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– Kayley Lockhead, ACIBSE IEng, UK

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What it takes to be a digital engineer

Adapt to survive

Building services engineers enjoyed another year of inflation-busting pay rises in 2016, but wage growth is starting to level out after a sharp increase in the wake of the last recession.

Our exclusive Hays salary survey, on page 9, found that wages increased by 3.5% on average last year, well ahead of the 2.8% average increase for the construction and property sector overall.

But wage growth has slowed since 2015, when everyone was recruiting and there was real competition for skills, which fed into salary inflation. The cooling of the labour market reflects, in part, how employers have become more savvy about responding to hiring pressures.

The survey found that 22% of building services employers feared a lack of talent would thwart their business objectives – and that Brexit, which could shrink the pool of non-UK people working in the sector, could exacerbate these shortages. Meanwhile, the fall in the value of the pound is making the UK less attractive for overseas workers.

Ray Upjohn, ChapmanBDSP chief executive, believes consultants are also facing competition for digital engineers from contractors keen to gain BIM expertise.

Our feature on adapting to the digital revolution (page 14) investigates what it takes to be a digital engineer, and how firms of all sizes are ensuring their employees embrace the technology, to make the most of its potential and set themselves apart from competition.

On page 4, we meet young professionals who have changed career to become building services engineers. The industry will have to start fishing from a wider pool of talent in this way to alleviate the acute skills shortfall in the UK, which is likely to be exacerbated by Theresa May's impending 'hard Brexit'.

LIZA YOUNG, DEPUTY EDITOR lyoung@cibsejournal.com

Welcome from CIBSE

CIBSE is committed to encouraging young people to enter the industry. It wants to ensure there is a skilled, enthusiastic and passionate community of engineers ready for the challenges ahead.

This annual careers guide highlights what a career in building services engineering offers, and what impact you could have in shaping the world in which we live and work.

As a building services engineer, you'll have the chance to develop a range of skills and talents, realise your potential, and pursue career opportunities in the UK and overseas. At the same time, you'll have the satisfaction of knowing you are making a difference to the way people experience buildings, and to the environment.

There are many routes into the industry, and many paths once you've entered it, and CIBSE will be able to help support you through the lifetime of your career. It gives all full-time engineering students free CIBSE membership for the duration of their course, with a small fee for those studying on a part-time basis. As a member, you can access a wealth of resources and publications through the Knowledge Portal, as well as by joining the Young Engineers Network.

Membership means CIBSE can support you as you gain chartered status and progress your career. Most of all, the institute wants to see more young people entering the industry and making the most of the opportunities it offers. For more information, visit **www.cibse.org**

Smart choices

Skills shortages and major new construction projects mean Britain needs more highly qualified labour. But graduates aren't the only ones in demand. David Blackman meets four professionals who changed career to become building services engineers

Building services was suffering from an acute skills shortage even before the UK's vote to withdraw from the European Union (EU).

The Royal Academy of Engineering has estimated that Britain needs 182,000 new engineers of all kinds per year – and demand within building services will be fuelled by major infrastructure projects such as Hinkley Point C nuclear power plant and the HS2 high-speed rail network, when they come on stream.

The shortfall is also likely to be exacerbated by the result of last June's EU referendum. Skilled labour from the rest of the European Union has plugged skills gaps in recent years, but that may become more difficult if migration rules are tightened post-Brexit.

As a result building services will need to start fishing from a wider pool of talent than it has in the recent past.

Angela Ringguth, CIBSE's professional development consultant, says the institute is keen to encourage new routes to becoming chartered building services engineers – such as the apprenticeships that the government is currently so keen to champion via its new levy on employers.

'We want people to understand that there is more than one way into the profession,' she says, pointing out that many of those in the industry's senior echelons entered via the professional qualification route, rather than through a university degree.

CIBSE Journal has spoken to some young engineers who have taken the roads less travelled into building services. CJ

ESSENTIAL SERVICES

Components that make buildings habitable

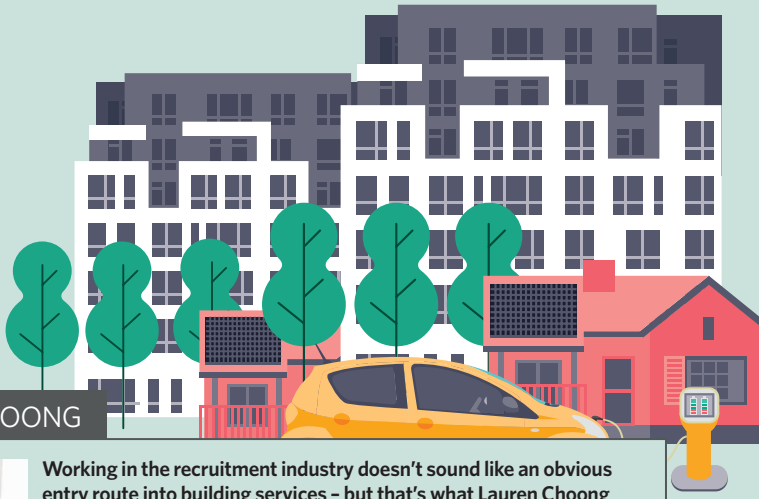
- Energy supply – gas, electricity and renewable sources
- Heating and ventilating
- Lighting – natural and artificial
- Escalators and lifts
- Harnessing renewable energy, such as solar power
- Communications, telephones and IT networks
- Security and alarm systems
- Fire detection and protection
- Air conditioning and refrigeration
- Façade engineering
- Public health engineering
- Control systems

