

The image shows a modern building with a curved glass entrance and a large stone-clad corner. In the foreground, a group of people is walking on a paved plaza. The sky is a clear, deep blue, suggesting dusk or dawn. The overall scene is a mix of architectural detail and human activity.

Annual Review

2019

The Institution of
StructuralEngineers



Image –

Tottenham Hotspur Stadium
Supreme Award Winner

Welcome

The Institution of Structural Engineers' main purpose is to support structural engineers in their professional development so that they have the necessary competencies to deliver a safe and resilient built environment for all.

Working closely with our members and the profession, we champion the important contribution structural engineers make to society. Our members' work is vital to public confidence in the safety of construction and the built environment. In addition to our commitment to structural safety we also recognise the importance of meeting the challenges of the future, most notably the impact of activities on climate change. We are proud to support the "Engineers Declare" movement in the UK and play an important facilitation role between industry, academia and the profession.

Our highlights for 2019 included the launch of a new brand and website to more accurately reflect how we represent our members and communicate with a diverse range of non-member audiences. As our membership has expanded both nationally and internationally, we too have expanded our offerings to provide more online support: virtual lectures and courses that complement our many face to face events.

Capturing and sharing lessons learnt from structural safety issues which might not otherwise get attention was the catalyst for the CROSS confidential reporting scheme launched in the UK nearly 25 years ago. Extending that model internationally so that global audiences can benefit from experiences outside their own country has been a long-held ambition. In 2018, we launched CROSS-Australasia and in 2019 through our collaborative partnership in the USA, we were delighted to support the Structural Engineering Institute (SEI) of the American Society of Civil Engineers (ASCE) launch CROSS-US.



Martin Powell – Chief Executive

Showcasing the work of structural engineers lies at the heart of our annual International Structural Awards celebration. Featuring projects from around the world, it highlights cutting-edge engineering projects where sustainable and responsible solutions are intrinsically embedded within the design. This report contains images of some of the 2019 winning projects. The supreme winner was the new Tottenham Hotspur Stadium, London, United Kingdom. A 62,300-seat stadium and the world's first three-way dividing, retractable football pitch with synthetic turf underneath for USA National Football League matches, concerts and other events. Gravel extracted during construction was sustainably re-used for concrete floors at the lower levels. Extensive use of post-tensioned slabs required 40% fewer columns to enhance the spectator experience.

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About us

The Institution is the world's largest international membership organisation dedicated to structural engineering. We are a charity established by Royal Charter, accountable to our Board of Trustees and advised by an elected Council. We are proud of our heritage and continue to be inspired by the opportunities to support structural engineers across the world for future generations.

Professional membership is one of the leading global benchmarks of competence and technical excellence. Members undergo rigorous technical assessment. We help them achieve this by supporting career long development and learning.

We provide a voice for our members, promoting their contribution to society as innovative, creative problem solvers and the guardians of public safety.

We recognise both the breadth and depth of the needs of our members. We help engineers come together and share knowledge and ideas through a variety of ways, including face to face events, digital platforms and social media (in 2019, our YouTube channel had over 65,000 views).

We are inclusive. No one with the aspirations and ability for a career in structural engineering should encounter any barriers. We are constantly reviewing our routes to membership to provide flexibility in the application and examinations process, offering more choice for all our candidates.

Our principles

- We are committed to exemplary **professional standards**
- We **respect** our members
- We **champion** the profession
- We are passionate about a **sustainable** built environment for all
- We are **inclusive**
- We **recognise** and **celebrate** the most talented structural engineers
- We are **collaborative**
- We are truly **international**

