EngineeringUK

Women in engineering

Trends in women in the engineering workforce between 2010 and 2021

Extended analysis

Executive summary

Although engineering remains a male-dominated field, since 2010 we have seen both a proportional and absolute increase in the number of women working in engineering roles.

In this paper we use data from the Labour Force Survey (LFS) to explore this trend in more detail, focusing on which engineering roles and industries have seen the most progress, in terms of gender balance – and which have seen the least.

- **In 2010, just over 1 in 10 (10.5%) of those working in engineering roles were women. By 2021, this had risen to 16.5%**

- **In terms of numbers, this represents an increase from 562,000 women working in engineering roles in 2010 to 936,000 in 2021**

In general, this rise has coincided with an overall expansion of the engineering workforce (from 5.3 million workers in 2010 to 5.6 million in 2021). Notably, however, the rise of women continued in absolute terms even when the total number of people working in engineering roles fell in 2020, the first year of the Covid-19 pandemic.

The engineering footprint

Our analysis makes use of the engineering footprint, a list of standard occupational classification (SOC) and standard industrial classification (SIC) codes that has been agreed by EngineeringUK, the Royal Academy of Engineering, and the Engineering Council to constitute 'engineering'.

Those we refer to as working in **engineering roles (or the 'engineering workforce')** are the people who work in the Standard Occupational Classifications (SOC) that meet the footprint's criteria for 'engineering'. Where appropriate, we have further disaggregated this according to the footprint's definition of 'core' and 'related' engineering:

- **Core**: roles that are primarily engineering-based and require the consistent application of engineering knowledge and skills to execute the role effectively (for example, civil engineers; mechanical engineers; electrical engineers; science, engineering and production technicians, machine operatives, etc.)

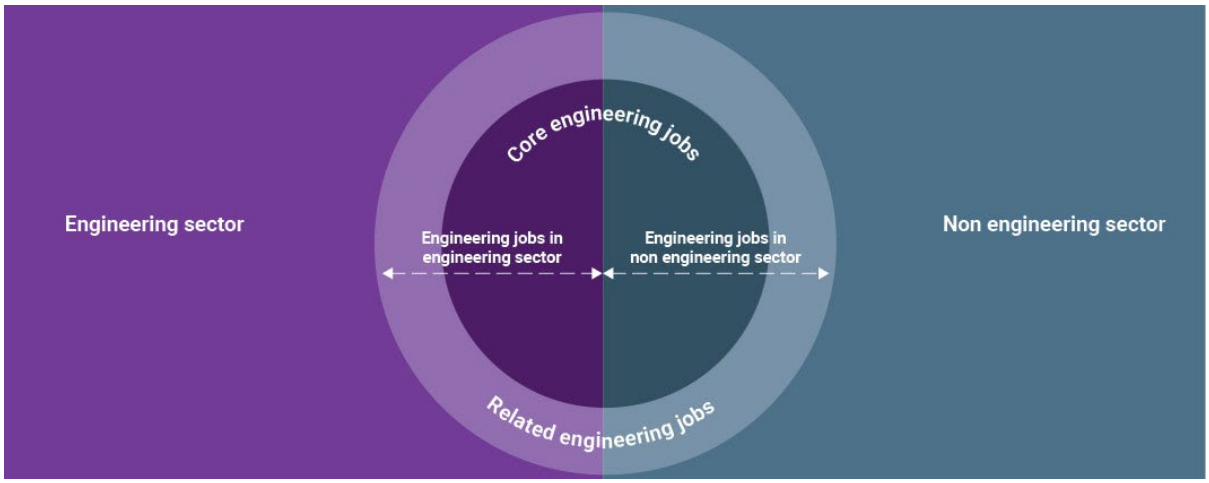
- **Related**: roles that require a mixed application of engineering knowledge and skill alongside other skill sets, which are often of greater importance to executing the role effectively (for example, quantity surveyors; architects; IT operations technicians; web designers and developers, etc.)

Those we refer to as working in the **engineering sector (or those 'working in engineering industries')** are the people who work in the Standard Industrial Classifications (SIC) that meet the footprint's criteria for 'engineering'.

It is worth noting, as the below illustration depicts, that these concepts inter-related. One can work in an engineering job (SOC) within or outside of the engineering sector (SIC) – and indeed we find the latter is more likely to be the case for women than it is for men. This has important for our understanding of where progress is – and isn't - being made.

For the purpose of this analysis, we have focused on those in engineering roles (SOC) and their presence in and outside of engineering industries (SIC). In other words, we do not consider those women who may work in engineering sectors, but not in engineering roles (so, for example, marketing or HR roles that arise in engineering companies but are nevertheless not engineering jobs).

Figure 1. The occupational and industrial engineering footprint



Differences by occupation and industry

It is apparent that while the proportion and number of women in engineering has increased, this rise has been concentrated in certain roles and sectors. Although results vary by individual occupation and sector, in general we found that women were more likely to be in related – rather than core – engineering roles[1] and working in industries outside of what is traditionally deemed to be 'engineering'[2] (the 'engineering sector').

- **Differences by occupation:** In 2021, just 15.2% of those working in 'core' engineering roles were women, compared with 19.0% of those working in 'related engineering' roles.

[1] As defined by the occupational engineering footprint agreed jointly by EngineeringUK, the Royal Academy of Engineering, and Engineering Council. See www.engineeringuk.com/media/156187/state-of-engineering-report-2018.pdf

[2] As defined by the industrial engineering footprint agreed jointly by EngineeringUK, the Royal Academy of Engineering, and Engineering Council. Ibid.

- **Differences by industry:** There were also differences by sector, with women making up only 12.5% of those working in engineering jobs within the engineering sector, compared to 24.4% *outside* of the engineering sector. This suggests that industries not traditionally associated with engineering may be more successful in attracting female engineers into the workforce.

We also found that rates of change (in terms of gender balance) were higher at the associate and technical professional levels than at managerial, director and senior official level.

- For example, between 2010 and 2021 the proportion of women within the engineering workforce (core or related) who were 'science, engineering, or technology associate professionals' increased from 18.8% to 28.1%.
- In contrast, in that time the proportion of women who were 'corporate managers or directors' in the engineering workforce increased from 11.2% to 15.0%.

Which engineering roles have seen the greatest progress?

Encouragingly, 61 of the 97 roles included in the engineering footprint have seen an increase in the percentage of female workers between 2010 and 2021. For the following 19 roles, this change has exceeded 10 percentage points:

- Rubber process operatives (from 12.5% to 32.2%)
- Production managers and directors in mining and energy (from 8.5% to 19.6%)
- Building and civil engineering technicians (from 14.8% to 31.7%)
- Quality assurance and regulatory professionals (32.4% to 48.6%)
- Science, engineering, and production technicians not elsewhere classified (20.0% to 44.7%)
- TV, video and audio engineers (3.4% to 18.2%)
- Production and process engineers (7.7% to 19.6%)
- IT and communications professionals (11.5% to 26.1%)
- Assemblers – vehicles and metal goods (14.1% to 28.9%)
- Assemblers – electrical and electronic products (38.8% to 49.6%)
- Web design and development professionals (24.6% to 35.5%)
- Energy plant operatives (0% to 14.1%)
- Electroplaters (0% to 12.7%)
- Electronics engineers (2.8% to 15.2%)
- Electrical engineers (1.1% to 12.7%)
- IT operations technicians (23.5% to 35.3%)
- Smiths and forge workers (0% to 11.5%)
- Draughtspersons (11.2% to 22.2%)
- Research and development managers (35.2% to 45.9%)

In all but 7 of these 61 roles, the increase has been both in proportional and absolute terms (that is, we have observed an increase in both the percentage and number of women) and for 27, it has coincided with an expansion of roles overall in that occupation.

