



Roma Agrawal

She worked on the building that redefined London's skyline and is the face behind the increasing promotion of women in engineering. We talk to 'Roma the Engineer' about building The Shard, raising the industry's profile and being a role model

WORDS: Amanda Pauley
PHOTOS: Chris Renton

My Story

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The first thing that strikes you about Roma Agrawal is her determination. Not only is she a successful Associate Structural Engineer and one of Marks & Spencer's 'Leading Ladies', but also the founder of the 'Your Life' initiative – a board whose sole focus is to increase the number of students studying maths and physics at A-level. She works for WSP, a global firm providing built environment and management consultancy services, and has a flair for designing bridges and buildings with an aesthetic edge.

In addition to these already noteworthy credentials, the 30-year-old is also the brains behind certain parts of London's newest skyscraper – The Shard. Her work on the project has won her numerous awards – including Engineer of the Year, Consultant of the Future and top place in *Management Today's* '35 women under 35 to watch' – and led to her being branded as 'Roma the Engineer', catapulting her into the public eye.

When we meet at Chancery Coffee, Holborn, it's clear to see why people are so interested in her incredible story. She's warm, clever, forward-thinking and most of all, modest: "It's strange when people recognise me but at the same time flattering, and if it means more children will start studying engineering then that is fantastic." I want to know what makes her tick, what fuels her passion. As she reflects on her rise to the top, Roma tells *QW* about her experiences of working on The Shard, taking risks and inspiring the next generation.

On top of the world

At first glance, Roma doesn't strike you as the type to take on a high-profile project such as The Shard, but under her shy exterior is a woman with guts of steel. "It's not every day you get to redefine skylines," she says. "I never felt nervous about the work, which genuinely surprises people, but I did feel a great sense of responsibility." Standing at 1,016ft high, The Shard is the tallest tower in Western Europe and no mean feat for the young engineer. Resembling an elaborate ice sculpture, it comprises five key areas – office spaces, restaurants, apartments, a hotel and two viewing platforms at the top that give unobstructed 360-degree views of London.

Roma spent six years designing the base and spire of the tower that changed London's skyline – her biggest career achievement to date. After countless structural drawings it was finally ready to be built, but as Roma insists, built with a twist. "We used an interesting new technique called top-down construction to build the core, where you start at ground level and dig out the foundation while building up at the same time. You're simultaneously working in opposite directions and what was challenging was we didn't have any precedent to say this is how it should be done. The technique had never been used on a building like this before so we were working completely from scratch. It made the process really exciting."

The pioneering method was not only a first for WSP but also for the UK, and its success is clear to see. For example, in one 36-hour period – employing 700 lorry-loads – the team managed to pour 5,400 cubic metres of concrete into the foundation alone. "The construction sequencing was very important and we had to break it down into different stages in

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Roma Agrawal,
Associate Structural
Engineer, London,
July 2014
Photo: Chris Renton

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order to understand exactly what was happening. These stages included everything from installing piles from ground level, casting the floor slabs and digging below them, to setting up a slip form to construct the core and install the steel floors,” explains Roma. “The structure being built above ground level was changing as we were building the foundations so I spent a lot of time on site to make sure everything was being completed according to the design.”

It took four years to get The Shard up and it’s no surprise that the lion’s share of the work was taken up by the base. It was important it meet several vital British Standards and the team’s confidence in top-down construction allowed the tower to be assembled quicker than it would have been using traditional methods, and as a result they saved a lot of time and money.

Dizzying heights

Roma’s work on The Shard’s spire is another amazing highlight of her CV – despite the fact that, ironically, she doesn’t like heights. It’s the highest and most striking part of the glass-clad pyramidal building, made up of 800 pieces of steel, weighing 500 tonnes and reaching a giant 66 metres in height. The challenges were daunting. “At the time, I remember thinking, how are we going to build this?” says Roma. “How are we going to make it completely practical but fantastic-looking at the same time? Every visitor that goes onto those viewing platforms will be able to see the structure’s bare bones – it had to be perfect.”