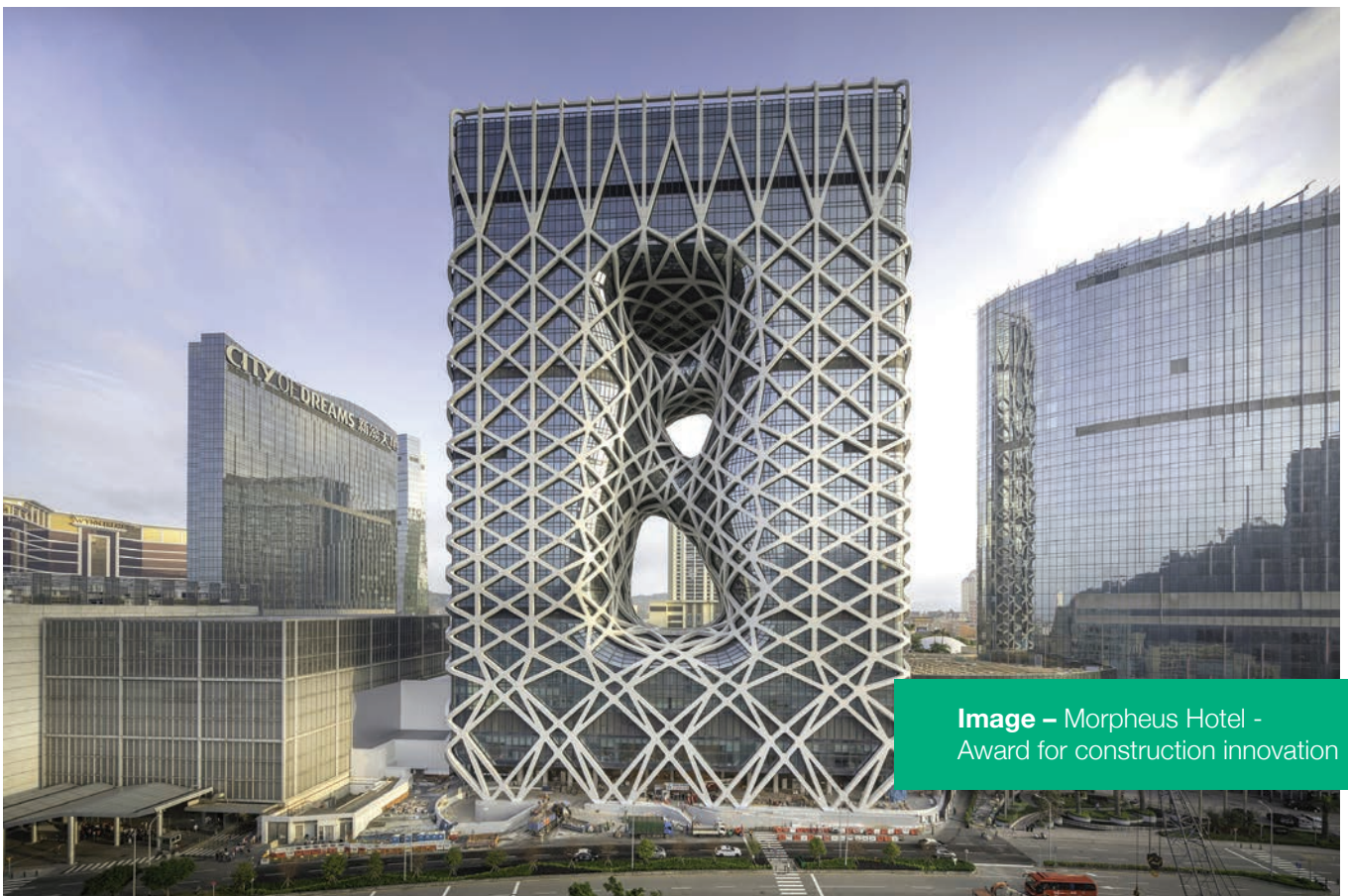
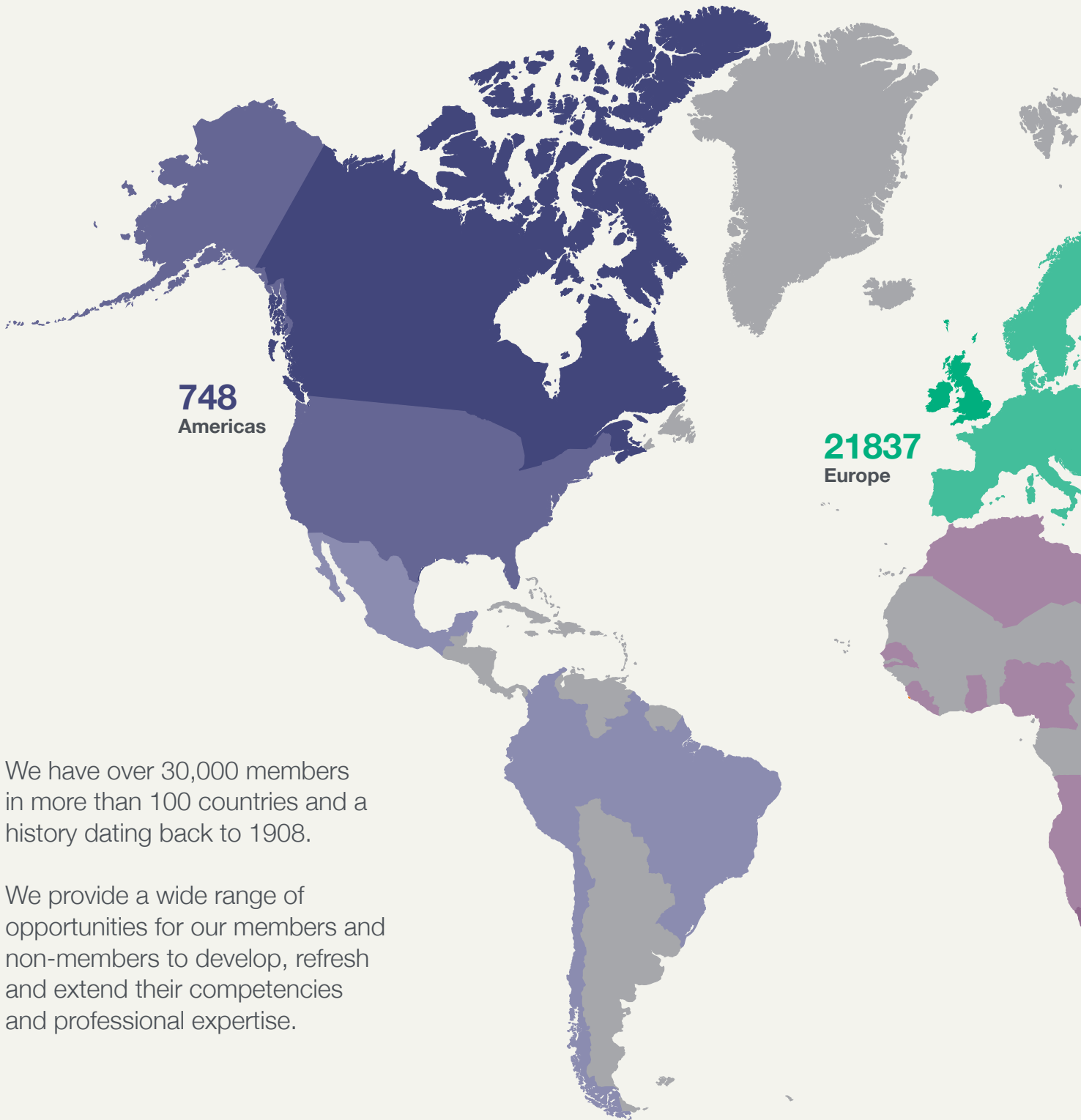