- For example, between 2010 and 2021 the number of people working in IT and telecommunications professional roles it increased by more than 90,000. Of these new roles, more than half of them were taken up by women.

However, there are also cases where the rise in women has been amidst an overall contraction of the workforce.

- For instance, between 2010 and 2021 the number of female electronics engineers increased by 2,500 while decreasing by 15,000 in the number of men (resulting in an overall decline of around 12,500).

Going forward, it will be important to understand what is driving these opposing trends (that is, an increase of women alongside a general contraction of the workforce) – whether there are differences in the way women and men are being treated in terms of recruitment, pay, contract type, or retention, for example.

Which engineering roles have seen the least amount of progress?

For 13 of the roles included in the engineering footprint, the proportion of women has remained at 0% meaning that virtually no women were in these professions in 2010 and this has remained the case some 11 years later. These are as follows:

- Rail and rolling stock builders and repairers (+)
- Moulders, core makers, and die casters
- Metal plate worker sand riveters (+)
- Pipe fitters
- Tool makers, tool fitter, and markers-out
- Air conditioning and refrigeration engineers
- Boat and ship builders and repairers
- Steel erectors
- Roofers, roof tilers and slaters
- Coal mine operatives
- Quarry workers and related operative
- Tyre, exhaust and windscreen fitters
- Rail construction and maintenance operatives

In all but 2 of these (denoted by a (+)), the overall number of people working in these roles shrunk over the last 11 years.

In the remaining 23 roles that comprise the engineering footprint, we have observed a decrease in the proportion of women since 2010. Those exceeding a 5 percentage point change are as follows:

- Metal making and treating process operatives (from 6.5% to 0.0%)
- Plastics process operatives (from 12.4% to 2.6%)
- Process operatives not elsewhere classified (from 15.8% to 0%)
- Inspectors of standards and regulations (from 37.4% to 24.3%)
- Glass and ceramics process operatives (from 18.3% to 3.4%)
- Chartered architectural technologists (from 37.2% to 20.8%)
- Environmental professionals (57.2% to 36.9%)
- Assemblers (electrical and electronic products) (38.8% to 33.6%)
- Planning, process and production technicians (31.1% to 25.8%)

For all but 5 of the 23 roles, the decline in the proportion of women also represented a decrease in absolute terms (i.e. the total number of women). However, in the case of engineering professionals not elsewhere classified, IT and telecommunications directors, quality assurance technicians, planning process and production technicians and environmental professionals, the number of women between 2010 and 2021 grew – just simply not at the same rate as men.

In absolute terms, the largest decreases in the number of women have been among plastics process operatives (-4,100), process operatives not elsewhere classified (-4,200), and assemblers (electrical and electronic products) (-4,100).

Sectoral analysis

It is important to not only consider which engineering roles have been able to attract more women over the last 10 years but also which sectors have seen most progress in terms of women in engineering roles.

While our sectoral analysis was necessarily limited by small sample size numbers, it nevertheless clearly shows that some industries have made much more progress in terms of the gender balance of those working in engineering roles than others. For example:

- Between 2010 and 2021 the proportion of women working in engineering roles within the water supply, sewerage, waste management and remediation activities increased from 8.5% to 11.5%

- In contrast, the proportion of women working in engineering roles within construction has remained stubbornly low, rising from 2.3% in 2010 to 4.7% in 2021

Next steps

Since 2010, we have seen a rise in the number of women across the majority of engineering roles, and across both engineering and non-engineering industries. This is welcome news, and we encourage the engineering community to continue to celebrate and promote examples of women working in engineering roles and sectors, especially to the girls who could be tomorrow's engineers.

As a community, we must ensure that progress continues and extends to the most 'core' of engineering roles and sectors, and at the highest levels. Identifying practices that help to increase the appeal, recruitment, retention and progression of women in engineering – and sharing this knowledge widely – will be paramount to this.

We also encourage the engineering community to be consistent in its reporting and messaging of these figures. Over the course of our analysis, we identified that different definitions and analytical approaches have been used to measure and report on the participation of women in engineering. This can undermine confidence and detract from the issue at hand. Greater consistency in approach and messaging will help us to remain clear-eyed on progress and the work required to further advance the representation of women in engineering.

Methodology

Labour Force Survey

Our analysis is based on data from the Labour Force Survey using the EngineeringUK Engineering footprint.[3]

The LFS is a continuous household survey run by the ONS. Respondents are interviewed for 5 successive waves at 3-monthly intervals and 20% of the sample is replaced every quarter. Datasets are published quarterly, and each contains 5 waves of data.

For each of the data points shown throughout this paper, four quarters of LFS data have been collated to create an annual dataset with only waves 1 and 5 of the data used (to avoid counting respondents who would appear in more than one quarter of the data in different waves). This is a standard approach, as using the full calendar year of data (4 quarters) allows for any seasonality within the data to be accounted for, while using just one quarter of data may produce different results depending on which quarter is selected.

The sample selected to complete the LFS is designed to be representative of the entire population and a weighting is applied throughout our analysis which aims to account for differences between the sample and the true population values, however some results where small numbers are considered may be affected by the sample.

Changes in mode to the LFS

Due to the COVID-19 pandemic, from 2020 the mode changed from mainly face-to-face to online and telephone data collection.

It is possible that this has had an effect on the sample demographics due to non-response biases, or on responses given. Whilst ONS have made adjustments to the person weighting to account for some of these differences, we must be aware of these changes when interpreting the data.[4]

The engineering footprint

Recognising the need for a consistent definition of engineering, in 2017 EngineeringUK, the Royal Academy of Engineering and Engineering Council established a standard engineering footprint. This was developed by agreeing on a set of criteria regarding the level of qualifications and skills deemed to be required for engineering roles, undertaking an extensive review of standard occupational classification (SOC) and standard industrial classification (SIC) codes, and agreeing the list that fulfilled the criteria.

Our analysis makes use of this footprint to explore both the occupational and industrial dimensions of engineering.

