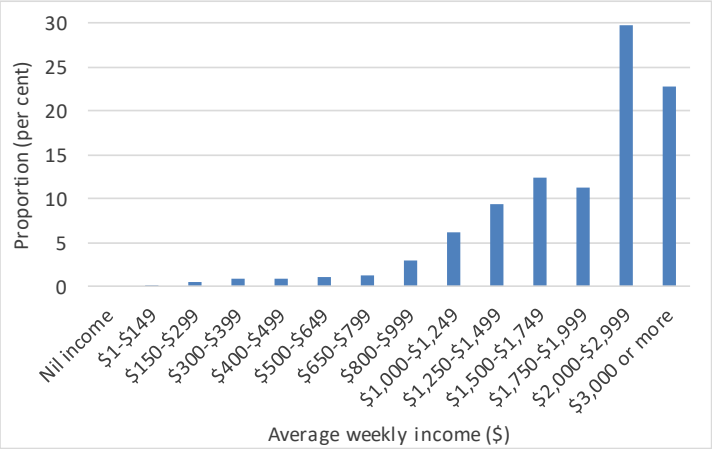
Figure B4 Proportion of engineering professionals in the Heavy and civil engineering construction industry by working hours, Australia, 2016



Note: Proportions calculated after excluding hours not stated and zero hours worked in week prior to census night.
Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using TablebuilderPro.

As shown in Figure B5, the majority (52 per cent) of HCEC Engineering professionals had total personal weekly income of more than $2000, while only a small fraction (8 per cent) of Engineering professionals had income of less than $1000 per week.

Figure B5 Average weekly personal income of Engineering professionals in the Heavy and civil engineering construction industry, Australia, 2016



Notes:
1. Total personal income includes income from sources other than employment (e.g. family benefits, investment income).
2. Negative incomes are excluded from chart.
Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using TablebuilderPro.

The estimated median weekly personal income[22] of HCEC Engineering professionals was $2083 in 2016, which is more than double than the median income of all employed persons ($1014). Among the sub-occupations, Electrical engineers had the highest median income ($2363), while Civil engineering professionals had the lowest median income ($2041).

Continued on next page

22 Total personal income includes income from sources other than employment (e.g. family benefits, investment income). BITRE has estimated median weekly income based on the categorical income responses in the census. Details of the methodology are provided in the notes to Figure 13.

Continued

Table B1 shows that HCEC Engineering professional jobs are concentrated in Australia's main capital cities, with Greater Sydney having the highest number of Engineering professional jobs, followed by Greater Melbourne. The combined capital cities have 78 per cent of HCEC Engineering professional jobs. Engineering professionals make up a much higher proportion of total HCEC employment in the capital cities than in regional areas (9.9 versus 4.4 per cent). The three largest cities of Sydney, Melbourne and Brisbane have the highest proportion of HCEC workers employed as Engineering professionals (all at 10 per cent or more).

Outside of the five major cities, the Significant Urban Areas (SUAs) with the most Engineering professionals in the HCEC industry were Newcastle–Maitland (130 jobs), Gold Coast-Tweed Heads (89 jobs) and Wollongong (48 jobs) (data not shown).

Small areas (SA2s) that contain a particularly large number of HCEC Engineering professional jobs include Perth City (236 jobs), North Sydney-Lavender Bay (137 jobs), Ashburton in WA (122 jobs), Weddell in NT (122 jobs) and Sydney-Haymarket-The Rocks in Sydney's CBD (109 jobs) (data not shown).

Table B1 Employment of Heavy and civil engineering construction Engineering professionals by place of work – Greater Capital Cities and Rest of states, Australia, 2016

Geographic areas	HCEC Engineering professionals	Share of HCEC employed persons (per cent)
Greater Sydney	1518	11.7
Greater Melbourne	1127	10.6
Greater Brisbane	717	10.0
Greater Adelaide	235	7.1
Greater Perth	686	8.8
Greater Hobart	32	5.4
Greater Darwin	177	6.3
Canberra	37	8.9
Rest of New South Wales	509	6.0
Rest of Victoria	143	3.6
Rest of Queensland	401	4.5
Rest of South Australia	14	1.5
Rest of Western ustralia	199	3.1
Rest of Tasmania	22	2.6
Rest of Northern Territory	9	3.2
New South Wales	2027	9.4
Victoria	1270	8.7
Queensland	1118	7.0
South Australia	249	5.9
Western Australia	885	6.2
Tasmania	54	3.8
Northern Territory	186	6.0
All capital cities	4529	9.9
Total rest of states	1297	4.4
Total Australia	5826	100.0

Notes:
1. Excluded No fixed work address, Migratory-Offshore-Shipping and Other territories from the total.
2. Australian Capital Territory is same as Canberra and was included in the Capital cities total.
Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of work data), extracted using TablebuilderPro.

In conclusion, HCEC Engineering professionals are overwhelmingly male and employed full-time, and are relatively youthful with a median age of just 33 years. They are very highly educated, tend to work very long hours, and are correspondingly well paid. HCEC Engineering professionals are concentrated in the major capital cities, and at the national scale their numbers have increased strongly between 2011 and 2016 (by 1124 persons, representing average annual growth of 4.3 per cent).

Recent changes

The preceding section presented a point-in-time snapshot of the characteristics of Heavy and civil engineering construction (HCEC) workers in 2016. This section compares ABS *Census of Population and Housing* data over the most recent inter-censal period (2011 to 2016) in order to identify some of the key changes that have occurred in recent years. In some cases, this short-term comparison is supplemented by a longer-term comparison (for the 2006 to 2016 period), to identify whether there are significant longer-term shifts in the underlying characteristics of HCEC workers. For some issues, post-2016 data from other sources is also incorporated to provide a more up-to-date picture.