On 30 March 2012, the spire was winched into place, bringing the tower to its full height. It took less than a year to complete thanks to the innovative idea of steel module design – where a structure is built in a series of modules that can be easily assembled. “We tested the spire in three portions at a steel factory in Yorkshire. Each portion was

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Standing at 1,016ft, The Shard is London’s tallest tower
Photo: Thinkstock

quality checked and if any issues were found – such as a part being too small – the team would take it back to the factory and fix it,” explains Roma. “Once it was ready, the team conducted a test run where they assembled the spire in its entirety, checked it was fit for purpose and then disassembled. It was then brought to London where it could be quickly reassembled and put on the top of the building – a bit like a massive Meccano toy set. It was a special moment because there is no other building in the UK that has used this unique process before.”

The placement of the spire went smoothly and a lot quicker than would have been the case if not for this trial assembly method. This technique not only helped the team build The Shard in record time but placed the tower in the history books as a completely unique construction.

Roma pulls a hand-sized sculpture of the building out of her bag and starts talking me through its many layers. “I know I’m biased because I worked on it, but my favourite part of the building is the top-level viewing platform. Everything that holds the building up is on show – there is no cover-up or hiding behind expertly placed finishes. You can see the structure and the work that has gone into it.”

Despite the project’s undoubted success, the maths enthusiast shies away from the limelight, explaining it was a collaborative approach that made the building great. “The architects at Renzo Piano Building Workshop had an amazing sense of how the building went together and how the engineering worked, so I was able to work with them to make sure we always had the best solution. The structure could change the architecture and

the architecture could change the structure – it was a two-way process.”

Model behaviour

Some valuable lessons were learned along the way which Roma is keen to share. “It’s important to build relationships and make sure everyone is communicating on a project because it creates one common goal. This is the softer side of engineering you don’t usually see. Many think of engineering as process-driven and number-crunching but that isn’t true – it’s much more than that. The profession is extremely creative – you can’t build a building like The Shard if you have no imagination.”

Roma’s rarity as a young, female engineer has been used to front campaigns on television and in the papers to help raise the profile of engineering careers. You may recognise her from this year’s Marks & Spencer ‘Leading Ladies’ campaign which celebrates exceptional women from a range of diverse and successful backgrounds – starring the likes of Chef Rachel Khoo. “People within the engineering world might already know me but the ‘Leading Ladies’ campaign gave me the chance to reach a whole new audience and inspire more girls to study maths, science and engineering,” says Roma. “It was my chance to say: ‘This is what I look like and this is why I’m in this industry. I can wear a flowery dress and be an engineer – it’s not a contradiction. Engineering has a major image problem that we need to sort out. It’s viewed as difficult, geeky, boring and male-dominated, and we need to make sure these stereotypes fall away because we’re putting talented people off from coming into what is a really vibrant industry.’”

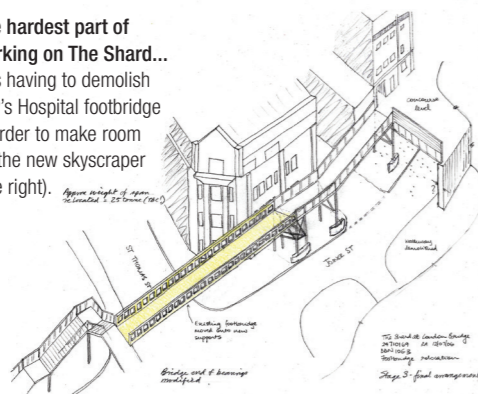
“The structure could change the architecture and the architecture could change the structure – it was a two-way process”

“Engineering is extremely creative – you can’t build a building like The Shard if you have no imagination”

Roma in a minute

My favourite project (apart from The Shard)... was a footbridge I designed for Northumbria University. It will always be my baby because it was my first project for WSP.