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[3] For a complete list of the SOC and SIC codes included in the engineering footprint, visit: https://www.engineeringuk.com/media/1572/engineering_uk_2018_annex.pdf

[4] Office for National Statistics. Coronavirus and its impact on the Labour Force Survey (webpage). Accessed 21 February 2021. https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/coronavirusanditsimpactonthelabourforcesurvey/2020-10-13

The engineering workforce / those working in engineering roles: Those we refer to as working in engineering jobs (or the 'engineering workforce') are the people who work in the Standard Occupational Classifications (SOC) that meet the footprint's criteria for 'engineering'. Where appropriate, we have further disaggregated this according to the footprint's definition of 'core' and 'related' engineering:

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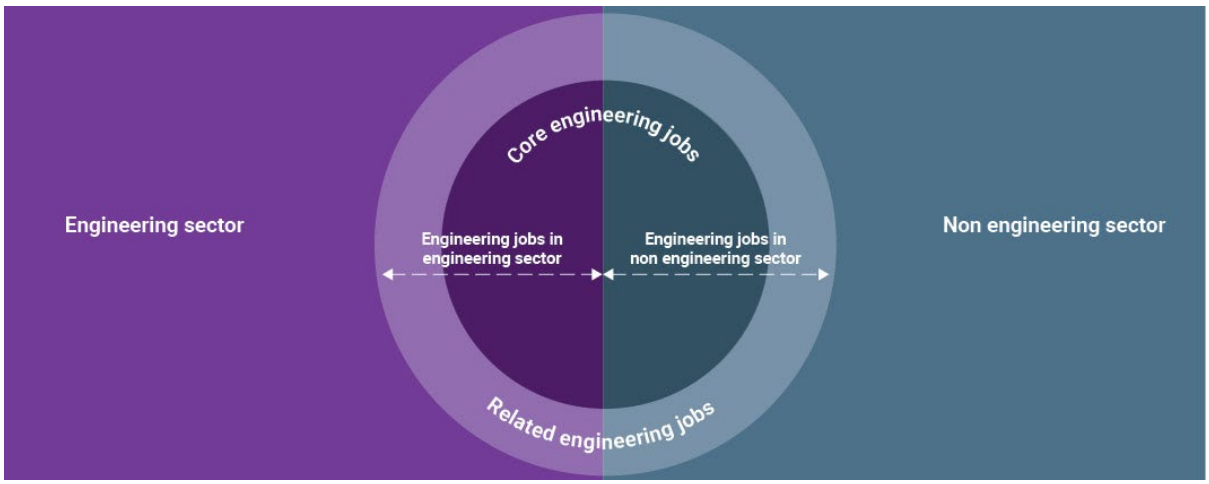


Comparisons with other sector figures

We recognise that there are other published statistics that differ from those in this paper. Where possible we have sought to investigate why this is and have determined that in all cases considered the discrepancies are driven by the different definitions being used for engineering roles and industries by different organisations.

For example, in Career Deflection: Exploring Diversity, Progression and Retention in Engineering, [5] Atkins reports 13% of engineering employees were women in 2020, based on LFS data and the engineering footprint. On closer analysis, this figure is based on the 'core' engineering footprint only, and on one quarter of LFS data rather than the annual adjusted dataset.

Separately, WISE[6] reports that 10.4% of engineers were women in 2020. This is based on analysis of the SOC codes that form the 'engineering professional roles' sub-major group – that is, the 7 SOC codes beginning with '212'. In contrast, the engineering footprint is comprised of 97 SOC codes. In addition, these figures were derived from the Annual Population Survey[7] (which uses data combined from two waves of the LFS on a local sample boost).

We recognise that there are many different datasets and ways of defining engineering and our approach is If the engineering community is to be aligned in its messaging, there is a clear need for greater consistency and transparency in definitions and analytical approaches.

[5] Atkins and SNC-Lavalin Group. 'Career Deflection: Exploring diversity, progression, and retention in engineering,' 2021. https://careers.snclavalin.com/latest-news/2021-11/career-deflection-report

[6] Wise Campaign. Updated workforce statistics to September 2020 (webpage). Accessed 21 February 2021. Updated workforce statistics to September 2020 - WISE (wisecampaign.org.uk)

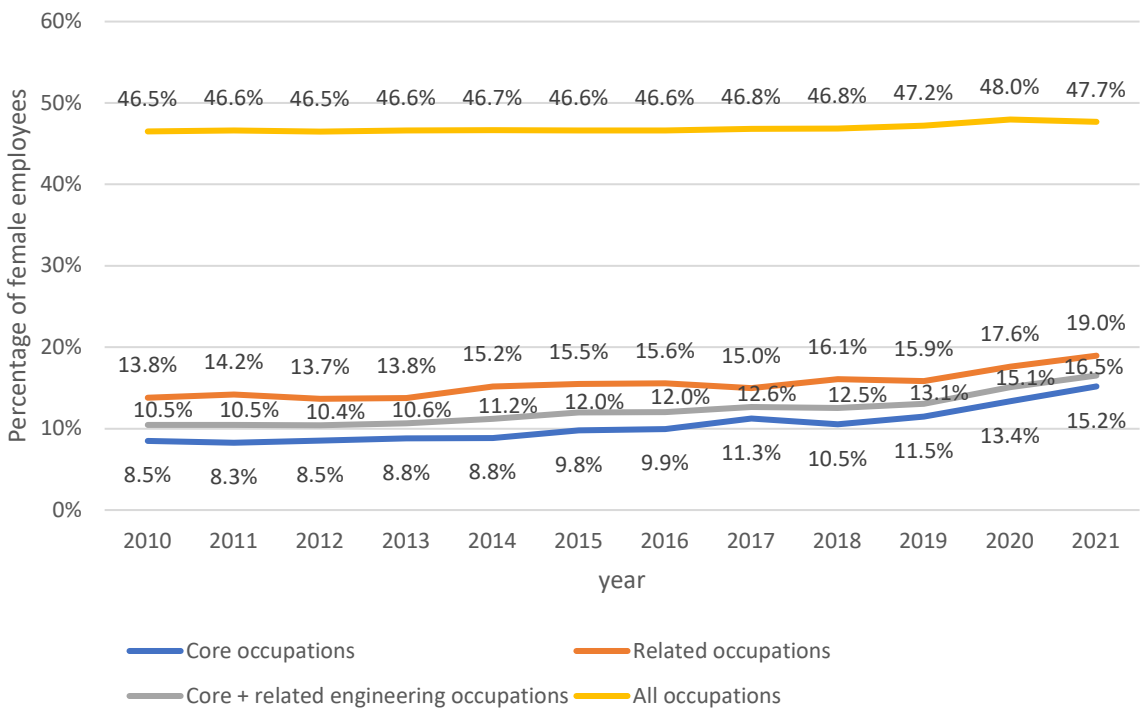
[7] Office of National Statistics. Annual population survey (APS) QMI (webpage). Accessed 21 February 2021. Annual population survey (APS) QMI - Office for National Statistics

Women in engineering over time

It is well reported that women are underrepresented in the engineering workforce. Over the last decade the percentage of women working in engineering roles has been increasing, albeit slowly. As of 2021 women still remain in the minority, comprising only 16.5% of those working in engineering roles compared with 47.7% in the workforce overall.

Over the last 11 years, there has been an increase in women working in engineering roles (both core and related). As can be seen in Figure 2a, the proportion of women in these roles rose from 10.5% in 2010 to 13.1% in 2019 and continued to increase to 14.5% mid-way through 2020 and up to 16.5% by 2021.