The variety of jobs within building services

- Air conditioning engineer
- Business manager or proprietor
- Building physics engineer
- Carbon emissions specialist
- Computer-aided design technician
- Commissioning engineer
- Consulting engineer
- Contract or project engineer
- Design engineer
- Domestic heating engineer
- Domestic plumber
- Ductwork installer
- Educator and trainer
- Electrotechnical panel builder
- Electrical repair and rewinder
- Energy inspector/adviser
- Environmental engineer
- Estimator
- Façade engineer
- Facilities manager
- Fitter/welder
- Gas fitter
- Heating and ventilating engineer
- Highway electrical systems installer
- Industrial and commercial plumber
- Installation electrician
- Instrumentation installer /engineer
- Lighting expert
- Maintenance electrician
- Project engineer
- Public health engineer
- Quantity surveyor
- Refrigeration engineer
- Satellite systems engineer
- Service and maintenance engineer
- Sheet metal weathering specialist
- Site supervisor

182,000

The number of new engineers of all kinds that the Royal Academy of Engineering estimates Britain needs per year to alleviate the skills shortage



LAUREN CHOONG

Working in the recruitment industry doesn't sound like an obvious entry route into building services – but that's what Lauren Choong was doing before she joined Ramboll as a graduate engineer.

Both of her parents worked in design, so engineering was in Choong's blood. In addition, the girls' grammar school she attended in Kent specialised in the subject.

But, having gone on to study mechanical engineering at Manchester University, she didn't move straight into the field when she graduated in 2011. 'The market wasn't so great, so I thought I would take time out to travel.'

While working in a local restaurant to earn money to travel, Choong was offered a job by a customer who ran a recruitment business. 'I hadn't considered recruitment as a career path, but thought I would be stupid to pass up a job opportunity.'

The agency she worked for was involved in the construction industry, which piqued her interest in the building services side of engineering. 'I was having conversations with guys who were on site and I was getting more and more interested in what was happening on projects.'

When applying for building services jobs, Choong admits she was nervous about competing with people who had just graduated, with more up-to-date technical knowledge than hers. But this didn't prove a hurdle. She believes the interpersonal skills she developed in recruitment have proved invaluable when working in cross-disciplinary construction teams.

'Half of what we do is communicating effectively. Recruitment taught me a lot about how to get people on board,' she said.

As for her advice for would-be building services engineers thinking about entering the profession, Choong says a good first step is to attend events such as London's Open House weekend, to see inside buildings. 'It's not just engineering; it's helping architects to express their design intentions.'

JOSH BULLARD

When he was growing up, Josh Bullard's dream was to work in Formula 1 racing. Keen to find a way into the industry, he followed in his father's footsteps by taking an engineering degree.

However, while studying aeronautical engineering at Bristol University, Bullard took a module on sustainability and stumbled across building services – prompting a radical change of career path. 'The projects I wanted to do were those that can build a better society, such as public buildings.'

After graduating, Bullard landed a job as an environmental design engineer at Mott MacDonald. He says making the transition from aeronautical to building services engineering was relatively straightforward, as there was crossover in terms of basic principles, such as understanding thermodynamics and heat flows. 'The core elements are very similar. The hardest thing was understanding a lot of the technical jargon, like soffits.'

Bullard has remained in Bristol, where he now works as a senior building performance engineer at Hydrock. He doesn't believe he is disadvantaged vis-à-vis his peers who took a more specialised degree, arguing that a lot of buildings services can only really be learned on the job.

But he believes getting advice is crucial. 'The earlier you can think of it the better; find a mentor who can help you along that journey.'

JAMIE ARBON

These days, Jamie Arbon – an engineering technician at Hoare Lea – can be found working on high-end residential and office projects in London. But his first job after leaving school at 16 was as a hod carrier for a local bricklaying company in his native Essex.

While working there, he gained an apprenticeship as an electrician, and built on this with a testing qualification. However, Arbon – now 26 – soon realised he didn't want to spend the rest of his career on building sites.

'When I was onsite I was working with guys who were a lot older than me. They were moaning that they hated the job; I didn't want to turn into that person.'

With his eyes on a white-collar job, and having developed an interest in the design side of construction, Arbon enrolled on an electrical engineering HNC at a college in Notting Hill Gate, London.

Three years ago – and halfway through the course – he joined Hoare Lea, which sponsored him to take a CIBSE-accredited part-time HND at South Bank University. He is currently midway through the penultimate year of the five-year course.

Arbon says the biggest project he has worked on while at Hoare Lea is a 12-storey office block at 245 Hammersmith Road, in west London. While on the project, the engineer who had been supervising him left the firm, which meant Arbon taking on additional responsibility, including extensive liaison with utility companies and the local council.

His advice for those aiming to make the transition from an apprenticeship to building services? 'Make sure you find a company where you can carry on with your studies and, hopefully, get the opportunity to go to university.'