Comparison of the two most recent censuses reveals that an additional 1 600 persons were employed in the HCEC industry in 2016, compared to 2011 (Table 16). This represents average annual employment growth of 0.4 per cent for the HCEC industry, substantially below the all-industry growth rate of 1.2 per cent. This recent growth in HCEC employment is much smaller in magnitude than the preceding 2006 to 2011 period, when the number of HCEC employed persons grew by 28 000 (or average annual growth of 2.0 per cent) (Table 16).

The ABS *Labour Force Survey* (LFS) provides an alternate measure of national employment change in the HCEC industry.[23] The LFS data reveals that there was a decrease of 1 900 employed persons in the HCEC industry in 2016, compared to 2011. Thus, the average annual decline rate is 0.6 per cent, compared to the growth rate of 0.4 per cent from the census for the same period. Like the census, the LFS data shows that the recent change in HCEC employment is much smaller in magnitude than the preceding 2006 to 2011 period (Table 16).

Post-2016 data is also available from the LFS. Overall, there was an increase of 60 100 employed persons in the HCEC sub-industry between the August quarters of 2006 and 2018, giving an average annual growth of 5.9 per cent (Table 16). However, this growth was concentrated in the post-2016 sub-period, with particularly rapid employment growth occurring between the November quarter of 2016 and the May quarter of 2018 (see Figure 3).

Table 16 Change in Heavy and civil engineering construction employment, Australia, 2006 to 2016

Year	Heavy and civil engineering construction		Average annual growth rate of all employed persons (per cent)
	Number of additional employed persons	Average annual growth rate (per cent)	
ABS Census of Population and Housing			
2006-2011	28 000	8.8	2.0
2011-2016	1 600	0.4	1.2
2006-2016	29 600	4.5	1.6
ABS Labour Force Survey			
2006-2011	7 100	2.2	1.9
2011-2016	-1 900	-0.6	1.4
2006-2016	5 300	0.8	1.7
2006-2018	60 100	5.9	1.8
2011-2018	53 000	8.6	1.7

Note: Comparisons are based on year ending August.
Source: BITRE analysis of ABS *Census of Population and Housing* 2006, 2011 and 2016 (place of usual residence data), extracted using TablebuilderPro, and ABS Cat. 6291.0.55.*003 Labour Force, Australia, Detailed, Quarterly, May 2019.*

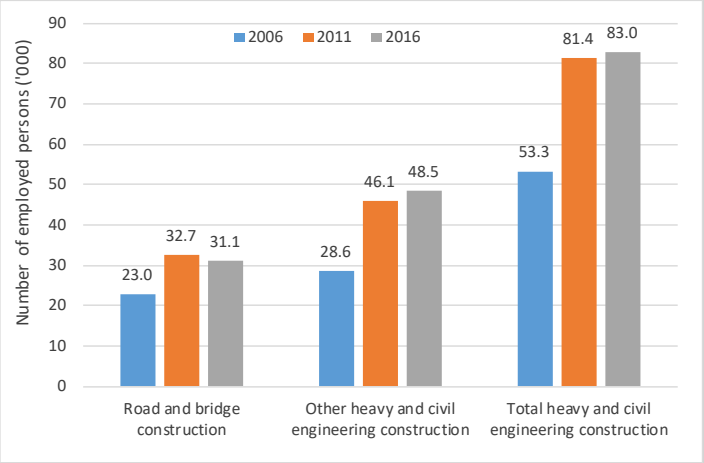
HCEC sub-industries

Figure 14 illustrates the number of persons employed in each HCEC sub-industry between 2006 and 2016, while Table 17 shows how the number of persons employed in each sub-industry changed during this period. These data are based on the census, as LFS data is not available at this level of disaggregation.

[23] The ABS *Labour Force Survey* (LFS) provides Australia's official measure of employment, and is specifically designed to support comparisons of employment data over time. Comparison of census data over time can be impacted by changes in methods. Note, however, that due to the relatively small size of the HCEC industry, HCEC employment estimates from the LFS may be subject to significant volatility, reflecting sampling error.

Between 2006 and 2016, HCEC added 29 600 employed persons, which included the HCEC not further defined category. The main source of HCEC employment growth was the Other heavy and civil engineering construction sub-industry, which added 19 900 employed persons, while the Road and bridge construction sub-industry added 8 000 people (despite a decline between 2011 and 2016). Average annual growth was much faster in the earlier period (2006-2011) than the later period (2011-2016) (Table 17).

Figure 14 Heavy and civil engineering construction employment by sub-industry, Australia, 2006 to 2016



Notes:
1. Sub-industries classified according to the ANZSIC 2006 (Revision 2) 4-digit industries (ABS 2013a).
2. Heavy and civil engineering construction, not further defined is included in HCEC total, but is not shown separately.
Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using TablebuilderPro.

Table 17 Change in Heavy and civil engineering construction employment by sub-industry, Australia, 2006 to 2016

4-digit HCEC sub-industries	2006-2011	2011-2016	2006-2016
	Change in employed persons ('000)		
Road and bridge construction	9.6	-1.6	8.0
Other heavy and civil engineering construction	17.5	2.4	19.9
Total HCEC industry	28.0	1.6	29.6
	Average annual growth rate (%)		
Road and bridge construction	7.2	-1.0	3.0
Other heavy and civil engineering construction	10.0	1.0	5.4
Total HCEC industry	8.8	0.4	4.5

Notes:
1. Sub-industries classified according to the ANZSIC 2006 (Revision 2) 4-digit industries (ABS 2013a).
2. Heavy and civil engineering construction, not further defined is included in HCEC total, but is not shown separately.
Source: BITRE analysis of ABS *Census of Population and Housing* 2016 (place of usual residence data), extracted using TablebuilderPro.