Figure 2a. Female employment in engineering roles compared with the overall workforce, 2010-2021

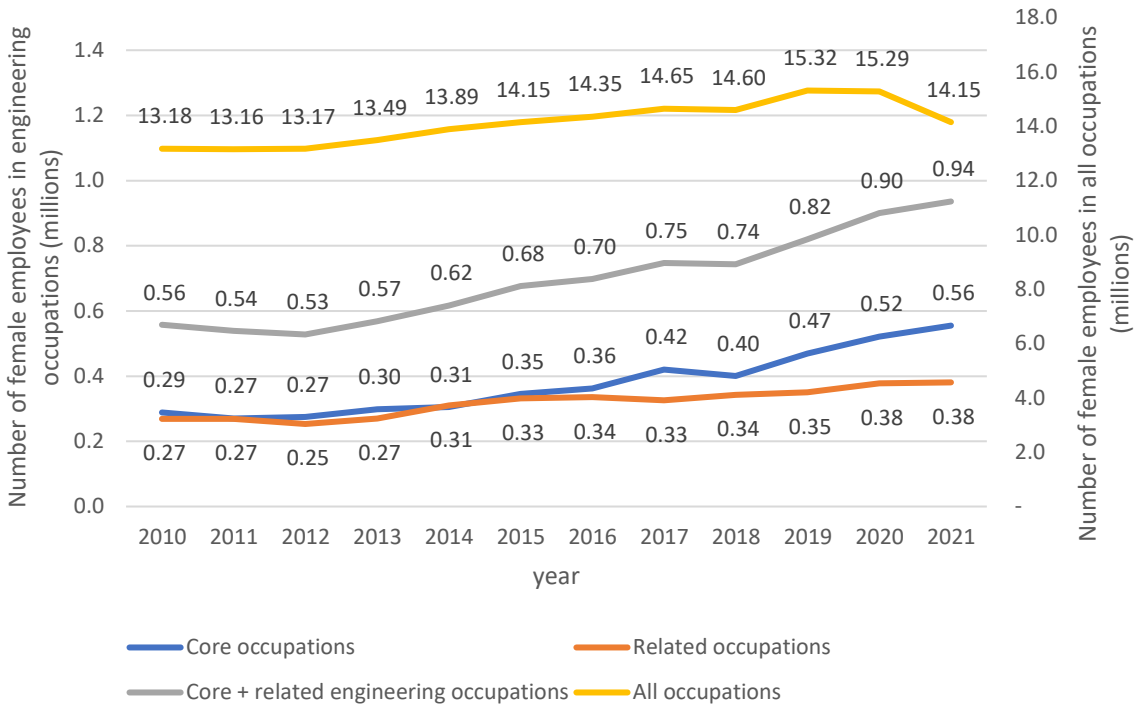


Source: ONS Labour Force Survey.

This rise has been both in proportional and absolute terms – that is, an increase in both the percentage and actual number of women working in engineering roles (see Figure 2b). In 2010, 562,000 women worked in engineering roles; by 2021, this had increased to 936,000.

In general, this rise has coincided with an overall expansion of the engineering workforce (from 5.3 million workers in 2010 to 5.6 million in 2021). Notably, however, the rise of women continued in absolute terms even when the total number of engineering roles fell in 2020, the first year of the Covid-19 pandemic.

Figure 2b. Female employment in engineering roles compared with the overall workforce, 2010-2021



Differences by occupation and industry

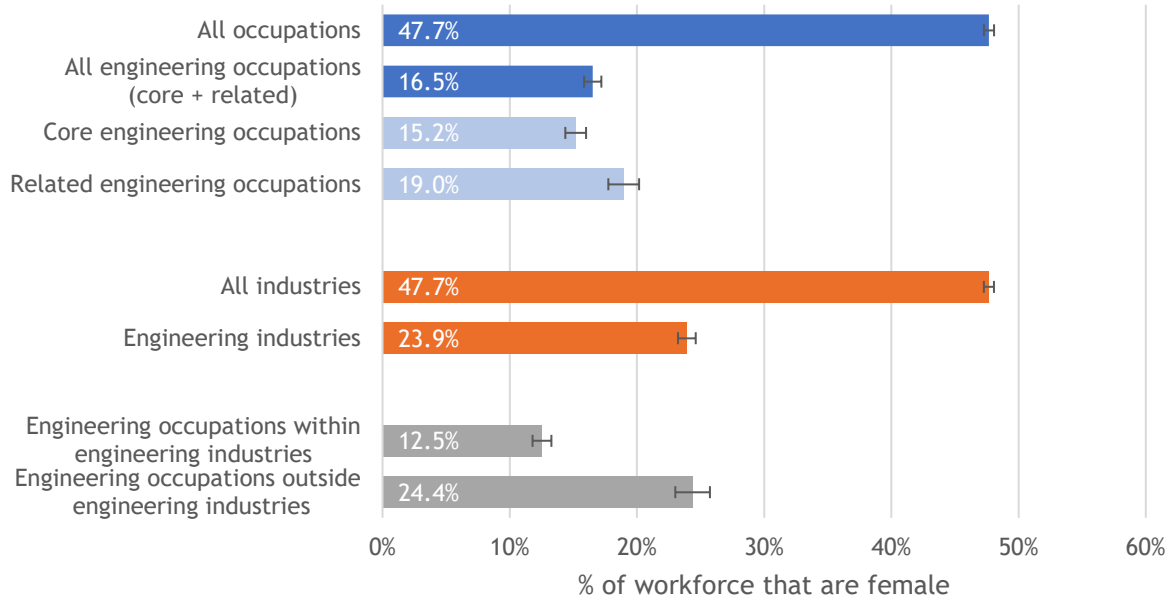
It is evident that certain engineering roles and industries have seen more progress, in terms of gender balance, than others.

Although results vary by individual occupation and sector, in general we found that women were more likely to be in related – rather than core – engineering roles and working in industries outside of what is traditionally deemed to be 'engineering' (the 'engineering sector').

- **Differences by occupation:** In 2021, just 15.2% of those working in 'core' engineering were women, compared with 19.0% of those working in 'related engineering' roles.

- **Differences by industry:** There were also differences by sector, with women making only 12.5% of those working in engineering jobs (either core or related) within the engineering sector, compared to 24.4% *outside* of the engineering sector. This suggests that industries not traditionally associated with engineering may be more successful in attracting female engineers into the workforce.

Figure 3. Percentage of women in engineering occupations and industries compared with all occupations and industries, UK, 2021



Source: ONS Labour Force Survey.

Analysis by broad occupational group (sub-major group)

Our occupational engineering footprint is comprised of standard occupational codes (4-digit 'SOC'), each corresponding to a role in the workforce. For example, the role of civil engineers has the 4-digit SOC code '2121'.

These codes can be grouped into broader occupational groups, which are denoted by the first two digits of the SOC code. For example, '11' relates to the group, 'corporate managers and directors'. Under this umbrella, there are a number of roles we deem to be engineering: 1121: production managers and directors in manufacturing; 1122: production managers in directors in construction; and 1123: production managers in directors and mining and energy.

Further examples of the types of engineering roles in each sub-major group can be found in Figure 4 below.

Figure 4. Example engineering roles (4-digit SOC) within each of the Standard Occupational Classification Sub-Major Groups

SOC sub-major group	Example engineering roles (4-digit SOC)
11 Corporate Managers and Directors	1121 Production managers and directors in manufacturing 1122 Production managers and directors in construction

12 Other Managers and Proprietors	1255 Waste disposal and environmental services managers
21 Science, Research, Engineering and Technology Professionals	2121 Civil engineers 2135 IT business analysts, architects and systems designers
24 Business, Media and Public Service Professionals	2431 Architects 2461 Quality control and planning engineers
31 Science, Engineering and Technology Associate Professionals	3112 Electrical and electronics technicians 3116 Planning, process and production technicians
34 Culture, Media and Sports Occupations	3422 Product, clothing and related designers
35 Business and Public Service Associate Professionals	3512 Aircraft pilots and flight engineers 3565 Inspectors of standards and regulations
52 Skilled Metal, Electrical and Electronic Trades	5212 Moulders, core makers and die casters 5225 Air-conditioning and refrigeration engineers 5242 Telecommunications engineers
53 Skilled Construction and Building Trades	5314 Plumbers and heating and ventilating engineers 5330 Construction and building trades supervisors
81 Process, Plant and Machine Operatives	8116 Plastics process operatives 8126 Water and sewerage plant operatives
82 Transport and Mobile Machine Drivers and Operatives	8221 Crane drivers 8232 Marine and waterways transport operatives

In order to examine where the greatest progress has been made in engineering in terms of gender balance, we compared how the percentage of women working in engineering had changed over time for these different occupational groups.