Image – Morpheus Hotel - Award for construction innovation

Worldwide membership



748
Americas

21837
Europe

We have over 30,000 members in more than 100 countries and a history dating back to 1908.

We provide a wide range of opportunities for our members and non-members to develop, refresh and extend their competencies and professional expertise.

26676

male members

4675

female members
(15% of membership)

31486

total members

8630

student members

8926

graduate members

12631

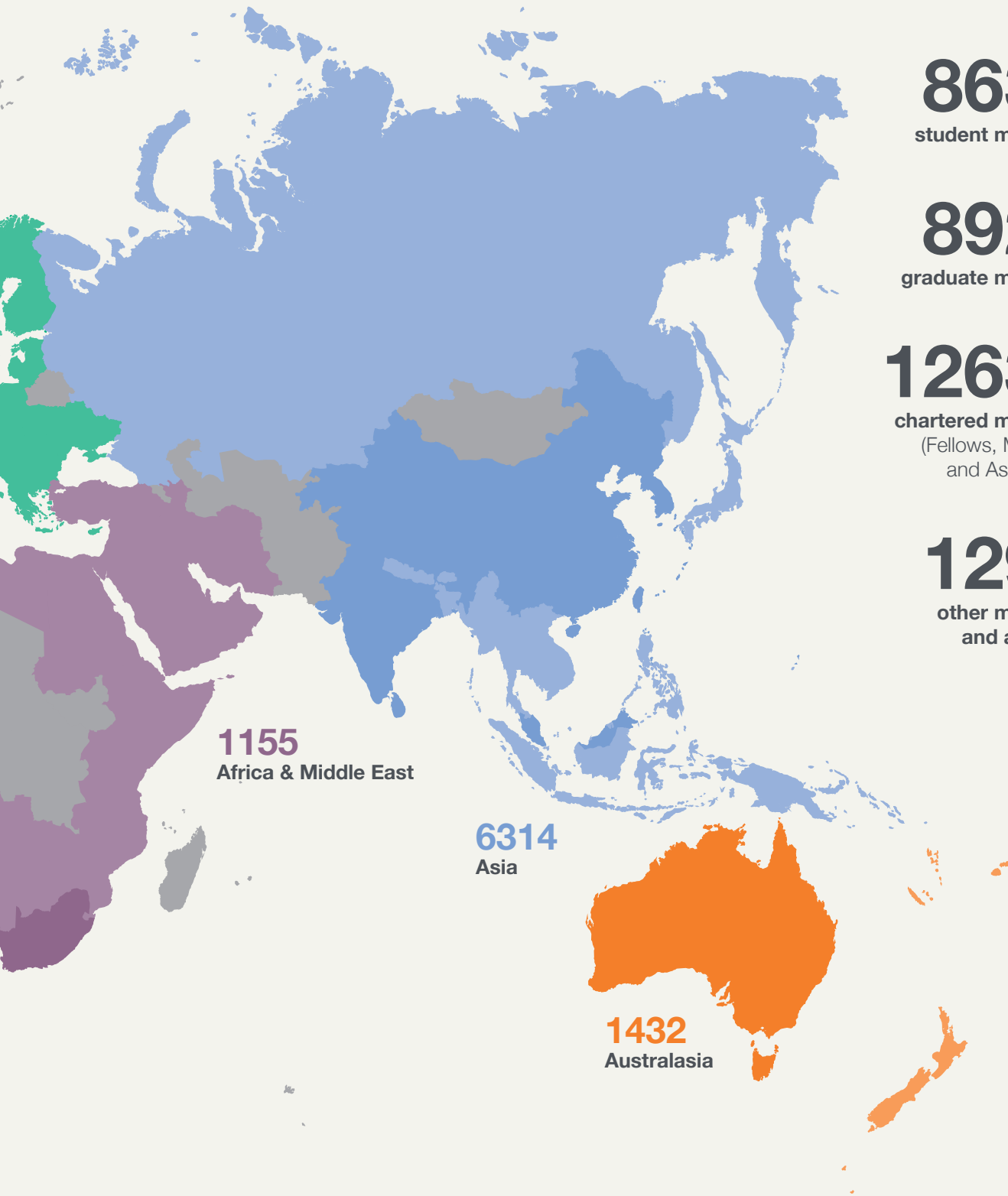
chartered members

(Fellows, Members
and Associates)