Employment type

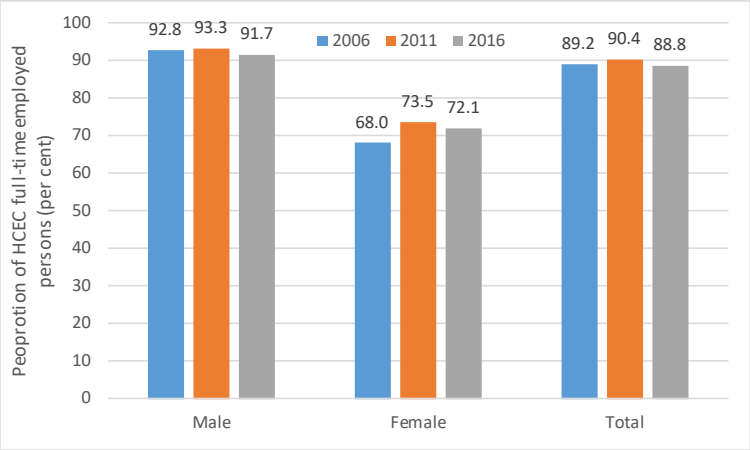
Figure 15 shows that between 2006 and 2016 there was a minor decline of 0.4 percentage points (from 89.2 to 88.8 per cent) in the proportion of HCEC workers employed on a full-time basis.[24] The decline in full-time HCEC employment was the net effect of a 1.1 percentage point decline in the proportion of males employed full-time, and a 4.2 percentage point rise in the proportion of females employed full time.

While the proportion of full-time workers in the HCEC industry rose by 1.3 percentage points between 2006 and 2011, it declined by 1.6 percentage points between 2011 and 2016. Similar declines were evident for male and female HCEC workers between 2011 and 2016. This recent decline in the proportion working full-time in the

24 There is an economy-wide trend towards reduced full-time employment, with the overall rate of full-time employment across all industries declining by 3.0 percentage points between the 2006 and 2016 censuses (from 68.5 to 65.5 per cent).

HCEC industry is somewhat less pronounced than the decline of 2.3 percentage points in the proportion of all employed persons working full-time between 2011 and 2016.

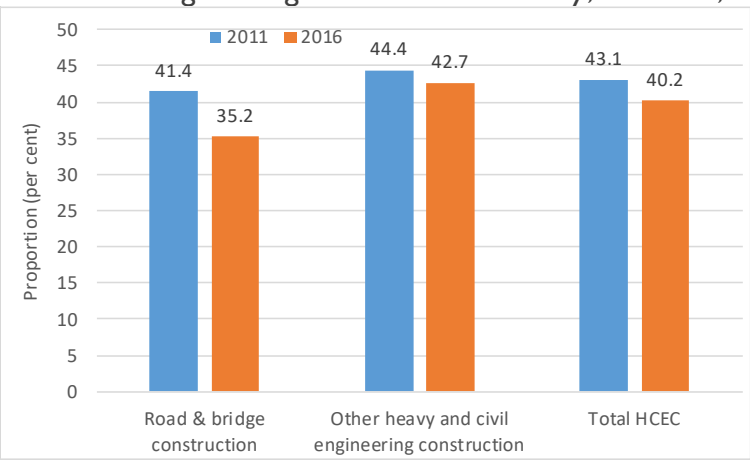
Figure 15 Proportion of full-time employed persons in the Heavy and civil engineering sub-industry by gender, Australia, 2006 to 2016



Note: Proportion calculated after excluding employed persons who were away from work.
Source: BITRE analysis of ABS *Census of Population and Housing* 2006, 2011 and 2016 (place of usual residence data), extracted using TablebuilderPro.

Figure 16 shows the proportion of HCEC employed persons who worked 49 or more hours in a week, disaggregated by sub-industry. Between 2011 and 2016, there was a 2.9 percentage point decline (from 43.1 to 40.2 per cent) in the proportion of HCEC employed persons who worked 49 or more hours a week. This decline was much more pronounced for Road and bridge construction employed persons (6.2 percentage points) than for Other heavy and civil engineering construction employed persons (1.8 percentage points). In a similar study, BITRE (2019) showed that across all industries, there was a decline from 17.8 to 15.9 per cent (or 1.9 percentage points) in the proportion who worked 49 or more hours per week. Thus, while there has been an economy-wide shift away from extra-long working weeks, the shift has been much more pronounced in the HCEC industry.

Figure 16 Proportion of employed persons who worked 49 or more hours in the Heavy and civil engineering construction industry, Australia, 2011 to 2016



Notes:
1. Proportion calculated after excluding not stated responses and those who reported working zero hours in the week prior to census night.
2. Sub-industries classified according to ANZSIC 2006 (Revision 2) 4-digit industries (ABS 2013a).
3. Heavy and civil engineering construction, not further defined is included in HCEC total, but is not shown separately.