For each of the broad occupational groups, Figure 5 shows the percentage of female employees working in engineering roles at four different time points between 2010 and 2021. The colour green is used to denote the roles that have seen more than a 5-percentage point increase in the percentage of women engineering employees between 2010 and 2021, while red is used to denote those roles where there has been more than a 5-percentage point decrease.

Figure 5. Percentage of women in engineering roles by occupational group and total number of employees in engineering roles between 2010 and 2021, UK

SOC	FEMALE % OF ENGINEERING WORKFORCE				TOTAL NUMBER OF EMPLOYEES ('000s)				Diff 2010-21
	2010	2015	2019	2021	2010	2015	2019	2021	
11 Corporate Managers and Directors	11.2	11.1	12.9	15.0	551	574	653	488	-
12 Other Managers and Proprietors	12.3	24.0	11.8	15.7	9	12	17	10	+
21 Science, Research, Engineering and Technology Professionals	13.6	15.6	15.5	21.1	1,255	1,392	1,669	1,921	+
24 Business, Media and Public Service Professionals	14.7	22.5	26.0	29.4	295	329	404	323	+
31 Science, Engineering and Technology Associate Professionals	18.8	21.4	21.2	28.1	420	424	535	471	+
34 Culture, Media and Sports Occupations	65.2	62.8	62.3	65.0	49	79	75	69	+
35 Business and Public Service Associate Professionals	25.2	21.9	23.8	16.9	57	56	68	54	-
52 Skilled Metal, Electrical and Electronic Trades	1.8	1.7	2.9	3.8	1,134	1,164	1,212	967	-
53 Skilled Construction and Building Trades	0.9	1.5	1.5	0.8	837	880	908	706	-
81 Process, Plant and Machine Operatives	17.7	18.3	19.8	20.7	746	753	747	636	-
82 Transport and Mobile Machine Drivers and Operatives	0.0	0.0	0.0	7.4	22	19	18	19	-
Total	10.5	12.0	13.1	16.5	5,375	5,682	6,306	5,664	+

Source: ONS Labour Force Survey.

Across that time period, 'Culture, Media and Sports Roles' (occupational group 34) consistently had the highest percentage of women working in engineering roles (at around two thirds), while skills-based roles (52, 53, and 82) had the lowest (<5%).

That said, **there have been significant increases in the percentage of female engineering workers within other occupational groups during this time, in particular within the professional and associate professional groups** (e.g. occupational groups 21, 24, and 31) – though more so at the lower levels than at the managerial, directorial, and senior official level (11).

In general, this has coincided with an overall expansion in the number of people working within these SOC major groups, suggesting that new roles are being created in these areas that are attracting more women into engineering roles. For example, between 2010 and 2021 the number of engineering roles within the 'Business, Media and Public Service Professionals' occupational group (24) increased by 30,000, and the percentage of women in these roles doubled.

Similarly, the proportion of women working in engineering roles in the 'Science, Engineering and Technology Associate Professionals' (31) group increased from 18.8% to 28.1% over this period, coinciding with an overall rise of 50,000 engineering roles within this group.

However, an overall expansion in the number of people working within a certain SOC major group has not always translated to greater gender balance. For instance, while we saw an increase in the number of engineering roles at the Business and Public Service Associate Professional group, the proportion who were women decreased from 25.2% in 2010 to 16.9% in 2021.

Conversely, despite the decrease in overall number of engineering roles at 'Process, Plant and Machine Operatives' (81) level, there has been an increase in the percentage of women in this group from 17.7% to 20.7%.

Detailed occupational analysis

In Figure 6, this analysis is broken down further to 4-digit SOC code level. To aid interpretation, the table has been sorted according to the change in the percentage of women working in roles. The change in the number of employees has furthermore been coloured green for increases between 2010 and 2021 and red for decreases over the same period.

More than half of the occupation groups have seen an increase in the percentage of female workers between 2010 and 2021 (61 out of 97). In all but 7 of these 61 roles, the increase has been both in proportional and absolute terms – and for 27 of these, it has coincided with an expansion of roles overall in that occupation. For example, between 2010 and 2021 the number of people working in IT and telecommunications professional roles increased by more than 90,000. Of these new roles, more than half of them were taken up by women.

However, not all of these proportional increases were absolute or within the context of a growing number of people working within that occupation.

- **Proportional – but not absolute - increases:** Among 7 roles (building and civil engineering technicians; architects; architectural and town planning technicians; production managers and directors in manufacturing; metal working machine operatives; welding trades; carpenters and joiners) the increase has been merely proportional. In absolute terms, the number of women has declined between 2010 and 2021 – just not at the rate of the decline observed among men.

- **Increases within the context of a declining number of men, or an overall contraction of the workforce:** In other areas, the rise in women has coincided with a decline in men. For example, of all the engineering roles 'Science,

engineering and production technicians not elsewhere classified' have seen the greatest change in the proportion of women, increasing from 20.0% in 2010 to 44.7% in 2021. This is in part driven by an increase in the number of women, but also in part by a decrease in men. In terms of numbers of employees, the increase in female workers appears to coincide with a decrease in male workers of similar magnitude.

For some roles, the rate of women entering has been outpaced by the rate of men leaving. For instance, between 2010 and 2021 the number of female electronics engineers increased by 2,500 while decreasing by 15,000 in the number of men (resulting in an overall decline of 12,500). Similarly, the number of female mechanical engineers increased by 3,800 while decreasing by 10,200 in the number of men (resulting in an overall decline of 6,400).

It will be important to understand what is driving these opposing trends – whether there are differences in the way women and men are being treated at recruitment, pay, contract type, or retention.

For 13 of the roles included in the engineering footprint, the proportion of women has remained at 0% - in other words, virtually no women were in these professions in 2010 and this has remained the case some 11 years later. In all but 2 of these roles, this has coincided with an overall shrinking of that workforce.

For the remaining 23 roles within the engineering footprint, there has been a decrease in the percentage of female employees over the period. For all but 2 of these roles, the decline in the proportion of women also represented a decrease, in absolute numbers. However, in the case of engineering professionals not elsewhere classified, IT and telecommunications directors, quality assurance technicians, planning process and production technicians and environmental professionals, the number of women between 2010 and 2021 grew – just simply not at the same rate as men.