1299

other members
and affiliates

Number at 31/12/2019



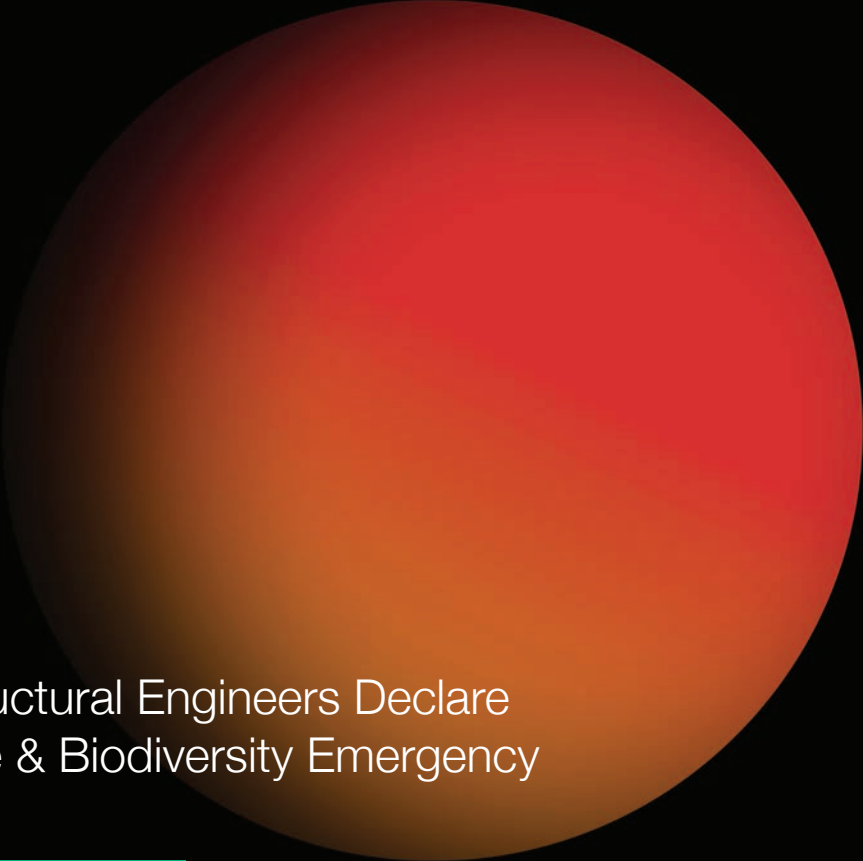
Countries where the Institution has most members are represented on this map in the darkest shades.

Climate emergency

In June 2019, the UK Government set a new target requiring the UK to bring all greenhouse gas emissions to net zero by 2050 as part of its commitment to support the sustainable development goals and address its contribution to climate change.

A number of organisations - including structural engineers - recognise the role buildings and construction play in the climate emergency - accounting for nearly 40% of energy-related carbon dioxide. Drastic reductions in the construction industry's carbon footprint will be needed to meet this ambitious new target. Through Engineers Declare, they have publicly committed to changing working practices. To succeed, change must happen now.

A large part of July 2019's Council was dedicated to instructive and motivating presentations and discussions, led by our younger members, about what needs to happen within the industry and how the Institution could contribute. In September, IStructE hosted the first Engineers Declare conference at HQ, and between these two forums the immediate way forward was agreed.



UK Structural Engineers Declare
Climate & Biodiversity Emergency

Image – Construction Declares



Image – CITIC Tower - Award for tall or slender structures

The structural engineers' deep understanding of material and design capabilities is already a vital part of collaborative construction teams and there is a huge duty on the profession to be at the leading edge of how the sector responds to the challenges of climate change.

Our Trustees have challenged the Institution to raise the level of activities in this field to be on a par with our long-term and ongoing commitment to structural safety.

To support the Board in delivering on this profound objective, we have assembled an enthusiastic and highly motivated Climate Emergency Task Group to help coordinate delivery across the entire breadth of Institution activities. The group has swiftly identified six target actions that all professional structural engineers should do without delay:

- **Get informed** – professional engineers are obliged to develop their skills continuously
- **Design low carbon** – track and reduce embodied Carbon, rethink the materials specified
- **Design lean** – reduce quantity of material and avoid over design
- **Design recycled** – specify recycled materials and design to allow future re-use
- **Work with the client** – Influence the brief, develop a sustainability plan, seek opportunities to reduce new-build and maximise retention, adaption, extension of existing buildings
- **Get active locally** – work with other professionals to help each other, compare progress, and learn

Work is underway to determine specific activities, products and services that will be developed by the Institution. This will include:

- Provision of publications, courses, conferences and other events to support learning and knowledge sharing around climate change
- Working with other institutions to design a reliable and simple carbon calculator
- Working with educators to develop a new direction for degree programmes and reviewing our own examination requirements
- Creating awards to celebrate the best achievements in carbon footprint reduction
- Interviews, blogs and thought pieces from leading thinkers that will be available via social media channels and *The Structural Engineer* magazine
- Considering the direct impact of Institution activities and our own carbon footprint

Competence and excellence

Driving professional competence is at the core of everything we do. We offer a wide range of opportunities for our members to develop, refresh and extend technical and professional competencies.

