Glenn Bell

Forensic engineering expert Glenn Bell stepped out of retirement to co-lead the investigation into the collapse of Champlain Towers South in Florida, which is now in its final stage. Helena Russell finds out what motivates this year's IStructE Gold Medal winner.

An eye for detail and an analytical mind might be crucial for the technical demands of forensic engineering, but the ability to stay humble and in touch with reality are just as important for personal resilience, says Glenn Bell. Having worked on some of the most high-profile building collapses in the world, he has plenty of experience to draw on.

Bell was hooked on engineering from a young age – his father was an electrical engineer working in the aerospace industry at an exciting time. 'It was the Space Race era, and my dad was part of that – he was my engineering hero!' Bell recalls. 'In my teens I started reading his engineering books and I thought I would probably be an electrical engineer like him.'

But just as Bell started thinking about university in the late 1960s, the aerospace industry fell on hard times; the Space Race had ended, the Vietnam War was raging and there was a big pushback against the development of military hardware. 'Work was hard to find, and the impact that had on my dad made me rethink my plans,' says Bell.

So, he settled on civil engineering as the discipline he thought would offer a stable career. At Tufts University in Boston, he was inspired to specialise in structural engineering after a module in which practising architects and engineers presented real-life projects. By the third year, Bell had developed a fascination for earthquake engineering and his college mentor, Professor Kentaro Tsutsumi, had a significant influence on his subsequent direction.

Steered down the right path

'My professor made two important recommendations: that I apply to the University of California at Berkeley for graduate school, and that I try and get an internship at local consultancy Simpson Gumpertz & Heger (SGH) – a company I knew nothing about but where I eventually spent 45 years!'

Bell was successful in his applications to both, and worked at SGH during the summer before going to California. 'They were working on some fascinating projects, so it was an opportunity to apply my skills.'

'I had a wonderful time at Berkeley; the giants of structural engineering academia

CAREER MILESTONES

1974	Graduated from Tufts University, Boston with BS in Civil Engineering
1975	Graduated from University of California, Berkeley with MS in Structural Engineering and Structural Mechanics
1975	Joined Simpson, Gumpertz & Heger (SGH)
1985	Appointed Associate at SGH
1995	Became CEO of SGH
2013	Elected IStructE Fellow through Eminent Person's Route
2016	Became Chair of the Board of Directors at SGH
2019	Became Director of CROSS-US
2020	President of the Structural Engineering Institute of ASCE
2022	Received ASCE President's Award
2024	Inducted into National Academy of Engineering
2025	Gold Medallist, Institution of Structural Engineers

a) Spaceship Earth geodesic sphere at Disney's EPCOT Center theme park, Florida

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↗FIGURE 1: A career at SGH afforded Bell the opportunity to work on a range of fascinating projects

were there and I learned from all of them. I also had a great cadre of classmates, some of whom became lifelong friends,' he recalls.

It was taken as read that Bell would return to SGH after finishing graduate school; the company employed only 30 people at the time, growing to around 600 by the time he retired in 2020.

'I started working on the design of new structures, mostly with Frank Heger. He piled opportunities on me and I worked on some amazing projects **(Figure 1)**; we designed the geodesic sphere at the EPCOT Center [Florida] and I was named as project manager at the ripe age of 27!' Bell says.

'We did a huge medical complex in Karachi, Pakistan, which was fascinating because all of the design was done to British Standards and I had to adapt, having grown up with the US system.'

Bell was never solely motivated by money and job satisfaction. 'It's more than that, it's about making a contribution to society. I grew up in a very supportive environment; we weren't wealthy, but we weren't starved of opportunities. Some people grow up in privilege and squander it, and I didn't want to do that.'

> "IT'S REALLY APPLYING A SCIENTIFIC METHOD – CREATE HYPOTHESES, COLLECT FACTS, TEST THOSE HYPOTHESES

Entering the forensic field

He expected to work in structural design all his professional life, but in 1981 the shocking collapse of two walkways at the Hyatt Regency Hotel in Kansas City proved a pivotal moment for Bell.

SGH was engaged to investigate the tragedy, in which 114 people died, and Howard Simpson asked Bell to co-lead the investigation, combining his structural engineering knowledge with Simpson's expertise in applied mechanics.

'That was a traumatic event for me. I spent weeks examining the collapse debris and I had to view videos taken in the atrium at the time the failure occurred. I started to project my own presence into that place; the human tragedy and the loss was tough. And I started asking myself how something like this could happen. What do we need to do as a profession to keep this from happening again?'