Figure 6. Percentage of women in engineering roles by 4-digit SOC code and changes in the number of employees in engineering roles between 2010 and 2021, UK

Occupation (main job)	Core or related	% of engineering workforce that are female			Change in number of employees			Total no. of employees in 2021
		2010	2021	*change*	Male	Female	Persons	
3119 'Science, engineering and production technicians n.e.c.'	CORE	20.0%	44.7%	*24.7%*	-4,909	6,794	1,886	25,969
8115 'Rubber process operatives'	CORE	12.5%	32.2%	*19.7%*	-137	1,740	1,603	7,807
3114 'Building and civil engineering technicians'	CORE	14.8%	31.7%	*16.9%*	-17,128	-883	-18,011	10,599
2462 'Quality assurance and	CORE	32.4%	48.6%	*16.1%*	32,484	44,442	76,926	120,781

regulatory professionals'								
8132 'Assemblers (vehicles and metal goods)'	RELATED	14.1%	28.9%	*14.8%*	-3,480	4,852	1,372	31,543
5244 'TV, video and audio engineers'	CORE	3.4%	18.2%	*14.7%*	-8,013	716	-7,297	6,556
2139 'IT and telecommunications professionals'	CORE	11.5%	26.1%	*14.6%*	44,560	46,171	90,731	244,825
8124 'Energy plant operatives'	RELATED	0.0%	14.1%	*14.1%*	2,149	1,680	3,829	11,875
8118 'Electroplaters'	RELATED	0.0%	12.7%	*12.7%*	3,539	999	4,538	7,873
2124 'Electronics engineers'	CORE	2.8%	15.2%	*12.4%*	-15,335	2,453	-12,883	22,630
2127 'Production and process engineers'	CORE	7.7%	19.6%	*11.9%*	-1,493	5,960	4,468	47,261
3131 'IT operations technicians'	RELATED	23.5%	35.3%	*11.8%*	-868	17,661	16,793	116,346
2123 'Electrical engineers'	CORE	1.1%	12.7%	*11.6%*	-41,488	2,333	-39,156	23,791
5211 'Smiths and forge workers'	CORE	0.0%	11.5%	*11.5%*	-1,742	397	-1,345	3,464
3122 'Draughtspersons'	CORE	11.2%	22.2%	*10.9%*	-1,345	4,827	3,482	40,570
1123 'Production mngrs and directors in mining and energy'	CORE	8.5%	19.4%	*10.9%*	-1,357	1,033	-324	9,721
2150 'Research and development mngrs'	CORE	35.2%	45.9%	*10.7%*	18,985	21,984	40,969	70,697
2135 'IT business analysts, archtcts and systms designers'	CORE	14.0%	24.1%	*10.1%*	112,966	46,468	159,434	239,875
5224 'Precision instrument makers and repairers'	CORE	1.9%	11.9%	*10.0%*	-7,233	1,793	-5,440	18,879
8114 'Chemical and related process operatives'	RELATED	16.4%	26.3%	*9.9%*	-7,261	3,649	-3,613	42,819
2461 'Quality control and planning engineers'	CORE	23.1%	32.0%	*8.9%*	2,713	3,894	6,606	26,551
2433 'Quantity surveyors'	RELATED	5.3%	14.1%	*8.8%*	7,933	5,514	13,448	54,541
2126 'Design and development engineers'	CORE	4.0%	12.5%	*8.5%*	19,563	8,901	28,464	91,513

8111 'Food, drink and tobacco process operatives'	RELATED	34.9%	43.3%	*8.4%*	-27,103	1,413	-25,690	123,466
2134 'IT project and programme mngrs'	RELATED	17.9%	26.3%	*8.3%*	6,288	9,558	15,845	80,482
8221 'Crane drivers'	RELATED	0.0%	7.8%	*7.8%*	-2,947	916	-2,031	11,744
1122 'Production mngrs and directors in construction'	CORE	4.9%	12.1%	*7.3%*	-31,368	9,144	-22,223	140,851
2431 'Architects'	RELATED	16.6%	23.9%	*7.2%*	-32,505	-4,931	-37,436	17,803
2133 'IT specialist mngrs'	RELATED	18.4%	25.3%	*6.9%*	30,605	27,303	57,908	240,319
8232 'Marine and waterways transport operatives'	RELATED	0.0%	6.9%	*6.9%*	-1,170	524	-646	7,601
8126 'Water and sewerage plant operatives'	CORE	0.0%	6.2%	*6.2%*	5,310	889	6,199	14,330
8133 'Routine inspectors and testers'	CORE	24.2%	30.4%	*6.2%*	-8,635	2,775	-5,860	67,694
2434 'Chartered surveyors'	RELATED	7.2%	13.4%	*6.2%*	-16,187	2,165	-14,022	51,339
2122 'Mechanical engineers'	CORE	4.4%	10.2%	*5.7%*	-10,191	3,804	-6,388	71,104
3112 'Electrical and electronics technicians'	CORE	6.0%	11.6%	*5.6%*	-4,693	888	-3,805	20,020
2436 'Construction project mngrs and related professionals'	RELATED	11.4%	16.9%	*5.5%*	-17,734	844	-16,891	50,070
2137 'Web design and development professionals'	RELATED	24.6%	29.4%	*4.8%*	19,426	11,467	30,893	80,203
3132 'IT user support technicians'	RELATED	22.2%	26.8%	*4.6%*	17,391	11,464	28,855	111,021
5249 'Electrical and electronic trades n.e.c.'	CORE	2.3%	6.8%	*4.5%*	-22,850	2,380	-20,470	63,750
8121 'Paper and wood machine operatives'	CORE	5.4%	9.2%	*3.8%*	-6,986	877	-6,109	31,371
1255 'Waste disposal and environmental services mngrs'	RELATED	12.3%	15.7%	*3.4%*	476	448	924	9,816
5250 'Sklld metal, electrical and electrnc trades sprvsrs'	CORE	4.8%	8.0%	*3.2%*	-12,203	367	-11,836	29,218

3113 'Engineering technicians'	CORE	6.5%	9.3%	*2.8%*	-16,566	586	-15,981	57,218
2136 'Programmers and software development professionals'	CORE	13.1%	16.0%	*2.8%*	172,751	39,766	212,517	417,952
2121 'Civil engineers'	CORE	6.2%	8.8%	*2.6%*	9,448	3,019	12,467	86,581
5223 'Metal working production and maintenance fitters'	CORE	2.3%	4.7%	*2.4%*	-18,259	3,171	-15,089	149,498
5242 'Telecommunications engineers'	CORE	3.7%	6.0%	*2.3%*	16,436	2,170	18,606	65,095
8141 'Scaffolders, stagers and riggers'	RELATED	0.0%	2.2%	*2.2%*	-3,103	530	-2,573	23,615
3121 'Architectural and town planning technicians'	RELATED	34.3%	36.5%	*2.2%*	-2,128	-615	-2,743	14,954
5330 'Construction and building trades supervisors'	CORE	0.0%	2.0%	*2.0%*	-13,055	945	-12,110	46,131
5231 'Vehicle technicians, mechanics and electricians'	CORE	0.2%	1.9%	*1.7%*	-47,559	2,474	-45,085	147,367
1121 'Production mngrs and directors in manufacturing'	CORE	13.6%	15.2%	*1.5%*	-99,448	-11,837	-111,284	216,803
5241 'Electricians and electrical fitters'	CORE	0.9%	2.4%	*1.5%*	-34,436	2,988	-31,448	215,811
1136 'IT and telecommunications directors'	RELATED	16.0%	17.5%	*1.5%*	57,438	13,081	70,519	120,632
8149 'Construction operatives n.e.c.'	RELATED	1.2%	2.6%	*1.4%*	7,746	1,186	8,933	77,138
5235 'Aircraft maintenance and related trades'	CORE	2.2%	3.2%	*1.0%*	57,891	2,128	60,018	78,247
5234 'Vehicle paint technicians'	RELATED	0.0%	0.8%	*0.8%*	-4,772	109	-4,663	12,904
5245 'IT engineers'	CORE	4.7%	5.4%	*0.7%*	-2,366	151	-2,216	35,511
8125 'Metal working machine operatives'	CORE	9.5%	9.8%	*0.3%*	-16,529	-1,615	-18,144	33,913
5215 'Welding trades'	CORE	1.6%	1.8%	*0.2%*	-35,372	-494	-35,866	27,929
5315 'Carpenters and joiners'	RELATED	0.4%	0.5%	*0.0%*	-43,196	-91	-43,288	173,400