We also help members specialise by developing courses, resources and qualifications in areas such as fire, seismic and offshore engineering. We nurture talent and skills from school through to retirement. We provide tailored guidance for students aged 16+, promoting the benefits of a career in structural engineering. Our experienced members mentor those just starting out or taking the next step in their career. We lead in best practice industry standards. We collaborate with other industry experts to share knowledge, and with national and international professional organisations to benefit from other experience. We ensure our examinations are aligned with industry and world standards, recognising international expertise while ensuring quality is not compromised.

Our strong regional representation provides support to engineers wherever they are in the world.

Supporting early career engineers

We want to make it easier for early career engineers to show excellence and improve their employability. In 2018, we launched the Certificate in Structural Behaviour, which assesses an engineer's understanding of fundamental structural theory. The certificate is an internationally recognised mark of competence sought by modern employers. It also helps engineers become professionally qualified.

Affiliate Scheme

To develop closer ties with the international engineering profession, we offer affiliation to those with an interest in structural engineering. Benefits include discounts on our publications and courses, access to the Elibrary, and invitation to networking events, lectures and livestreams.



Image – Certification presentation 2019

Convenient flexible learning choices

Structural engineering is constantly evolving, and keeping abreast of technical and professional developments is an essential part of the role. We offer a wide range of resources to benefit members and non-members. These are useful to both practising structural engineers, and broader audiences such as teachers looking to inspire future generations; non-structural engineers undertaking research; or those new to the industry.

Courses

Through partnerships with leading experts, academic institutions, trade and professional organisations, our CPD courses offer an expanding range of technical, professional and management topics to support practitioners at every stage of their career. In 2019, we ran about 100 courses.

Lectures

Members have access to a broad programme of events, including research, practice, education, and technical lectures. Regional Group activity is tailored for local audiences and their needs. We also support events run by affiliates, providing insight from across the built environment. Many of our events are livestreamed and recorded so they can be watched at any time, from anywhere in the world. In 2019, there were over 350 events, with 90% held in regions.

Library

The Institution's Library houses one of the UK's finest collections of printed structural engineering literature. Books, standards and technical reports can be read on-site or loaned via post.

Elibrary

Our Elibrary is an expanding online resource; in 2019, 75% of the library budget was spent on ebooks and the Elibrary was accessed around 19,000 times (almost ten times more than physical book loans).

Publications

We produce a range of quality publications covering the latest news, technical articles, features, opinion and research.

The Structural Engineer

Our flagship publication features peer-reviewed technical and professional guidance and case studies from a fascinating range of structural engineering projects.

Structures

A peer-reviewed journal showcasing cutting edge research.

Manuals and guides on a wide range of topics, from fire safety engineering to temporary demountable structures.



Image – Young Engineers Conference 2019

Award winners 2019

Structural Award winners 2019

Award	Company	Project	Country
The Award for Tall or Slender Structures	Arup and Beijing Institute of Architectural Design (Group) Co., Ltd	CITIC Tower	China
The Award for Long Span Structures	BuroHappold Engineering and Schlaich Bergermann Partner	New Tottenham Hotspur Stadium	UK
The Award for Vehicle Bridges	KREBS + KIEFER and Knight Architects	Kienlesberg Bridge	Germany
The Award for Pedestrian Bridges	Tongji Architectural Design (Group) Co., Ltd	Tanxishan Glass Landscape Pedestrian Bridge	China
The Award for Small Projects of under £3 million	Tianjin University Research Institute of Architectural Design & Urban Planning	Millet Vinegar Museum	China
The Award for Structures in Extreme Conditions	Lewis Bradford Consulting Engineers	Tūranga	New Zealand
The Award for Structural Heritage	Free4m Consulting Ltd	Newquay Harper Footbridge	UK
The Award for Structural Transformation	Arup	Coal Drops Yard	UK
The Award for Construction Innovation	BuroHappold Engineering	Morpheus Hotel	China
The Award for Structural Artistry (building structures)	China Architecture Design & Research Group	Qingdao World Expo City	China
The Award for Structural Artistry (non building structures)	AKT II	Vessel	USA
The Award for Sustainability	Eckersley O'Callaghan	La Reference	Haiti
The Supreme Award for Structural Engineering Excellence	BuroHappold Engineering and Schlaich Bergermann Partner	New Tottenham Hotspur Stadium	UK