Bell found himself drawn into forensic engineering; he began to study other failures, engaging with the professional community and the initiatives that sprang up after the collapse.

He notes that the key skills for forensic engineers are very different to those used in building design. 'In investigations you are dealing with facts and you collect information, it's highly detailed. You can spend as much time analysing a single connection as you would designing a whole building. It's really applying a scientific method – create hypotheses, collect facts, test those hypotheses, and try to find out what's going on.'

His studies at Berkeley were helpful, he says. 'In earthquake engineering, you are often looking at performance in extreme conditions, and near-collapse behaviour.'

A holistic perspective

Although he started building up expertise in – and a reputation for – forensic engineering, Bell did not turn his back on design. 'I felt it was important to be able to practise forensic engineering in the greater context of design and structural engineering, so as not to lose touch with reality. It also keeps you humble. Fortunately, catastrophic failures are rare, so while learning from them, we need to remember that the vast majority of the structures we design perform well.'

'It was always a tug of war for me to jump from forensic mode to design mode; in one you are dealing with evidence as it is, and in the other you are dealing with what could be. But the really useful part of forensics is that it gives you a real-world experience of what can go wrong and how to avoid that. I have no doubt that studying failures made me a better design engineer. Reviewing case studies of failures should be a core, lifelong activity for every engineer.'

Engineers tend to design on an element-by-element basis without always considering the redundancy of the whole structure, he says. Looking at collapses helps them understand what happens if an element fails, and consider how the design could be adapted to limit its impact.

In the aftermath of the Hyatt collapse, Bell began to forge links with other forensic engineering experts and push for wider understanding of its importance.

In 1985 he co-founded a group called the Technical Council on Forensic Engineering, which has since grown to become a division of the American Society of Civil Engineers (ASCE). 'We laid out a series of subcommittees and a programme to work on practices for forensic engineering, collecting information on structural failures and

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b) Simmons Hall, student residence at Massachusetts Institute of Technology

c) Bahá'í Temple of South America (Structural Award winner in 2019; design by Hariri Pontarini Architects)

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disseminating it to the industry, looking at lessons learned and how we could use those.'

He also helped to launch the *Journal of Performance of Constructed Facilities*, focusing on forensic engineering, and started speaking on the subject at conferences and to professional associations. 'We wanted to build a system for constant learning and vigilance. It's human nature that when a disaster occurs there is a response, but if it doesn't repeat for a while then attention can fade.'

IStructE and CROSS

After giving a keynote address at a US conference on developing the next generation of structural engineers, Bell was approached by a delegation from the IStructE, which invited him to travel to London and give the same presentation.

In time, he was invited to join the Institution via the Eminent Person's Route, subsequently joining the Council and eventually serving on the Board of Trustees. This involvement was what first brought the confidential reporting system CROSS to his attention. 'I was introduced to Alastair Soane – now a close personal friend – and we started talking about bringing CROSS to the USA. At this time, I was on the board of directors of the Structural Engineering Institute of ASCE as well as a trustee at IStructE, so part of my remit was to try and bring the two closer together,' he explains.

Bell admits there have been challenges, in particular that of reassuring potential reporters that their confidentiality can be safeguarded in a country where litigation is common. But he adds that one of the strengths of the system is its focus on lower-level failures and near misses.

'They tend to occur more frequently, so you don't suffer the episodic approach to learning from failures. By placing constant attention on lower-level failures, we can learn more and avoid the catastrophic ones,' Bell points out.

CROSS-US was launched in 2019 under the auspices of the Structural Engineering Institute of ASCE; Bell retired from SGH in 2020 and was running it almost full time. Then, in June 2021, the Champlain Towers South in Surfside, Florida suffered a dramatic overnight collapse **(Figure 2)**, killing 98 people.