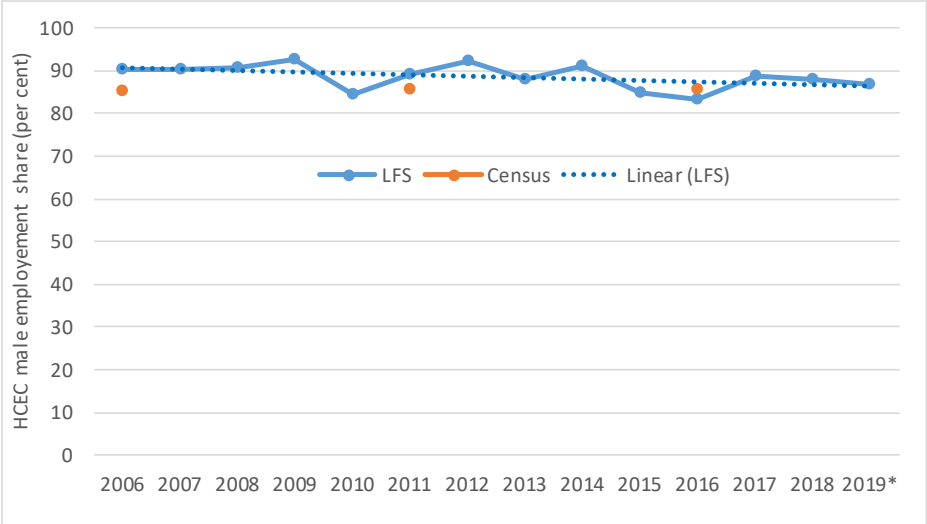
Source: BITRE analysis of ABS *Census of Population and Housing* 2011 and 2016 (place of usual residence data), extracted using TablebuilderPro.

Demographics

Figure 17 shows the proportion of male employed persons in the HCEC industry using both ABS *Labour Force Survey* (LFS) data (from 2006 to 2019) and ABS census data (2006, 2011 and 2016).

The ABS LFS data shows that the gender mix of the HCEC workforce has fluctuated over the period. Males accounted for 90.4 per cent of employed persons in 2006, which fell to 86.8 per cent in 2019, giving a net decrease of 3.5 percentage points. There was a small decline in the male employment share between 2006 and 2011 (1.3 percentage points), followed by a large decline between 2011 and 2016 (5.8 percentage points), and a moderate rise between August 2016 and May 2019 (3.6 percentage points). Overall, the linear trend line (dotted) shows a tendency for the male employment share in the HCEC industry to decline. On the other hand, ABS census data shows minimal change in the share of male employed persons, which stood at 85.2 per cent in 2006, 85.4 per cent in 2011, and 85.6 per cent in 2016.

Figure 17 Proportion of male employed persons in the Heavy and civil engineering construction industry, Australia, 2006 to 2019



Note: * Data for 2019 is for May quarter, (since August quarter data was not yet available). For all other years, data relates to August quarter (to align with census timing).

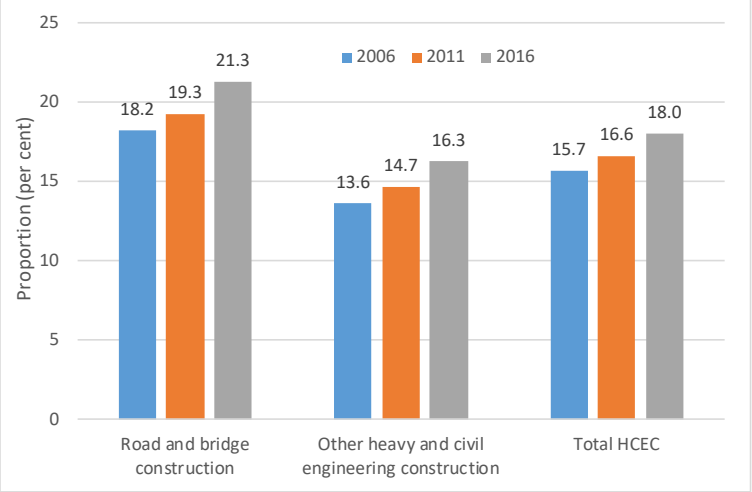
Source: BITRE analysis of ABS Cat. 6291.0.55.003 Labour Force, Australia, Detailed, Quarterly, May 2019 and ABS *Census of Population and Housing* 2006, 2011 and 2016 (place of usual residence data), extracted using TablebuilderPro.

ABS census data shows that the HCEC workforce has been ageing to a lesser degree than the overall workforce. The proportion of HCEC employed persons aged 55 and over stood at 15.7 per cent in 2006, and rose to 16.6 per cent in 2011, and then to 18.0 per cent in 2016. This represents a 2.3 percentage point increase between 2006 and 2016 (see Figure 18), which compares to a 4.2 percentage point rise for total employment (see BITRE 2019).

Figure 18 also shows that between 2006 and 2016 the proportion of employed persons aged 55 and over rose more for the Road and bridge construction sub-industry (by 3.1 percentage points), compared to Other heavy and civil engineering construction (2.7 percentage points).