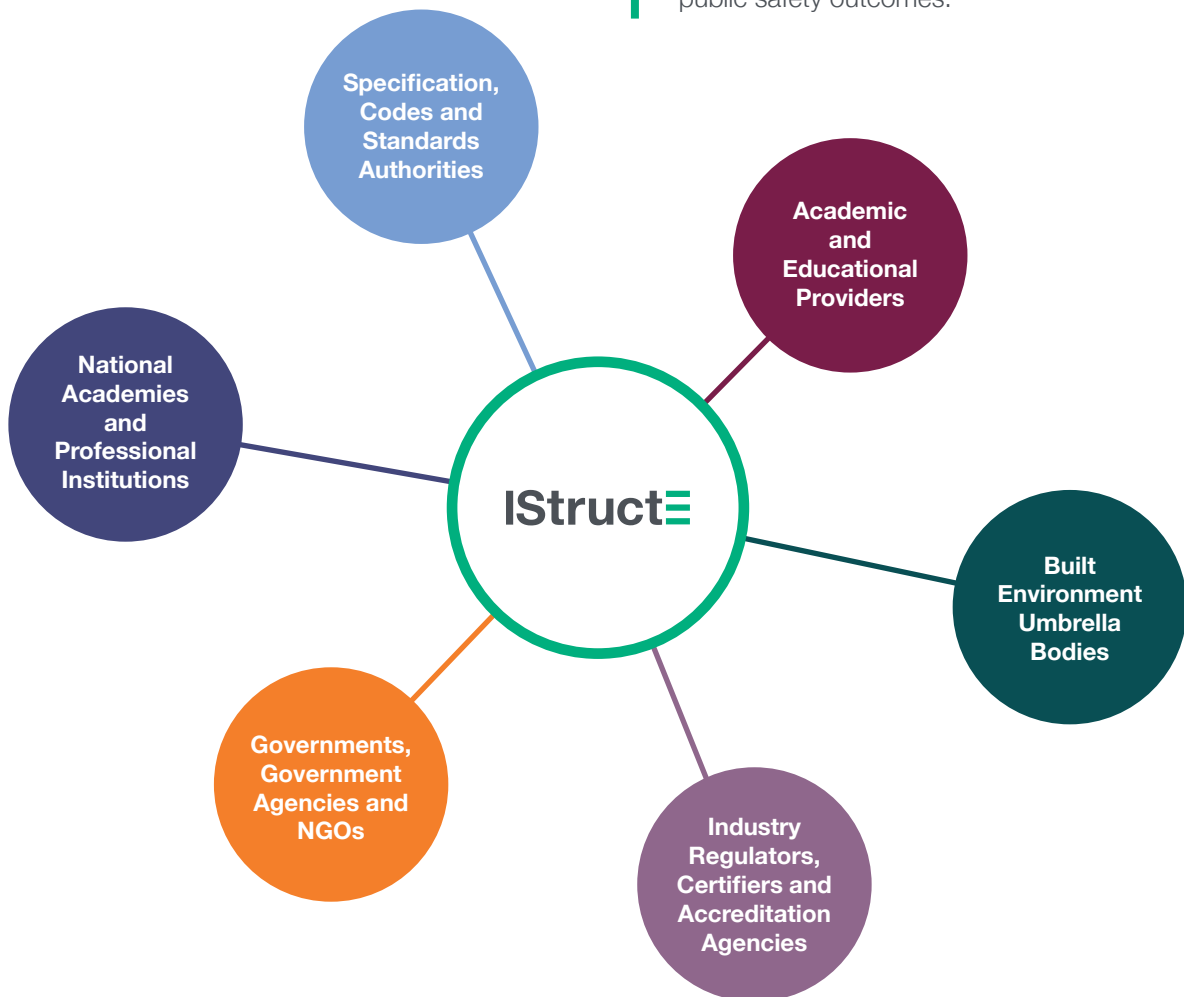
People Award winners 2019

Award	Name
The Murray Buxton Award	Alice Blair, Carolina Bartram, Edward Clark
The Guthrie Brown Award	Hay Wah Michael Sien
The Derrington Construction Award (Diploma)	Damian Eley, Nigel Annereau
The Derrington Construction Award (Medal)	Ghanshyam Kumar, David Sharples
The Clancy Prize	Deborah Lazarus, Hyuk-II Jung
The Oscar Faber Award (Diploma)	Jon Orr
The Oscar Faber Award (Medal)	Allan Mann
Sir Arnold Waters Medal	Athanasios Bistolas
Best Research Paper Prize	Dan Bempa, Ahmed Elghazouli, Christian Málaga-Chuquitaype, Jeremy Ilkanaev
Best Research into Practice Paper Prize	Anders Klasson, Ivar Björnsson, Roberto Crocetti, Eva Frühwald Hansson
The Award for Excellence in Structural Engineering Education	Ted McKenna
Pai Lin Li Travel Award	Arthur Coates
The Young Structural Engineering Professional Award 2019 (commendation)	Marc Easton
The Young Structural Engineering Professional Award 2019 (runner-up)	Matthew Thomas
The Young Structural Engineering Professional Award 2019 (winner)	Kristina Scheibler-Frood
Service Awards	Stephen David Alford, David John Goatman, David Gregory, Gordon Eric Harris, Suzanna Ovenstone, Stephen Taylor,
Lewis Kent Awards	Paul Fast, Anne Fuller, Shui Kwan Thomas Lai, David Guy Vesey
President's Award 2018	Alastair John Mackenzie Soane
Keith Eaton Award	Peter Tak Sum Ho
The Lifetime Achievement Award	Tony Gibbs
Gold Medal	James O'Callaghan

Collaboration with other organisations

Using our expert guidance and knowledge, we work in partnership with many national and international organisations to support the development of a safe, sustainable and resilient built environment for all. Our members sit on a wide range of national and international external specialist advisory panels and bodies.