"The projects I wanted to do were those that can build a better society, such as public buildings"

NICK AGOPIAN

Nick Agopian entered building services after taking a degree in civil engineering at University College London.

At secondary school, he admits he was torn between wanting to be an architect and an engineer. He eventually plumped for the latter because he was better at maths and sciences than art.

He found a way of marrying the two after taking a module in environmental engineering, which interested him so much that he chose the building services role in his final-year team project.

This involved designing a sustainable building that used a combination of natural and mechanical ventilation for heating and cooling. 'When I delved a bit deeper into the building services world, it was more interesting than the other modules.'

Agopian joined ChapmanBDSP as a trainee in November 2013. The most high-profile project he has been involved with is the redevelopment of Battersea power station, where he has worked on phases two and three.

Having moved on from trainee to intermediate mechanical engineer, Agopian doesn't believe that entering building services via civil engineering has hindered his progress. However, he admits to probably spending more time on BDSP's graduate programme than many of his peers.

'Some graduates will be 100% sure that they want to do electrical or mechanical. I wanted to do each a bit longer to make sure I made the right choice.

'Working with different teams, you get a better idea of what you want.'

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Making hay

Salaries in the building services sector rose by a healthy 3.5% last year, despite Brexit looming on the horizon. David Blackman reports on a jobs market showing strong resilience in the face of European uncertainty

For many British workers, the years since the recession have constituted a lost decade of stagnating wage growth. Construction has proved a rare bright spot though – at least in recent years – and building services staff enjoyed another period of inflation-busting pay rises in 2016.

Salaries increased by an average of 3.5%, according to the latest salary guide and survey of building service employers and candidates, compiled exclusively for CIBSE by Hays. This represented a bigger rise than the average recorded by Hays for the construction and property sector overall (2.8%). Those working in building services also outperformed the 1.8% salary average increase for all UK professions.

Nearly two-thirds (60%) of building services employers told Hays that they had raised salaries in the past 12 months, with the same proportion reporting that they expect to increase them in the next 12 months. Nearly one in six (16%) anticipate these salary increases to be 5% or more.

However, building service company employees clearly still have itchy feet; more than two-thirds (70%) anticipate moving in the next 12 months, which is slightly higher than at this point last year. Just more than half (53%) expect to switch jobs within the next six months.

The relief for employers is that the 3.5% annual wage increase represents a slowdown on 2015, when salary hikes were running at 5% on average, according to Hays.

Richard Gelder, director at Hays Building Services, says things have calmed down since what he describes as the 'chaotic' situation in 2015, when building »

Contractors: Directors

Region	Typical 2017	Min 2017	Max 2017
East Midlands	£56,500	£55,000	£70,000
East of England	£55,000	£50,000	£70,000
London	£90,000	£70,000	£120,000
North East England	£52,000	£48,000	£60,000
North West England	£58,000	£55,000	£70,000
Northern Ireland	£64,000	£60,000	£80,000
Scotland	£55,000	£50,000	£60,000
South East England	£72,000	£70,000	£85,000
South West England	£58,000	£55,000	£60,000
Wales	£53,500	£52,000	£60,000
West Midlands	£60,000	£55,000	£75,000
Yorkshire and the Humber	£56,000	£55,000	£60,000
National average	£60,833	£56,250	£72,500
% increase year on year	5%		

97%

Before the EU referendum, 97% of building services employers surveyed by Hays expected business activity levels to increase in the next 12 months

two-thirds

More than two-thirds (70%) of employees anticipate moving in the next 12 months, which is slightly higher than at this point last year

» services companies were hiring and reopening regional offices, while new firms were trying to break into the field.

'Just 12 to 18 months ago, there was sense of disbelief about how quickly everything had turned. Everyone was recruiting, there was real competition for skills, and that fed into wage inflation,' he said. The cooling of the labour market reflects, in part, how employers have become more savvy about responding to hiring pressures, says Gelder: 'Throughout 2016, you have seen employers become a lot more proactive, rather than reactive. They want to do it right by not taking on somebody who is not a good fit for the business, or where the pay is so disproportionate that it will create other management challenges. If you can't contain your staff costs, that becomes a real problem.'

Jay Amin, head of human resources at Hurley Palmer Flatt, agrees that the jobs market has calmed down over the past few months. 'The year before was a bit more challenging. You would make offers and people would make counter-offers. It became a bit of a numbers game and we were being held to ransom.'

Ray Upjohn, chief executive of ChapmanBDSP, believes that salaries have largely levelled out after a couple of years of big post-recession increases. 'The correction process is near the end,' he says, while Philippe Honnorat, UK head of building services at WSP Parsons Brinckerhoff, also feels that salary levels have become much more stable over the past year. 'A new average has been found for each and every role,' he says.