5212 'Moulders, core makers and die casters'	CORE	0.0%	0.0%	*0.0%*	-1,799	0	-1,799	898
5214 'Metal plate workers, and riveters'	CORE	0.0%	0.0%	*0.0%*	667	0	667	5,633
5216 'Pipe fitters'	CORE	0.0%	0.0%	*0.0%*	-7,033	0	-7,033	6,329
5222 'Tool makers, tool fitters and markers-out'	CORE	0.0%	0.0%	*0.0%*	-5,566	0	-5,566	9,174
5225 'Air-conditioning and refrigeration engineers'	CORE	0.0%	0.0%	*0.0%*	-12,423	0	-12,423	1,475
5236 'Boat and ship builders and repairers'	CORE	0.0%	0.0%	*0.0%*	-2,540	0	-2,540	10,119
5237 'Rail and rolling stock builders and repairers'	CORE	0.0%	0.0%	*0.0%*	7,753	0	7,753	13,320
5311 'Steel erectors'	RELATED	0.0%	0.0%	*0.0%*	-2,528	0	-2,528	5,013
5313 'Roofers, roof tilers and slaters'	RELATED	0.0%	0.0%	*0.0%*	-4,059	0	-4,059	36,235
8122 'Coal mine operatives'	CORE	0.0%	0.0%	*0.0%*	-2,010	0	-2,010	93
8123 'Quarry workers and related operatives'	CORE	0.0%	0.0%	*0.0%*	-364	0	-364	7,958
8135 'Tyre, exhaust and windscreen fitters'	RELATED	0.0%	0.0%	*0.0%*	-1,667	0	-1,667	9,953
8143 'Rail construction and maintenance operatives'	CORE	0.0%	0.0%	*0.0%*	-3,473	0	-3,473	5,416
3422 'Product, clothing and related designers'	RELATED	65.2%	65.0%	*-0.2%*	7,156	13,091	20,248	68,948
5312 'Bricklayers and masons'	RELATED	0.3%	0.0%	*-0.3%*	-18,980	-203	-19,183	57,820
3115 'Quality assurance technicians'	CORE	38.7%	38.4%	*-0.3%*	15,306	9,459	24,766	42,275
5319 'Construction and building trades n.e.c.'	RELATED	1.7%	1.4%	*-0.3%*	-42,575	-1,378	-43,953	192,671
5314 'Plumbers and heating and ventilating engineers'	CORE	1.3%	0.7%	*-0.5%*	-28,964	-1,085	-30,049	133,339

5232 'Vehicle body builders and repairers '	CORE	5.3%	4.8%	*-0.5%*	-3,389	-330	-3,719	24,334
5316 'Glaziers, window fabricators and fitters'	RELATED	0.8%	0.0%	*-0.8%*	24,680	-313	24,368	61,881
5213 'Sheet metal workers'	CORE	1.1%	0.0%	*-1.1%*	-16,603	-313	-16,916	11,056
5221 'Metal machining setters and setter-operators'	CORE	5.3%	3.4%	*-1.9%*	-21,684	-1,831	-23,514	30,148
2129 'Engineering professionals n.e.c.'	CORE	13.8%	11.8%	*-2.1%*	47,856	3,983	51,839	155,373
8139 'Assemblers and routine operatives n.e.c.'	RELATED	38.8%	36.4%	*-2.3%*	-916	-1,880	-2,796	33,905
8142 'Road construction operatives'	RELATED	3.3%	0.0%	*-3.3%*	-8,093	-763	-8,855	14,299
3512 'Aircraft pilots and flight engineers'	RELATED	3.4%	0.0%	*-3.4%*	-3,353	-699	-4,052	16,472
8129 'Plant and machine operatives n.e.c.'	CORE	14.3%	10.8%	*-3.5%*	-7,888	-2,226	-10,114	22,324
8131 'Assemblers (electrical and electronic products)'	RELATED	38.8%	33.6%	*-5.1%*	-3,701	-4,123	-7,824	21,141
3116 'Planning, process and production technicians'	CORE	31.1%	25.8%	*-5.3%*	12,697	3,282	15,979	31,994
8117 'Metal making and treating process operatives'	CORE	6.5%	0.0%	*-6.5%*	-4,173	-931	-5,103	9,246
8116 'Plastics process operatives'	CORE	12.4%	2.6%	*-9.9%*	-12,569	-4,117	-16,686	20,748
3565 'Inspectors of standards and regulations'	CORE	37.4%	24.3%	*-13.1%*	5,447	-4,621	826	37,624
8112 'Glass and ceramics process operatives'	RELATED	18.3%	3.4%	*-14.8%*	943	-975	-32	6,527
8119 'Process operatives n.e.c.'	RELATED	15.8%	0.0%	*-15.8%*	-11,761	-4,236	-15,998	10,774
2435 'Chartered architectural technologists'	RELATED	37.2%	20.8%	*-16.3%*	54	-407	-353	1,688
2142 'Environment professionals'	CORE	57.2%	36.9%	*-20.4%*	18,267	1,238	19,505	48,769

Source: ONS Labour Force Survey.

Similar to the occupational engineering footprint, our industrial engineering footprint is comprised of Standard Industrial Classification codes (5-digit 'SIC'), each corresponding to an industry in the economy. For example, the manufacture of consumer electronics has the SIC code '26400'.

Like SOC, these codes can be grouped into broader industry 'sections'. For example, under Section F: Construction sits a variety of industries we deem to be engineering, such as construction of commercial buildings (SIC 41201), construction of bridges and tunnels (42130), and construction of utility projects for electricity and telecommunications (42220).

There are also, of course, industries that we do not consider to be engineering but in which people working in engineering roles may nevertheless work - for instance, retail or book publishing.

By industry sections

It is important to not only consider where progress has been made in terms of the engineering roles women occupy, but also in which sectors they work. Toward this aim, we analysed the extent to which the proportion of women working in engineering roles has changed within different engineering industries (SIC), the results of which are presented in Figure 7.

Owing to the comparatively small sample size numbers within each SOC and SIC, it is not possible to present analysis of the industries women in engineering roles work in at a detailed level – and indeed, a degree of caution should be exercised in the interpretation of the high-level data we do present (in particular any rows with an * or **).

These caveats aside, it is clear some industry sections have made much more progress, in terms of the gender balance of those working in engineering roles, than others.

Between 2010 and 2021, for instance, the proportion of women working in engineering roles within the water supply, sewerage, waste management and remediation activities increased from 8.5% to 11.5%. In contrast, the proportion of women working in engineering roles within construction has remained stubbornly low, rising from 2.3% in 2010 to 4.7% in 2021.