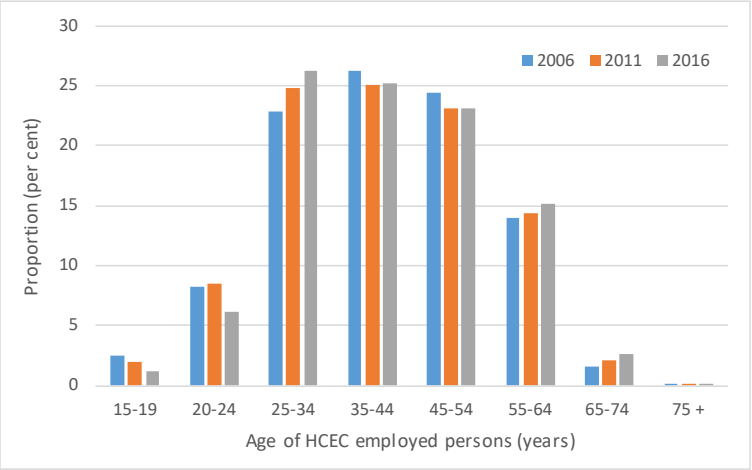
Figure 19 illustrates the shift in the age structure of the HCEC workforce between 2006 and 2016. While the increased proportion of workers aged 55 and over is a key feature, so too is the significantly increased proportion of workers aged between 25 and 34, which has risen by 3.4 percentage points between 2006 and 2016.

Figure 18 Proportion of employed persons aged 55 and over in the Heavy and civil engineering construction industries, Australia, 2006 to 2016



Note: Heavy and civil engineering construction, not further defined is included in HCEC total, but is not shown separately.
Source: BITRE analysis of ABS *Census of Population and Housing* 2006, 2011 and 2016 (place of usual residence data), extracted using TablebuilderPro.

Figure 19 Heavy and civil engineering construction employment by age category, Australia, 2006 to 2016



Source: BITRE analysis of ABS *Census of Population and Housing* place of usual residence data for 2006, 2011 and 2016 (data extracted using Tablebuilder Pro).

Skills

Occupation

Table 18 show the changes in HCEC employed persons by occupation between 2011 and 2016. During this period, the 1-digit ANZSCO occupation category that experienced the most employment growth within the HCEC industry was Managers, which added 1557 employed persons. In addition, there was a substantial increase in the number of HCEC employed persons who were Professionals (747 employed persons). However, there were decreases in the number of HCEC employed persons in two occupations: Clerical and administrative workers (-858 employed persons) and Machinery operators and drivers (-543).

Table 18 also shows the employment of Community and personal service workers in the HCEC industry grew relatively faster than other occupations, averaging 6.7 per cent growth per annum between 2011 and 2016, closely followed by Sales workers (6.5 per cent per annum). Both these occupations were starting from a very low base of less than 600 employed persons in the HCEC industry in 2011. Managers and Professionals are the two most highly skilled 1-digit occupational categories (ABS 2013b), and the above-average employment growth in these two occupations points to a general upskilling of the HCEC workforce between 2011 and 2016.

Table 18 Changes in Heavy and civil engineering construction employed persons by occupation, Australia, 2011 to 2016

Occupation type	Change in the number of employed persons, 2011-2016	Average annual growth rate (per cent)
Managers	1557	3.4
Professionals	747	1.5
Technicians and trades workers	140	0.1
Community and personal service workers	124	6.7
Clerical and administrative workers	-858	-2.0
Sales workers	199	6.5
Machinery operators and drivers	-543	-0.7
Labourers	120	0.1
All occupations	1568	0.4

Note: Inadequately described/not stated occupations are not shown separately in the table, but are included in the total.
Source: BITRE analysis of ABS *Census of Population and Housing* 2011 and 2016 (place of usual residence data), extracted using Tablebuilder Pro).

The Other heavy and civil engineering construction sub-industry saw large increases in the number of Managers and Machinery operators and drivers between 2011 and 2016 (997 and 622 employed persons, respectively). It also experienced a loss of 617 Clerical and administrative workers. The Road and bridge construction sub-industry lost 1167 Machinery operators and drivers between 2011 and 2016 (data not shown).

The 3-digit occupational scale provides a more detailed perspective on growth occupations. Between 2011 and 2016, the 3-digit ANZSCO occupations that experienced the most employment growth within the HCEC industry were Construction, distribution and production managers (which added 1183 employed persons) and Engineering professionals (1124) (Table 19). These two occupations are skill level one occupations (on a scale of one to five, see p.18). Table 19 also shows that average annual growth was much faster for Cleaners and laundry workers (19 per cent) and Machine operators (9 per cent), compared to the other listed occupations.

The 3-digit occupations that experienced the largest employment decline within the HCEC industry from 2011 to 2016 were Mobile plant operators (which lost 928 employed persons) and Construction and mining labourers (which lost 670 employed persons). These are skill level four/five occupations. The strong growth of 3-digit occupations at the top end of the skill spectrum, together with the declines of some 3–digit occupations towards the lower end of the skill spectrum, again point to a general upskilling of the HCEC workforce between 2011 and 2016.

Table 19 Main growth and decline occupations for Heavy and civil engineering construction employed persons, Australia, 2011 to 2016

3-digit Occupation	Change in HCEC employed persons, 2011-2016	Average annual growth of HCEC employed persons, 2011-2016 (per cent)
Growth occupations		
Construction, distribution and production managers	1183	5.2
Engineering professionals	1124	4.3
Cleaners and laundry workers	932	19.0
Building and engineering technicians	642	2.6
Machine operators	484	8.8
Declining occupations		
Electronics and telecommunications trades workers	-263	-3.3
General clerks	-314	-4.5
Truck drivers	-352	-2.0
Construction and mining labourers	-670	-1.1
Mobile plant operators	-928	-2.2

Source: BITRE analysis of ABS *Census of Population and Housing* 2011 and 2016 (place of usual residence data), extracted using Tablebuilder Pro.