One of the factors underpinning the cooling in salary increases is the additional uncertainty injected into the construction market by

Contractors: CAD technician

Region	Typical 2017	Min 2017	Max 2017
East Midlands	£28,000	£27,000	£30,000
East of England	£24,000	£22,000	£26,000
London	£39,000	£30,000	£50,000
North East England	£25,000	£22,000	£26,500
North West England	£28,500	£25,000	£30,000
Northern Ireland	£28,000	£24,000	£30,000
Scotland	£22,000	£22,000	£24,000
South East England	£33,000	£30,000	£37,000
South West England	£30,000	£25,000	£33,000
Wales	£28,000	£24,000	£34,000
West Midlands	£27,000	£22,000	£34,000
Yorkshire and the Humber	£24,000	£21,000	£26,500
National average	£28,042	£24,500	£31,750
% increase year on year	3.90%		

Contractors: Contract quantity surveyor

Region	Typical 2017	Min 2017	Max 2017
East Midlands	£42,000	£35,000	£50,000
East of England	£39,000	£33,000	£50,000
London	£55,000	£45,000	£75,000
North East England	£37,500	£35,000	£42,000
North West England	£38,000	£35,000	£40,000
Northern Ireland	£38,000	£30,000	£42,000
Scotland	£40,000	£35,000	£42,000
South East England	£55,000	£50,000	£70,000
South West England	£42,500	£42,000	£50,000
Wales	£40,000	£34,000	£44,000
West Midlands	£40,000	£33,000	£45,000
Yorkshire and the Humber	£35,000	£30,000	£40,000
National average	£41,833	£36,417	£49,167
% increase year on year	3.20%		

Contractors: Estimator

Region	Typical 2017	Min 2017	Max 2017
East Midlands	£40,000	£30,000	£45,000
East of England	£42,000	£35,000	£55,000
London	£54,000	£45,000	£60,000
North East England	£35,000	£30,000	£40,000
North West England	£40,000	£38,000	£45,000
Northern Ireland	£33,000	£30,000	£40,000
Scotland	£38,000	£35,000	£40,000
South East England	£55,000	£50,000	£65,000
South West England	£40,000	£35,000	£45,000
Wales	£37,500	£30,000	£40,000
West Midlands	£40,000	£30,000	£45,000
Yorkshire and the Humber	£33,000	£25,000	£35,000
National average	£40,625	£34,417	£46,250
% increase year on year	6%		

Contractors: Project engineer

Region	Typical 2017	Min 2017	Max 2017
East Midlands	£35,000	£30,000	£40,000
East of England	£36,000	£32,000	£45,000
London	£45,000	£35,000	£60,000
North East England	£32,000	£28,000	£35,500
North West England	£38,000	£35,000	£40,000
Northern Ireland	£32,000	£28,000	£35,000
Scotland	£38,000	£35,000	£40,000
South East England	£40,000	£40,000	£47,000
South West England	£35,000	£35,000	£45,000
Wales	£34,000	£28,000	£35,000
West Midlands	£36,000	£30,000	£40,000
Yorkshire and the Humber	£32,000	£30,000	£40,000
National average	£36,083	£32,167	£41,875
% increase year on year	3.50%		

Contractors: Project manager

Region	Typical 2017	Min 2017	Max 2017
East Midlands	£45,000	£40,000	£50,000
East of England	£45,000	£40,000	£55,000
London	£65,000	£50,000	£75,000
North East England	£42,500	£40,000	£50,000
North West England	£45,000	£40,000	£55,000
Northern Ireland	£35,000	£33,000	£38,000
Scotland	£40,000	£38,000	£47,000
South East England	£60,000	£55,000	£65,000
South West England	£45,000	£40,000	£45,000
Wales	£40,000	£37,000	£42,000
West Midlands	£43,000	£35,000	£50,000
Yorkshire and the Humber	£45,000	£40,000	£57,000
National average	£45,875	£40,667	£52,417
% increase year on year	3.30%		

Contractors: Senior contracts manager

Region	Typical 2017	Min 2017	Max 2017
East Midlands	£47,500	£45,000	£55,000
East of England	£50,000	£45,000	£60,000
London	£60,000	£50,000	£75,000
North East England	£40,000	£30,000	£45,000
North West England	£43,000	£38,000	£50,000
Northern Ireland	£45,000	£38,000	£50,000
Scotland	£44,000	£38,000	£47,000
South East England	£60,000	£55,000	£65,000
South West England	£48,500	£45,000	£55,000
Wales	£46,000	£40,000	£50,000
West Midlands	£48,500	£40,000	£55,000
Yorkshire and the Humber	£37,000	£34,000	£43,500
National average	£47,458	£41,500	£54,208
% increase year on year	3.20%		

the UK's vote to withdraw from the European Union. Amin recalls that 'when it [the referendum] kicked in initially, a handful of clients went on hold.' However, these projects have now come back on stream and the firm is recruiting again, she adds. This shows that confidence within the building services sector has proved more resilient than expected in the immediate aftermath of last June's vote.

Before the EU referendum, 97% of building services employers surveyed by Hays expected business activity levels to increase over the following 12 months. Across the construction sector as a whole, a survey carried out by the agency after the vote found that exactly the same proportion of employers expected activity levels to increase or stay the same.

Upjohn agrees that activity levels have 'held up stronger than expected', while Gelder says: 'Most people have fairly busy order books and pipelines of work. Right now, there has been no change.'

The government's announcements on the long-delayed Hinkley Point C nuclear power plant and a third runway at Heathrow Airport have given a major fillip to the infrastructure pipeline.

A rash of opportunistic property investment – often motivated by a desire to snap up UK real estate bargains after the post-referendum devaluation of the pound – has also propped up activity in the commercial sector, says Honnorat.