Structural Safety works with the industry to improve safety in the design, construction and use of structures. It has two entities SCOSS (Standing Committee on Structural Safety) and CROSS (Confidential Reporting on Structural Safety), and is a collaboration between the Institution of Structural Engineers, the Institution of Civil Engineers and the Health and Safety Executive. It is also supported by several UK national authorities, including the Ministry of Housing, Communities and Local Government, Highways England, Network Rail, Scottish Government Building Standards Division and Local Authority Building Control. CROSS has been operating since 2005 with demonstrable public safety outcomes.



Improving our ways of working both locally and internationally

In September 2019, IStructE and SEI hosted their first joint international conference: “Iconic Global Structures – what can we learn?” as part of our commitment to support the structural engineering profession in wrestling with the challenges of our time. The conference used global learnings to support improved and innovative local delivery.

The value of lessons learned was central to the conference theme. Nine iconic international projects were discussed, categorised into three types of structure: large volume occupancy (Museum of the Future, Singapore Sports Hub, Tottenham Hotspur stadium), unusual structures (Dubai Frame, London Eye, Vegas High Roller) and performance based design of tall buildings (Jeddah Tower, Salesforce Tower and Shanghai Tower). The conference included keynote speeches and in depth panel discussions where structural engineers were joined by other experts including architects, building authorities, developers and suppliers; providing insightful reflection on changes that could improve safety, efficiency, and communication.

Lessons Learned

- Projects and clients would benefit from a structural engineer’s expertise from day one
- A structural engineer should be regarded as a trusted advisor or consultant, as well as an enabler of design. Engineers should strive to help manage expectations and avoid costly assumptions
- Multi-disciplinary work is essential for successful projects and co-location of collaborative teams is hugely valuable when possible
- Post project reflection helps avoid repeating failures
- Catch constructability issues during design
- Objective based peer review helps both reviewer and designer, especially if specific objectives are identified, as opposed to a more general review
- Designers should be aware of the intent of the building codes and look beyond blind conformity
- Engineers need to see projects in the wider context of landscape, infrastructure, environment and wellness
- Consider improvement rooted in long-term planning, such as improvements in waste management and ability to present different design options specifically in relation to their impact on sustainability



Image – Shanghai Tower



Images – Museum of the Future, Singapore Sports Hub (Photo credit: Darren Soh for Arup), Tottenham Hotspur stadium (Photo credit: BuroHappold), Dubai Frame, London Eye, Vegas High Roller, Jeddah Tower (Photo credit: Adrian Smith & Gordon Gill Architecture/Jeddah Economic Company), Salesforce Tower and Shanghai Tower

Recommendations for more effective practice

Embrace a more expansive vision for the structural engineer's role -

Our work is not about the structure, per se, but the role of the structure in service to our clients and society. Future structural engineers will embrace a diversity of backgrounds, skills and functions. Our roles will range from niche experts to leaders of societal initiatives. We must prepare ourselves and our profession.

Be globally aware and globally adept -

Nearly every project executed today has international components.

Be a super-collaborator not a superstar -

We have much to learn about the qualities of great collaborators and in establishing effective collaborative teams and workflows. Hierarchical organisations are giving way to more complex networked relationships.

Dare to challenge building codes -

We must not blindly follow codes but rather understand their rationale and step outside their bounds when required. Often Performance Based Design results in more creative, better-performing structures.

Be good custodians -

We must embrace sustainability and contribute to the challenges raised through objective resilience design.

Learn from others and share with others -

Societies and industries advance by shared learning. Whether on a project basis through peer reviews, design critiques, post-completion reflections, or through large-scale sharing, we have much to learn from each other.

Financial highlights 2019¹

Income 2019

Most of our income comes from membership subscriptions and trading subsidiaries. In 2019, these sources accounted for 86% of total revenue.

Key

- Membership subscriptions
- Trading companies
- Learning, development and examinations
- Other activities and donations