Education

There was a clear shift towards higher levels of educational attainment within the HCEC industry between 2011 and 2016. Table 20 shows that the number of HCEC employed persons with bachelor degree or higher qualifications increased by 2700 employed persons, which is much higher than the total HCEC employment increase of 1600 employed persons over the period. There were also substantial increases in the numbers holding advanced diploma and diploma qualifications (1000) and certificate qualifications (2700). The total number with post-school qualifications increased by 6400 employed persons. Given the low rate of current participation in education by HCEC workers (see p. 20), it is likely that much of the upskilling is occurring through recruitment of new higher-qualified workers. Between 2011 and 2016, there were significant declines in the number of HCEC employed persons whose highest level of educational attainment was Year 11 schooling, or less.

Table 20 Level of educational attainment of Heavy and civil engineering construction employed persons, Australia, 2011 and 2016

Level of educational attainment	Number of HCEC employed persons		Change (per cent)	Average annual growth (per cent)
	2011	2016	(2011-2016)	(2011-2016)
Postgraduate degree, graduate diploma or graduate certificate qualification	2 800	3 600	800	5.2
Bachelor degree qualification	9 700	11 700	1 900	3.7
Advanced diploma/diploma qualification	5 700	6 700	1 000	3.4
Certificate level qualification	27 800	30 500	2 700	1.8
Completed Yr12 schooling, No identified post-school qualification	10 000	9 900	-100	-0.2
Completed Yr10 or Yr11 schooling, No identified post school qualification	16 100	14 000	-2100	-2.8
Did not complete Yr10 or equivalent,* No identified post school qualification	6 000	4 400	-1600	-6.2
Total HCEC employed persons	81 400	83 000	1 600	0.4

Notes:
1. Asterisk (*) Includes not stated level of schooling completion.
2. Not stated post-school qualification category included in the total, but not shown in Table.
3. Number of employed persons are rounded to nearest 100.

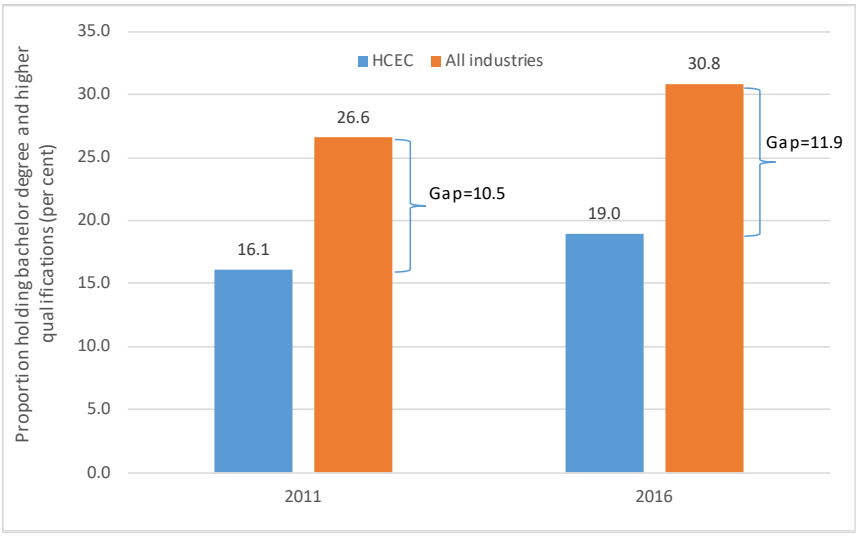
Source: BITRE analysis of ABS *Census of Population and Housing* 2011 and 2016 (place of usual residence data), extracted using Tablebuilder Pro.

The average annual growth rates between 2011 and 2016 show a clear pattern of being at their highest for those with post-graduate qualifications (5.2 per cent), and then systematically declining as educational attainment declines, with rapid job decline occurring for the least educated category between 2011 and 2016.

The increase in educational attainment was evident for both HCEC sub-industries. In Road and bridge construction, there were 700 extra persons with bachelor degree or higher qualifications in 2016 (compared to 2011), and 1700 extra persons with post-school qualifications. In Other heavy and civil engineering construction, there were 1700 extra persons with bachelor degree or higher qualifications in 2016, and 3900 extra persons with post-school qualifications.

This reflects a general trend towards higher levels of educational attainment across the Australian workforce. Figure 20 shows that while the proportion of HCEC employed persons with a bachelor degree or higher qualification rose by 2.9 percentage points between 2011 and 2016 (from 16.1 to 19.0 per cent), over the same period the proportion of all employed persons with a bachelor degree or higher qualification rose by 4.3 percentage points (from 26.6 to 30.8 per cent). Thus, despite sizeable growth in the number of HCEC workers with higher educational qualifications, the average HCEC worker continues to be significantly less highly educated than the average Australian worker. Moreover, the gap has widened in recent years. Figure 20 shows the gap in the proportion holding bachelor degree or higher qualifications has expanded from 10.5 percentage points in 2011 to 11.9 percentage points in 2016.

Figure 20 Proportion of employed persons with bachelor degree or higher qualifications by industry, Australia, 2011 and 2016



Source: BITRE analysis of ABS *Census of Population and Housing* 2011 and 2016 (place of usual residence data), extracted using Tablebuilder Pro.

Income

Table 21 shows the average annual growth rate of the average and median income of employed persons in each of the HCEC sub-industries between 2011 and 2016. The growth rate of average incomes in the HCEC industry of 3.6 per cent per annum exceeds the growth rate of average incomes for all employed persons of 2.9 per cent per annum. However, the growth rate of median incomes is similar for HCEC and total employment (at 2.6 and 2.5 per cent, respectively). Average and median incomes grew at a similar pace in Road and bridge construction, but average incomes grew more rapidly than median incomes in the Other heavy and civil engineering construction industry (reflecting very strong income growth for high income workers).