While this has resulted in a steady flow of new inquiries, he cautions that wider economic uncertainty means there is less confidence about whether projects will be delivered.

There is, Honnorat explains, 'less sense that a project will eventually result in further investment, even in design costs – and, further down the line, in real construction costs – because the whole investment world is pondering how we adjust.'

This probably explains why employers are seeing reduced turnover, despite bullish statements from their staff about moving »

"Most people have fairly busy order books and pipelines of work. Right now, there has been no change"

Consulting: Associate

Region	Typical 2017	Min 2017	Max 2017
East Midlands	£55,000	£50,000	£58,000
East of England	£51,000	£50,000	£65,000
London	£68,000	£60,000	£75,000
North East England	£42,000	£38,000	£45,000
North West England	£53,500	£50,000	£60,000
Northern Ireland	£50,000	£45,000	£55,000
Scotland	£50,000	£50,000	£55,000
South East England	£59,000	£55,000	£63,000
South West England	£55,000	£50,000	£60,000
Wales	£50,500	£40,000	£52,000
West Midlands	£52,000	£48,000	£55,000
Yorkshire and the Humber	£47,000	£42,000	£48,000
National average	£52,750	£48,167	£57,583
% increase year on year	3.10%		

Consulting: CAD technician

Region	Typical 2017	Min 2017	Max 2017
East Midlands	£28,000	£27,000	£30,000
East of England	£29,000	£25,000	£37,000
London	£34,000	£30,000	£38,000
North East England	£24,000	£21,000	£25,000
North West England	£28,000	£25,000	£35,000
Northern Ireland	£20,000	£18,000	£25,000
Scotland	£25,000	£20,000	£25,000
South East England	£31,000	£28,000	£34,000
South West England	£28,000	£25,000	£30,000
Wales	£28,000	£23,000	£32,000
West Midlands	£27,000	£23,000	£30,000
Yorkshire and the Humber	£26,000	£22,000	£28,000
National average	£27,333	£23,917	£30,750
% increase year on year	1.90%		

Consulting: Director

Region	Typical 2017	Min 2017	Max 2017
East Midlands	£60,000	£55,000	£70,000
East of England	£61,000	£50,000	£70,000
London	£90,000	£80,000	£100,000
North East England	£50,000	£42,000	£54,000
North West England	£65,000	£60,000	£70,000
Northern Ireland	£60,000	£50,000	£70,000
Scotland	£55,000	£50,000	£60,000
South East England	£69,000	£64,000	£74,000
South West England	£55,000	£52,000	£65,000
Wales	£53,500	£52,000	£57,000
West Midlands	£65,000	£50,000	£70,000
Yorkshire and the Humber	£50,000	£42,000	£55,000
National average	£61,125	£53,917	£67,917
% increase year on year	2.70%		

Consulting: Intermediate design engineer (M&E)

Region	Typical 2017	Min 2017	Max 2017
East Midlands	£33,500	£30,000	£38,000
East of England	£37,000	£33,000	£50,000
London	£38,000	£32,000	£40,000
North East England	£30,000	£28,000	£32,000
North West England	£34,000	£29,000	£40,000
Northern Ireland	£26,000	£25,000	£29,000
Scotland	£35,000	£30,000	£40,000
South East England	£33,000	£31,000	£36,000
South West England	£37,000	£30,000	£40,000
Wales	£34,000	£28,000	£35,000
West Midlands	£31,000	£25,000	£35,000
Yorkshire and the Humber	£26,000	£22,000	£28,000
National average	£32,875	£28,583	£36,917
% increase year on year	4%		

Consulting: Junior design engineer (M&E)

Region	Typical 2017	Min 2017	Max 2017
East Midlands	£26,000	£20,000	£30,000
East of England	£24,000	£20,000	£28,000
London	£28,000	£25,000	£32,000
North East England	£21,000	£18,000	£24,000
North West England	£25,000	£22,000	£26,000
Northern Ireland	£23,000	£20,000	£24,000
Scotland	£27,000	£25,000	£30,000
South East England	£28,000	£26,000	£32,000
South West England	£27,000	£24,000	£30,000
Wales	£25,000	£22,000	£28,000
West Midlands	£23,000	£18,000	£25,000
Yorkshire and the Humber	£21,000	£18,000	£24,000
National average	£24,833	£21,500	£27,750
% increase year on year	4.70%		

Consulting: Professional quantity surveyor

Region	Typical 2017	Min 2017	Max 2017
East Midlands	£44,500	£35,000	£50,000
East of England	£47,000	£40,000	£55,000
London	£65,000	£45,000	£75,000
North East England	£38,000	£35,000	£40,000
North West England	£42,000	£38,000	£45,000
Northern Ireland	£35,000	£30,000	£37,000
Scotland	£37,500	£33,000	£41,000
South East England	£61,500	£60,000	£70,000
South West England	£48,500	£45,000	£60,000
Wales	£41,000	£34,000	£45,000
West Midlands	£41,000	£32,000	£50,000
Yorkshire and the Humber	£40,000	£35,000	£45,000
National average	£45,083	£38,500	£51,083
% increase year on year	4.90%		

» At WSP, the attrition rate has fallen over the past 12 months, claims Honnorat: 'People will look twice [before moving] in this environment.' Amin also says turnover is 'slightly down' at her company: 'People are reluctant to move and a bit worried.'