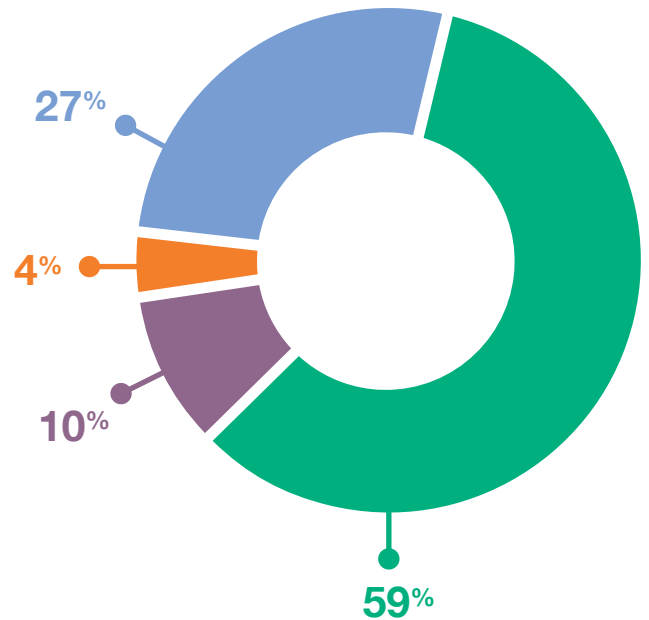


Image – Young Researchers Conference

The Award for Structures in Extreme Con



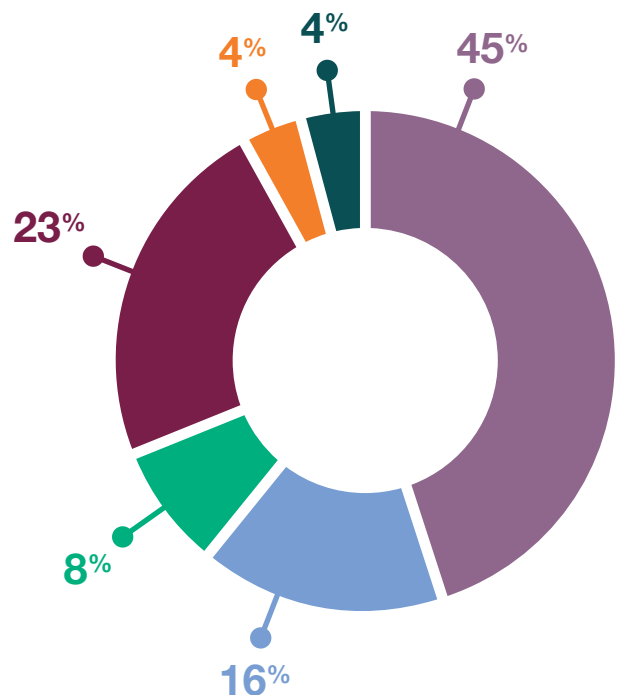
Image – Structural Awards Winner Tūranga (extreme conditions)

Expenditure 2019

The provision of membership, learning, development and examinations was the largest area of expenditure in 2019, accounting for 45% of total spend.

Key

- Learning, development and examinations
- Other staff and employment costs
- Trading companies
- Digital transformation and IT
- Other operating costs
- Depreciation



¹ Data is drawn from our final 2019 management accounts. The full audited and adopted accounts of the Institution can be accessed via our website.

Looking to the future

Preparing this review in May 2020 looks very different to the picture that would have been presented at the end of 2019 – the formal period of this Annual Review.

Still in the grip of a worldwide pandemic and trying to look beyond the human tragedy we are caught somewhere between returning to the world we knew (but perhaps taking two or three years in getting there) or, the development of a “new normal” on criteria that we are still trying to formulate.

We know historically that great innovative leaps occur during or as a result of major crises. There is no reason to believe the COVID-19 crisis will be any different. The basic tenets of our 2018 review remain however, entirely pertinent.



We live in a fast-paced, ever changing world with a host of new challenges on the horizon. We have a duty to evolve and keep pace with this change, so we can continue to serve our members and provide public safety to the best of our ability.

Good business and the best solutions demand holistic thinking and input that draws from a wide variety of views, perspectives and experiences.

We will continue to listen to our members’ needs and find innovative and reliable ways to support them and society. Artificial intelligence, big cities and resilience are topics that impact the future of structural engineering.

During 2019, we had renewed reason to reflect on the contribution and responsibility the structural engineering profession has with regard to climate change mitigation. The pandemic has not removed the climate agenda from acute relevance, only from the immediate radar of the public who understandably have prioritised their attention elsewhere. Reductions in travel (most notably

by air) and industrial manufacturing have had an almost immediate impact on our environment – improvements that may have taken many years to achieve by other means. All of this suggests that the Institution’s resolve to place climate change at the heart of its agenda should increase in intensity. As economies start to recover and kick-start their infrastructure and building programmes, there is a very real opportunity to do things differently. We of course cannot do this alone. We must address those things within our gift and work tirelessly to collaborate and influence elsewhere.

As an Institution with significant international reach we reflect like others on whether coronavirus will reverse the trend towards increasing globalisation. The world as a system has become increasingly dependent on what is happening elsewhere on the planet. The first few months of 2020 revealed how quickly the spread of Covid-19 impacted not only individual national economies but also a highly integrated world economy. For the Institution, the real impact of globalisation is about the movement of people, ideas and information – the things that have been the focus of this annual review and are at the heart of what we do.

Harnessing the energies of people, supporting the sharing of ideas, and the dissemination of knowledge transcends the more obvious concerns of manufacturing globalisation. We have already used the catalyst of the pandemic to embrace virtual communications and witnessed the great appetite of our profession to cross national and regional borders in order to access webinars and lectures; to contribute their experiences and knowledge; to interview and mentor aspiring structural engineers. This will be a vital part of the Institution’s own “new norm” and presents an exciting opportunity to re-examine and continue to modernise as we support the profession and uphold our commitment to public safety.

Our Dubai conference demonstrated both the peripatetic nature of the profession and the benefits of global interoperability. None of this has been diminished because of what we have witnessed in the early part of 2020. There may indeed be a “new norm” and most certainly the Institution will need to operate differently. At the core however, we remain unchanged in our values and attributes. Together with our members and strategic partners, we will build on these strengths.



Image –

Vessel, USA, New York
SA winner Structural Artistry

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Registered with the Charity Commission
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in Scotland No. SC038263



Image –

Apple store, Kunming

Gold Medal winner: James O'Callaghan

Photo credit: Hufton + Crow / Eckersley O'Callaghan