Table 21 Growth of average and median incomes of employed persons in the Heavy and civil engineering construction sub-industries, Australia, 2011 to 2016

HCEC sub-industries (4-digit level)	Average annual growth rate (per cent), 2011-2016	
	Average income	Median income
Road and bridge construction	3.3	3.4
Other heavy and civil engineering construction	3.4	2.1
Total HCEC	3.6	2.6

Note: Total personal income includes income from sources other than employment (e.g. family benefits, investment income). BITRE has estimated median weekly income based on the categorical income responses in the census. Details of the methodology are provided in the notes to Figure 13.

Source: BITRE analysis of ABS *Census of Population and Housing* 2011 and 2016 (place of usual residence data), extracted using Tablebuilder Pro.

Table 22 shows the changes in average and median incomes between 2011 and 2016 for the top ten HCEC 3-digit occupations. There is evidence of above-average wage pressures for Electricians, whose average incomes grew by 6.8 per cent per annum and median incomes by 6.1 per cent per annum. There is also some evidence of wage pressures for Fabrication engineering trades workers, whose average incomes grew by 5.0 per cent per annum and median incomes by 3.6 per cent. The relatively high income growth observed in these occupations may reflect the emergence of skill shortages, as electricians are identified as being in national shortage by the Department of Employment, Skills, Small and Family Business (2019). Specific types of Fabrication engineering trades workers, such as Sheetmetal trades workers and Metal fabricators, are also identified as being in national shortage by the Department of Employment, Skills, Small and Family Business (2019).

Table 22 Change in occupational income by Heavy and civil engineering construction employed persons, Australia, 2011 to 2016

Occupation (3-digit level)	2011		2016		Average annual growth (per cent)	
	Average income ($)	Median income ($)	Average income ($)	Median income ($)	Average income	Median income
Construction and mining labourers	1352	1146	1562	1288	2.9	2.4
Mobile plant operators	1330	1167	1468	1310	2.0	2.4
Engineering professionals	2143	1945	2431	2081	2.6	1.4
Construction, distribution and production managers	2389	2387	2807	2480	3.3	0.8
Building and engineering technicians	2015	1785	2321	1937	2.9	1.7
Truck drivers	1150	1011	1263	1125	1.9	2.2
Fabrication engineering trades workers	1832	1608	2338	1923	5.0	3.6
Mechanical engineering trades workers	1759	1523	2068	1723	3.3	2.5
Electricians	1908	1683	2652	2260	6.8	6.1
Miscellaneous labourers	1138	962	1274	994	2.3	0.7

Note: Top 10 occupations based on 2016 number of employed persons.
Source: BITRE analysis of ABS *Census of Population and Housing* 2011 and 2016 (place of usual residence data), extracted using Tablebuilder Pro.

While there is recent evidence of skill shortages for Engineering professionals working on infrastructure and built environment projects (Consult Australia 2019, Department of Employment, Skills, Small and Family Business 2018), there is no evidence of excess wage pressures for Engineering professionals in the 2011 to 2016 period. Table 22 shows that Engineering professionals recorded relatively modest growth of 2.6 per cent for average incomes and 1.4 per cent for median incomes between 2011 and 2016 (which are both below the all-industry growth rates for the period). This discrepancy is most probably due to differences in timing, with HCEC employment growing strongly since August 2016 (see Figure 3). A comparison of the Consult Australia[25] survey findings over time shows a big increase in the proportion of firms responding 'we are recruiting and experiencing a skill shortage' between 2014 and 2016, and then a further, but moderate, increase from 2016 to 2019 (Consult Australia 2016, 2019). Department of Employment, Skills, Small and Family Business (2018) notes that the Civil engineering occupation was listed as being in national shortage in 2018, for the first time since 2012. The prices charged by firms offering Engineering design and engineering consulting services recorded average annual growth of 3.0 per cent per annum between 2016 and 2019 (ABS 2019d), so this recent emergence of skill shortages has not yet created excessive upward pressure on the prices charged for engineering services.

Location

As mentioned earlier (p. 22), HCEC employment is inherently difficult to tie down to a small area location due to the project-based nature of the work, with work sites potentially changing frequently. The ABS significantly changed its methodology for allocating people to a place of work between the 2011 and 2016 censuses, meaning that the place of work data is not directly comparable across these two censuses. Instead we have used the place of usual residence data for 2011 to 2016 to investigate changes in the location of HCEC employed persons.

Table 23 provides information on changes in HCEC employed persons by place of usual residence between 2011 and 2016, with respect to states, capital cities and rest of states. At this highly aggregated geography, the great majority of people will live and work in the same city/region.

There was an increase of around 1700 HCEC employed persons between 2011 and 2016, representing 0.4 per cent average annual growth. Growth was positive for capital cities (1.5 per cent per annum), but negative for Rest of states (-1.3 per cent per annum).

25 This is a survey of consulting firms who provide design, advisory and engineering services for the built and natural environment.

Among the capital cities, the increase in HCEC employed persons was highest for Greater Sydney (2300 persons), with growth averaging 3.7 per cent per annum. Darwin and Melbourne also added a significant number of HCEC employed persons, at 1400 and 1100, respectively. The increases for these three cities were largely being driven by Other heavy and civil engineering construction employment. However, HCEC employed persons dropped in Greater Brisbane (-1100) and in the Rest of Queensland (-1600), and these decreases were largely driven by a decline in Road and bridge construction employment.