However, perhaps the biggest hiring concern for building services employers is the impact that the UK's withdrawal from the EU will have on their access to skilled labour.

The sector's skills shortage is already acute, judging by Hays' survey, which found that nearly a quarter (22%) of building services employers are concerned that they lack the talent they need to achieve their business objectives. These shortages are likely to be exacerbated if – as looks increasingly likely – Brexit ends the free movement of labour between the UK and the European Union.

'There's a clear pool of non-UK people working in the sector, without whom we would really be struggling,' says Gelder.

Honnorat is also worried about the implications of the end of free movement of labour. 'The whole construction industry depends on people prepared to move and work hard. The EU workforce currently based in the UK find themselves wondering what the future holds.'

As well as the uncertainty surrounding EU employees' residency status in a post-Brexit Britain, the drop in the value of the pound means the UK is a less lucrative place to work. Honnorat predicts that the EU talent will start to flock back to their home countries, citing as an example Spanish engineers. 'If the Spanish economy rises strongly, some of our people may decide to go back home; people are more mobile than before.'

And this narrowing of the talent pool risks making the UK building services a less vibrant sector. 'These are quite entrepreneurial and dynamic people who bring a different outlook with a different culture and training and a wider set of skills. It makes us richer, so of course we are concerned that – if we have less access to those people – we will suffer.' CJ

£52,750

Typical national average salary for associate consultant in 2017

THE BIG WINNERS IN 2016

Junior and intermediate design engineers and quantity surveyors saw the biggest increases in salary last year

While average pay increases may have eased off in building services, this is not true across the board, says Hays' Richard Gelder: 'Competition for candidates in several areas remains fierce and drives salary increases above the industry average, as counter-offers continue to be prevalent.'

Among those working for contractors, estimators enjoyed the highest salary growth last year – with a national average increase of 5% – followed by directors (5%) and CAD technicians (4%). Within consultancy ranks, quantity surveyors and junior design engineers saw the highest salary increases (5%), while intermediate design engineers (M&E) also experienced an above-average pay rise of 4%.

Gelder says: 'A good design engineer can expect to secure a number of interviews, a competitive salary offer for a new role, and – in many cases – a counter-offer from their current employer to keep them.'

ChapmanBDSP's Ray Upjohn says consultancies face strong competition from contractors to retain staff with BIM expertise, as the technology becomes the norm on construction projects. WSP Parsons Brinckerhoff's Philippe Honnorat, meanwhile, isn't surprised that estimators are in such strong demand. 'Contract prices are all over the place; with the pound dropping, everything you import costs more. It's hard to get hold of certain trades; last year it was bricklayers, this year it's electricians. Somebody who understands the market well removes some of the uncertainty around future prices.'

By contrast, those with expertise in sustainable construction received the lowest average uplift in salary – a meagre 1.2% – but Honnorat believes demand for their services will eventually rebound.

'Sustainable construction will come back because legislation keeps changing and the younger generation is more attuned to the fact that we must do something about it.'

Consulting: Revit/BIM technician

Region	Typical 2017	Min 2017	Max 2017
East Midlands	£31,500	£30,000	£40,000
East of England	£30,000	£28,000	£38,000
London	£45,000	£40,000	£60,000
North East England	£32,000	£28,000	£35,000
North West England	£35,000	£30,000	£38,000
Northern Ireland	£24,000	£22,000	£28,000
Scotland	£30,000	£25,000	£35,000
South East England	£40,000	£35,000	£42,000
South West England	£35,000	£30,000	£40,000
Wales	£34,000	£30,000	£35,000
West Midlands	£31,000	£26,000	£40,000
Yorkshire and the Humber	£33,000	£28,000	£35,000
National average	£33,375	£29,333	£38,833
% increase year on year	3.20%		

Consulting: Senior design engineer (M&E)

Region	Typical 2017	Min 2017	Max 2017
East Midlands	£46,000	£40,000	£50,000
East of England	£45,000	£40,000	£55,000
London	£55,000	£50,000	£65,000
North East England	£43,000	£40,000	£45,000
North West England	£45,000	£40,000	£55,000
Northern Ireland	£38,000	£35,000	£44,000
Scotland	£44,000	£40,000	£45,000
South East England	£53,000	£47,000	£57,000
South West England	£48,000	£45,000	£55,000
Wales	£45,000	£38,000	£48,000
West Midlands	£42,000	£38,000	£45,000
Yorkshire and the Humber	£42,000	£38,000	£45,000
National average	£45,500	£40,917	£50,750
% increase year on year	2.5%		

Consulting: Sustainability consultant

Region	Typical 2017	Min 2017	Max 2017
East Midlands	£42,000	£35,000	£45,000
East of England	£50,000	£42,000	£60,000
London	£55,000	£45,000	£60,000
North East England	£40,000	£36,500	£43,500
North West England	£45,000	£40,000	£50,000
Northern Ireland	£25,000	£23,000	£28,000
Scotland	£43,000	£40,000	£50,000
South East England	£42,000	£40,000	£45,000
South West England	£45,000	£40,000	£50,000
Wales	£41,500	£38,000	£45,000
West Midlands	£43,000	£38,000	£46,000
Yorkshire and the Humber	£42,500	£40,000	£47,500
National average	£42,833	£38,125	£47,500
% increase year on year	1.20%		