Champlain Towers investigation

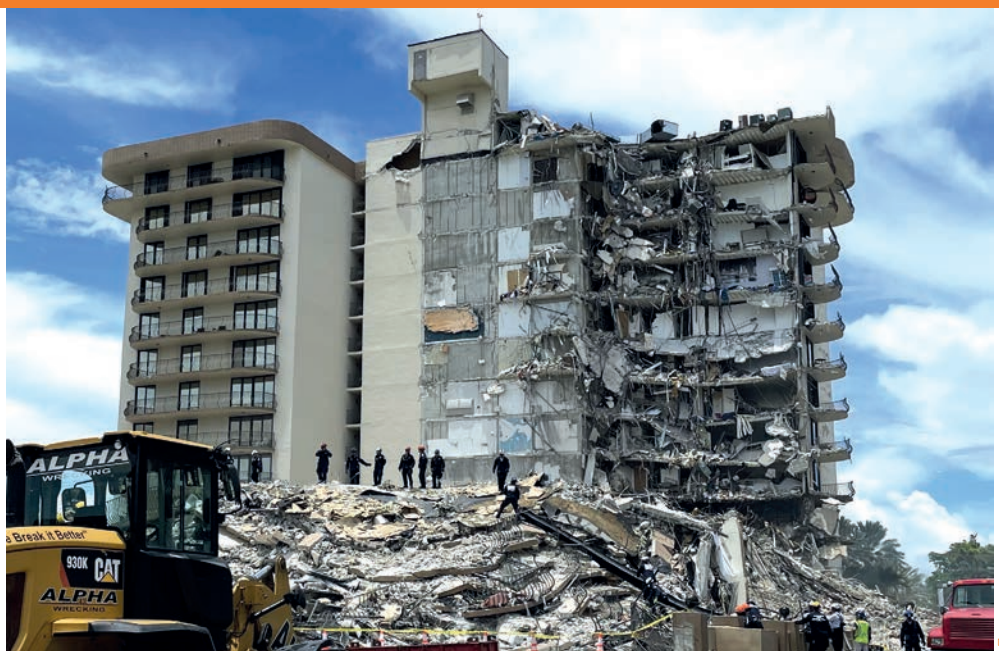
The first couple of weeks after the collapse, Bell acted as the ASCE's main spokesperson for press enquiries. But soon Judith Mitrani-Reiser of the National Institute of Standards and Technology (NIST) asked him to join her as co-lead of the National Construction Safety Team (NCST) investigation. 'She's very persuasive but I was inclined to say yes in any case, and the next day I was on a flight to Miami,' Bell says.

'It became a 70-hour-a-week job and I had to recruit help with CROSS, but I plan to go back to a more active leadership role when this investigation is over.'

The process was intense: 'The first two months after the collapse were critical,' Bell explains. 'You can't see everything, evidence starts to disappear and you have to set priorities for what to recover.

'We couldn't go on the collapse footprint while search and rescue operations were going on, so the team set up remote monitoring equipment – time-lapse photography, drones, lidar etc. – from two adjacent buildings. We established a system with the first responders whereby debris, mostly elements of the building, was brought off site, identified, tagged and stored for future use. In the end, this was more than 600 pieces of structure,' Bell says.

During the first month working at the collapse site, NIST developed a multidisciplinary investigation team of technical experts, and set up an online portal for NCST investigations where the public were invited to submit documents, statements, theories and so on. The social science team carried out interviews, compiling a long list of interviewees – those who lived in the building, those present at the time of the collapse, eye-witnesses, those who managed and maintained the building, and subsequently those responsible for codes and standards and enforcing them and so on.



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↑**FIGURE 2:** For the past four years, Bell has served as co-lead of the team investigating the collapse of Champlain Towers South in Surfside, Florida

Early in the investigation, the many hypotheses for initiation of the failure were narrowed down to about two dozen, which were evaluated against the evidence to determine the most probable scenarios and their causes.

'NIST stated in September that the building's pool deck likely collapsed before the tower, and that the collapse progressed into the tower, so the team must try and explain why and how that happened,' Bell says.

NIST is tasked with making recommendations for changes to codes, standards and practices that will improve building safety and limit the possibility of a repeat. Such recommendations have to consider the context of existing systems and roles and so on, so the team is interviewing building safety professionals to ensure the recommendations are practical and implementable.

'The only records from the original construction that the team was able to find were design drawings, so the investigation involved extensive work in trying to establish the as-built details of the building,' Bell says. 'The value of records in evaluating the safety of an existing building is likely to be a subject of our recommendations,' he reveals.

The investigation's technical work will be completed this year, and a detailed public update on the collapse and its most likely causes is expected in mid-2026. Written reports, which run to many thousands of pages, will subsequently be submitted for technical and policy review.

Register for the Gold Medal address

Don't miss Glenn Bell's 2025 IStructE Gold Medal address, which will take place at Institution HQ on 7 November. Sign up to attend in person or to watch the livestream of the event at **www.istructe.org/events/hq/2025/gold-medal-address-2025/.**