Figure 7. Percentage of women in engineering roles (defined by SOC), by engineering industry (SIC) between 2010 and 2021

SIC group	2010	2015	2019	2021
Section B: MINING AND QUARRYING	3.4%	4.2%	5.3%	4.2%
Section C: MANUFACTURING	10.5%	12.5%	12.5%	15.5%
Section D: ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY*	4.8%	4.5%	6.3%	11.3%
Section E: WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES	8.5%	8.9%	9.9%	11.5%
Section F: CONSTRUCTION	2.3%	3.7%	4.2%	4.7%

Section G: WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES*	0.4%	1.3%	1.1%	4.2%
Section H: TRANSPORTATION AND STORAGE*	0.0%	0.0%	0.0%	29.4%
Section J: INFORMATION AND COMMUNICATION	0.0%	0.0%	0.0%	17.8%
Section M: PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES	12.5%	14.8%	15.1%	18.1%
Section N: ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES*	0.0%	0.0%	8.7%	2.3%
Section O: PUBLIC ADMINISTRATION AND DEFENCE; COMPULSORY SOCIAL SECURITY*	9.0%	8.8%	8.3%	17.1%
Section S: OTHER SERVICE ACTIVITIES*	4.7%	5.1%	5.3%	9.1%

Source: ONS Labour Force Survey.

**denotes figures based on an unweighted sample size less than 10 in 2010, 2015 and 2019*
*** denotes figures based on unweighted sample size less than 5 in 2010, 2015 and 2019*

By detailed occupation

Overall, we know that women working in engineering jobs (either core or related) are more likely to do so outside of the engineering sector (24.4%) than within it (12.5%; see Figure 3).

To better understand where these differences lie, we examined this at the 4-digit SOC level, the full results of which can be found in the accompanying Excel annex to this document. Though in some cases the figures were too small to consider, it was nevertheless evident there is a great deal of variability in the percentage of women that work in engineering industries (SIC) versus non-engineering industries by occupation.

Of the 62 roles for which numbers are large enough to confidently interpret, in 47 the proportion of women was higher among non-engineering industries than in engineering industries – and in 21 the difference was greater than 10 percentage points (see Figure 8). In other words, in these roles, women were much more likely to work outside of what is traditionally deemed to be 'engineering industries' than within it.

Notably, the majority of these were core engineering roles – including civil engineers, mechanical engineers, electronics engineers, and science, engineering and production technicians not elsewhere classified. This suggests there remains significant work to tackle gender imbalance issues within the more traditional engineering industries and roles.

Figure 8. Engineering roles for which there is a <10 percentage point difference in the proportion of women working in non-engineering industries compared to within engineering industries, 2021 UK

Occupation (main job)	Core or related	% of engineering workforce that are female	
		Engineering industries	Non-engineering industries
3115 'Quality assurance technicians'	CORE	26.0%	65.6%
3121 'Architectural and town planning technicians'	RELATED	21.1%	59.7%
8133 'Routine inspectors and testers'	CORE	23.7%	49.7%
2461 'Quality control and planning engineers'	CORE	23.4%	49.1%
2121 'Civil engineers'	CORE	7.1%	31.9%
2431 'Architects'	RELATED	18.5%	42.0%
3112 'Electrical and electronics technicians'	CORE	3.3%	25.8%
2122 'Mechanical engineers'	CORE	6.5%	27.5%
2134 'IT project and programme mngrs'	RELATED	16.7%	37.5%
1255 'Waste disposal and environmental services mngrs'	RELATED	4.4%	25.0%
3422 'Product, clothing and related designers'	RELATED	51.1%	70.1%
3565 'Inspectors of standards and regulations'	CORE	12.5%	31.4%
2124 'Electronics engineers'	CORE	9.1%	27.9%
8111 'Food, drink and tobacco process operatives'	RELATED	36.1%	54.2%
3119 'Science, engineering and prodctn technicians n.e.c.'	CORE	33.2%	50.4%
2462 'Quality assurance and regulatory professionals'	CORE	37.0%	54.2%
1122 'Production mngrs and directors in construction'	CORE	7.2%	23.4%
5232 'Vehicle body builders and repairers '	CORE	1.9%	15.4%
2150 'Research and development mngrs'	CORE	39.4%	52.0%
1136 'IT and telecommunications directors'	RELATED	12.1%	24.2%
2139 'IT and telecommunications professionals'	CORE	21.9%	32.9%
2436 'Construction project mngrs and related professionals'	RELATED	13.9%	23.4%
5245 'IT engineers'	CORE	2.4%	11.6%
2133 'IT specialist mngrs'	RELATED	20.5%	29.2%
5224 'Precision instrument makers and repairers'	CORE	9.3%	16.7%
2136 'Programmers and software development professionals'	CORE	13.2%	20.0%
2137 'Web design and development professionals'	RELATED	26.6%	33.3%
2142 'Environment professionals'	CORE	34.7%	40.9%
2135 'IT business analysts, archtcts and systms designers'	CORE	21.5%	26.4%
3122 'Draughtspersons'	CORE	21.2%	25.3%
5330 'Construction and building trades supervisors'	CORE	1.4%	5.1%
2433 'Quantity surveyors'	RELATED	13.8%	16.9%
2434 'Chartered surveyors'	RELATED	12.7%	15.7%
1121 'Production mngrs and directors in manufacturing'	CORE	14.7%	17.4%
5241 'Electricians and electrical fitters'	CORE	2.1%	4.6%

5231	'Vehicle technicians, mechanics and electricians'	CORE	1.2%	3.7%
2126	'Design and development engineers'	CORE	12.1%	14.6%
8125	'Metal working machine operatives'	CORE	9.3%	11.7%
5319	'Construction and building trades n.e.c.'	RELATED	0.6%	2.9%
3132	'IT user support technicians'	RELATED	25.7%	27.8%
5242	'Telecommunications engineers'	CORE	5.6%	7.5%
8221	'Crane drivers'	RELATED	7.1%	8.9%
8149	'Construction operatives n.e.c.'	RELATED	2.0%	3.5%
5223	'Metal working production and maintenance fitters'	CORE	4.3%	5.8%
3113	'Engineering technicians'	CORE	9.0%	10.4%
5315	'Carpenters and joiners'	RELATED	0.0%	0.9%
2129	'Engineering professionals n.e.c.'	CORE	11.7%	12.2%
5237	'Rail and rolling stock builders and repairers'	CORE	0.0%	0.0%
5313	'Roofers, roof tilers and slaters'	RELATED	0.0%	0.0%
5316	'Glaziers, window fabricators and fitters'	RELATED	0.0%	0.0%
5314	'Plumbers and heating and ventilating engineers'	CORE	0.8%	0.0%
5249	'Electrical and electronic trades n.e.c.'	CORE	7.6%	4.8%
3131	'IT operations technicians'	RELATED	37.3%	34.0%
8129	'Plant and machine operatives n.e.c.'	CORE	12.0%	8.4%
2127	'Production and process engineers'	CORE	20.1%	16.3%
5235	'Aircraft maintenance and related trades'	CORE	4.6%	0.0%
8114	'Chemical and related process operatives'	RELATED	27.0%	21.6%
8121	'Paper and wood machine operatives'	CORE	10.7%	4.0%
3116	'Planning, process and production technicians'	CORE	27.4%	19.6%
5250	'Sklld metal, electrical and electrnc trades sprvsrs'	CORE	9.5%	0.0%
8139	'Assemblers and routine operatives n.e.c.'	RELATED	40.3%	14.9%