EDUCATION & TRAINING PROVIDERS

Heriot-Watt University

Address: School of Energy, Geoscience, Infrastructure and Society, Edinburgh Campus, Edinburgh, EH14 4AS
Website: www.hw.ac.uk/egis
Telephone: 0131 451 8363
Contact: EGIS School Office
Email: egis-enquiries@hw.ac.uk;
Distance Learning: All MSc courses are available via independent distance learning (IDL). Contact: EGIS-idl-enquiries@hw.ac.uk
Courses offered: CIBSE and EI accredited: BEng (Hons)/MEng Architectural Engineering; BEng (Hons)/MEng Architectural Engineering with International Studies; MSc Architectural Engineering; MSc Sustainable Building Design.
RICS and CIOB accredited: MSc Building Conservation (Technology & Management); MSc Construction Project Management.
RICS accredited: MSc Quantity Surveying; MSc Real Estate & Planning, MSc Real Estate Management & Development; MSc Real Estate Investment & Finance; and MSc Sustainable Urban Management.

Leeds College of Building

Address: North Street, Leeds, LS2 7QT
Website: www.lcb.ac.uk
Telephone: 0113 222 6061
Contact: Higher Education Department
Email: info@lcb.ac.uk
Courses offered: As specialists in construction education and training, the college offers complete progression routes, from entry level to senior management and design. Including level 3 diplomas and Advanced Apprenticeships, level 4 HNC, level 5 HND and Higher Apprenticeships. Full-time, part-time, day-release and distance-study options are available.

Loughborough University

Address: School of Civil and Building Engineering, Loughborough University, Loughborough, Leicestershire LE11 3TU
Website: www.lboro.ac.uk/civil
Telephone: 01509 228529
Contact: Mahroo Eftekhari
Email: m.m.eftekhari@lboro.ac.uk 01509 222606
Courses offered: CIBSE and EI accredited: MSc Low Carbon Building Design and Modelling; MSc Low Energy Building Services Engineering.
JBM accredited for 'further learning' and CIWEM accredited: Water and Environmental Management; Water and Waste Engineering; and Infrastructure in Emergencies.
JBM, RICS and CIOB accredited: MSc Construction Management; and MSc Construction Project Management.
Other Master's course: MRes Energy Demand Studies.

Faculty of Engineering, Environment and Computing, Coventry University

Address: School of Energy, Construction and Environment, Sir John Laing Building, Much Park Street, Coventry, CV1 2LT
Website: www.coventry.ac.uk/cabk
Telephone: 02476 887688
Contact: Engineering, Environment and Computing Admissions Team
Email: admissions.ec@coventry.ac.uk
Courses offered: BSc Construction Management CIOB accredited; BSc Building Surveying RICS accredited; BSc Quantity Surveying and Commercial Management RICS accredited; BEng Building Services Engineering (two-year direct entry); MSc Construction Project and Cost Management RICS accredited; and MSc Construction Management CIOB accredited.

Adapt and survive in these digital times

With the data revolution sweeping through the construction sector, building services firms are on the hunt for a new type of design professional. Liza Young finds out what it takes to be a digital engineer

Big desks and long rulers were the order of the day when CIBSE digital engineering consultant Carl Collins started in mechanical engineering as a draughtsman; computers were few and far between.

'Back in 1983, we were using the ancestors of the modern 3D building information modelling (BIM) tools – simple CAD applications on computers that were little more than virtual drawing-boards,' he says. 'But, most importantly, we were using computers to interpret and store data, to help eliminate errors and to automate processes. That's when BIM truly started, and when the digital engineer was born.'

So while the 'digital' part of the job title is relatively new, the 'engineer' part has a much longer lineage. 'Engineers have been around for hundreds of years, adapting to the tools that became available,' says Steven Hale, managing director at Crofton Design. 'We went from slide rules to calculators and now to BIM. That's not digital engineering – that's engineering.'

The most valuable part of BIM is the way engineers capture, organise and deploy data, says Collins. 'BIM should not be an expensive add-on to a project, but a way of working that permeates everything we do.' And, if used from the start of a project, BIM can create a platform for true collaboration and accelerate delivery.

Efficiencies

Crofton deployed BIM software across all engineers' desktops five years ago, and the firm is 'beginning to see a tipping point', says Hale. As well as staff going home on time, they have gained hours of productive time because of an increase in efficiency.

Instead of generating non-recyclable data, a digital engineer only needs to input building information once before it is shared and used by multiple parties. 'Typically, you would do the calculations, draw the schematic and create the schedules. With BIM, those are just different views of the same bit of data, so you no longer have to reproduce that information manually three times,' says Hale.

Manual methods also introduce the potential for human error and propagate any inaccuracies there may be in the original drawings. In BIM, the drawings and schedules are generated directly from the underlying model, ensuring information is always consistent with the design.

When a change is made in the design – for example, the size of an air handling unit – it automatically ripples down to all related construction documents and schedules. 'Otherwise, you risk fragmentation of data – when schematics and schedules fail to align – and out-of-date information,' says Hale.