The hardest part of working on The Shard... was having to demolish Guy’s Hospital footbridge in order to make room for the new skyscraper (see right).

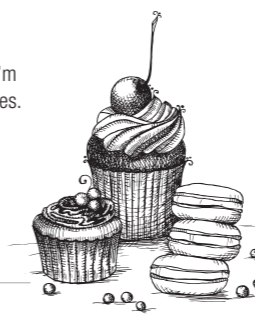


I would have liked to have created... the Houses of Parliament. They are spectacular and were built without the aid of computers. I want to know how they did that.



I love... walking around Manhattan. I could stare at the amazing skyscrapers all day.

I couldn’t live without... flour. I love baking and I’m obsessed with cakes.



My Story

Roma Agrawal's CV

2005 – 2014 WSP
Associate Structural Engineer

Projects

Northumbria University Footbridge (2005–2007)
Crystal Palace Station redevelopment (2008)
The Shard at London Bridge (2006–2012)
261 City Road (2011–2012)
Albemarle Street (2012–2014)
Royal Mint Street (2012–2014)
Marylebone Lane (2013–2014)

Qualifications

2011 Institution of Structural Engineers
Achieved Chartered Engineer status

2004–2005 Imperial College London
Masters in General Structural Engineering

2001–2004 The University of Oxford
BA Honours in Physics

Panels

The Your Life campaign – founding member
Construction Industry Council – Diversity Panel
Institution of Engineering and Technology –
Knowledge Management Board

Industry Awards

Engineering Excellence Awards 2014
Winner – Consultant of the future

Women in Construction Awards 2014
Winner – Engineer of the Year

Management Today Awards 2013
Winner – 35 women under 35

Institution of Engineering & Technology
Awards 2012
Finalist – Young Woman Engineer of the Year

Institution of Structural Engineers Awards 2011
Winner – Young Structural Engineer of the Year

Building Awards 2008
Finalist – Newcomer of the Year

National statistics show women still only make up a small number of engineers – less than 10% – and Roma believes the issue must be addressed at school level. “Girls are automatically ruling themselves out of studying engineering degrees at university but they don’t understand what they’re missing – amazing career options lie ahead by studying those subjects.”

Growing up in a household with a mother who was a computer programmer and father who was an electrical engineer obviously helped, but the engineer explains it was also support from her teachers and career advisers at school that led her to study for a physics engineering degree at The University of Oxford, followed by a masters in Structural Engineering at the Imperial College London. “I was encouraged to follow my gut instinct,” she says. “It’s career advisers like the ones I had that are vitally important to getting more women into engineering. They can provide an awareness of the industry and explain why it’s extremely creative and fun.”

And throwing herself into the limelight has helped the media recognise the value of Roma’s government-backed ‘Your Life’ campaign. Her passion is clear to see as her face lights up at the mention of the campaign: “I’ve had a lot of positive discrimination because I was one of a few women engineers on The Shard and as a result, people wanted to know more about my story. Being a minority doesn’t always have to be a negative – I got to stand out and that is a positive thing. The ‘Your Life’ initiative is about increasing the number of students studying maths and physics, and the exposure I’ve had has helped push this message. It’s important to raise awareness of this issue, especially as there is a particular drop-off at the GCSE/A-level stage, where only 7,000 girls go on to do physics every year compared to 25,000 boys.”

Roma genuinely wants to encourage the next generation and has humbly accepted her part in inspiring the engineers of the future. “Six years ago I never would have imagined the amount of media coverage I’ve got but I’m really going to run with it because if I can inspire others then that is amazing.” And her current project poses a more technically challenging task – she’s working on building residential buildings in London above and around train lines. This is pure Roma – never one to shy away from the challenge. Despite her incredible achievements, it’s clear we haven’t seen the best of her yet – there’s still so much more she can add to the world of engineering ■