Among the state balances, the Rest of New South Wales added 1100 HCEC employed persons between 2011 and 2016, which was principally due to an increase in Other heavy and civil engineering construction employment.

Table 23 Change in Heavy and civil engineering construction employed persons by place of residence, Australia, 2011 to 2016

GCCSA	Change in HCEC employed persons (2011-2016)	Average annual growth rate (per cent)
Greater Sydney	2300	3.7
Greater Melbourne	1100	2.0
Greater Brisbane	-1100	-2.4
Greater Adelaide	600	3.6
Greater Perth	200	-0.3
Greater Hobart	-100	-3.6
Greater Darwin	1400	24.8
Canberra	-200	-6.2
Rest of New South Wales	1100	2.3
Rest of Victoria	-600	-2.3
Rest of Queensland	-1600	-2.9
Rest of South Australia	*	-0.8
Rest of Western Australia	-800	-3.9
Rest of Tasmania	-200	-2.9
Rest of Northern Territory	*	0.2
New South Wales	3400	3.1
Victoria	500	0.6
Queensland	-2700	-2.6
South Australia	600	2.5
Western Australia	-1000	-1.3
Tasmania	-300	-3.1
Northern Territory	1400	20.6
All capital cities	3700	1.5
Total Rest of states	-2100	-1.3
Australia	1700	0.4

Notes:
1. * indicates change of less than 50 employed persons.
2. No usual address, Migratory-Offshore-Shipping and Other Territories are included in the total, but not presented separately in the table.
3. Australian Capital Territory is same as Canberra and was included in the Capital cities total.
4. Changes in HCEC employed persons rounded to nearest 100. The total change of 1700 employed persons differs slightly from the change estimate presented elsewhere (e.g. Tables 16 and 17) due to the impact of ABS confidentialisation practices on Tablebuilder outputs, and due to rounding.

Source: BITRE analysis of ABS *Census of Population and Housing* 2011 and 2016 (place of residence data), extracted using TablebuilderPro.

Concluding remarks

The Heavy and civil engineering construction (HCEC) industry accounted for 2.0 per cent (or $33 billion) of value added in 2017–18 (ABS 2018a) and employed 114 600 persons as of May 2019 (ABS 2019a). This study provides a national profile of people employed in the HCEC industry in 2016, providing details of the sub-industries in which HCEC workers are employed, their employment status, hours worked, gender, age, occupation, educational qualifications, income, work location and commuting behaviour.

According to the 2016 census, HCEC workers are predominantly male (85 per cent) and employed on a full-time basis (89 per cent), and a very high proportion work 49 or more hours per week (40 per cent). HCEC workers are concentrated in the middle of the age distribution, with those aged 25 to 54 over-represented relative to all employed persons, while the 15 to 24 and 55 and over age groups are under-represented.

While HCEC workers tend to be less highly educated than the average Australian worker, they are much more likely to hold a vocational qualification. Those employed in the HCEC industry are well-remunerated, with full-time employed workers earning a median weekly personal income that is 26 per cent higher than the typical Australian full-time worker.

In addition to providing this national snapshot of the characteristics of HCEC workers in 2016, the Information Sheet also describes some of the key changes that have occurred in recent years, such as:

- There has been a trend decline in the proportion of HCEC workers who are male (from 90 per cent in 2006 to 87 per cent in 2019), according to the ABS *Labour Force Survey*.
- The shift towards fewer hours of work in the HCEC industry—with the proportion working 49 or more hours a week declining by 2.9 percentage points between 2011 and 2016, and the proportion working full-time declining by 1.6 percentage points.
- The significant increase in the proportion of the HCEC workforce aged between 25 and 34, and the moderate pace of ageing in the HCEC workforce—from 2011 to 2016, the proportion aged 55 and over rose by 1.4 percentage points in HCEC, compared to a 1.6 percentage point rise for total employment.
- The general upskilling of the HCEC workforce between 2011 to 2016, with strong growth in Managers and Professionals, and declines in the numbers employed in some lower-skill occupations.
- The shift towards higher levels of educational attainment within the HCEC industry—in 2016, there were 2700 additional HCEC employed persons who held bachelor degree or higher qualifications (compared to 2011), 6400 additional persons holding post-school qualifications, and 3800 fewer persons holding neither Year 12 nor post-school qualifications. However, despite this strong growth in educational attainment, the number of HCEC employed persons with bachelor degree or higher qualifications (19 per cent) continues to remain well below the national proportion of 31 per cent.

This Information Sheet provides a useful basis for understanding the nature of employment in the HCEC industry, and the transitions that are currently underway. It can also be directly compared to the national profile of Transport, postal and warehousing employment contained in BITRE Information Sheet 104 (BITRE 2019), which adopts a consistent methodology.

Abbreviations and Acronyms

ABS	Australian Bureau of Statistics
ANZSCO	Australian and New Zealand Standard Classification of Occupations
ANZSIC	Australian and New Zealand Standard Industrial Classification
ASCED	Australian Standard Classification of Education
ASGS	Australian Statistical Geography Standard
BITRE	Bureau of Transport, Infrastructure and Regional Economics
Cat.	Catalogue
CBD	Central Business District
GDP	Gross Domestic Product
GVA	Gross Value Added
HCEC	Heavy and civil engineering construction
LFS	Labour Force Survey
nfd	Not further defined
NSW	New South Wales
NT	Northern Territory
QLD	Queensland
SA	South Australia
SA2	Statistical Area Level 2
SUA	Significant Urban Area
TPW	Transport, postal and warehousing
TAS	Tasmania
VIC	Victoria
WA	Western Australia

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