'Automation can do the mundane tasks so we can do more important things, like design,' adds Dave Lee, BIM manager at Hilson Moran. 'It also saves time, because architects and engineers can work on projects simultaneously.' A collaborative model prompts interdisciplinary understanding, too, Lee says, breaking down barriers between electrical, public health and mechanical engineers, and architects.

Hale says Crofton's BIM expertise – combined with such a small

market of competitors – has helped the firm secure jobs, particularly on the government's Priority School Building Programme. The drawback? 'It's eye-wateringly expensive,' he says. 'SMEs are struggling because they look at the cost and wonder how the hell it's going to pay them back.

'It will, but it requires continued commitment to get to where we are. We started the BIM journey at the depths of the recession – we couldn't afford to do it, but we couldn't afford not to.'

Smaller companies need to embrace digital technologies or they will get left behind, says Mark Maidment, director of Skelly & Couch, which invested in BIM seven years ago. 'Companies that do not invest will lose engineers. Unless they have experience working with the tools, they will find it difficult to get jobs in the future,' he adds.

To simplify and standardise some aspects of BIM, CIBSE is developing product data template (PDTs) – a database of manufacturer-prepared fields with values for products and specifications. Designers and contractors can use these to populate their BIM models automatically with component data, to work out energy savings and cost.

The recently launched BIMHawk website and software plug-in allows users to upload PDTs corresponding to real-world products with a full set of industry-recognised parameters ready to be filled in, before importing the model directly into a BIM platform.

Engineering first

Skelly & Couch and Hilson Moran rank highly those individuals who have experience in using digital packages, but their key criteria for candidates are strong engineering principles and a willingness to learn. Training an engineer to use software is much easier than teaching a Revit expert engineering, says Lee. 'Existing engineers have been hired because of the quality of their designs, not because of their ability to click a button – they can be trained up to do that. What we can't teach so easily is the innovative engineering behind it.'

> "Engineers are hired because of the quality of their designs, not because of their ability to click a button"

Maidment insists modelling in isolation – without an understanding of what is coming out at the end – is a dangerous activity. Skelly & Couch encourages everyone to do hand calculations in the first instance, to ensure they know that what they're getting from the software packages is reasonable and correct. 'Digital allows us to push boundaries, have confidence in our designs, and instigate things we couldn't have seven years ago. But we need to recognise its limitations,' says Maidment.

Training

Like Skelly & Couch, which supplements Revit courses with in-house training, Crofton runs weekly BIM workshops on creating schematics and schedules, as well as offering Revit training on Linda.com. 'We have been training for five years and have seen a 15% improvement in productivity,' says Hale. 'Every one of our engineers will need to be able to manipulate data-rich models to work here. Everyone in the business – including me – is learning.'

Hilson Moran, with 150 engineers and a 30-strong CAD department, is also bridging the gap between the two disciplines by creating digital technologists – experts in both engineering and software. 'Our strategy is that everyone – no matter what age – should have digital knowledge, including the CEO,' says Lee, who uses company-wide KnowledgeSmart testing to identify knowledge gaps.

However, there's still a long way to go before all disciplines are on board, adds Hale. Electrical engineers' drawings, for example, use symbols that do not accurately translate into Revit, which allows 3D components to be tagged with data. 'This has been the convention for electrical drawings for the past 60 years, and it will be really hard to unpick,' he says.

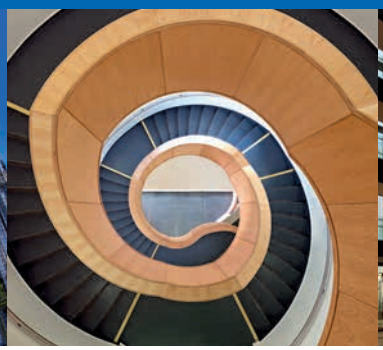
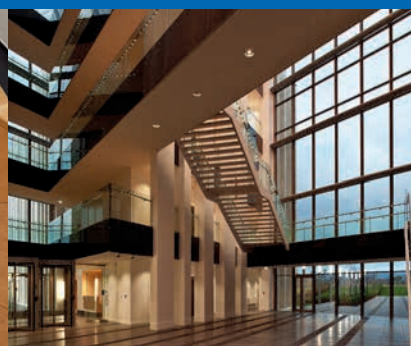
Hale believes the terms BIM and digital will fall away in time, as the industry begins to accept these technologies as the norm. 'Many people see BIM as a problem, but we see it as an opportunity to set ourselves apart from our competitors,' he says.

BIM is just data, organised to do different things, adds Collins. 'It's no different to what engineers have always done – solved problems by doing creative things with the tools available. We're all digital engineers, but we need to embrace this role to make the most of its potential.' **CJ**

For more information visit **www.cibse.org/bimroadshows**

Real Estate & Infrastructure



YOUNG ENGINEERS AWARDS
CIBSE
EMPLOYER OF THE YEAR 2016


Heathfield School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TÜV SÜD is an international award winning building services engineering consultancy with 17 offices across the UK, Ireland & UEA.

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"TÜV SÜD have supported both my educational and practical engineering development since joining the company. Completing the Graduate Scheme will help achieve my goal of CIBSE Chartership status" Laurie McKelvie, Graduate Engineer