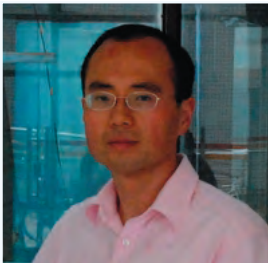


The IABSE Awards 2011



worldwide since 1929

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The purpose of the IABSE Awards is to recognise the achievements and the importance of work done by structural engineers, and to promote structural engineering to the public community. This is done by honouring remarkable and innovative aspects of new structures, as well as creativity of all involved in the design and construction. IABSE recognises personalities for their exceptionally great services to the Association with Honorary Membership.



IABSE

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International Award of Merit in Structural Engineering

The International Award of Merit in Structural Engineering is conferred for outstanding contributions in the field of structural engineering, with special reference to their usefulness to society. Contributions may include various aspects in Planning, Design, Construction, Materials, Equipment, Education, Research, Government, and Management. The Executive Committee of IABSE has conferred the International Award of Merit to **Leslie E. Robertson, USA,**



“for forging the future of structural engineering through inspirational designs which render architectural dreams into reality”.

A global innovator in structural engineering over the past six decades, Leslie E.



Robertson’s theories and work on skyscrapers, museums, bridges, and long-span roofs, provide practical technological breakthroughs which transformed architects’ and developers’ dreams into buildable concepts. Visual masterpieces, his designs consistently embody his creative flare for invisible support structures which skillfully meld aesthetic, financial, and social interests. Consider the 492 meter (1,614 foot) Shanghai World Financial Center. On entering the project in a late construction document stage, Leslie Robertson met the developer’s request for a sixteen percent increase in floor space, while accepting foundations for a lower and smaller building, by not only decreasing costly building materials, but enhancing structural reliability and robustness through the incorporation of a diagonally-braced frame with outrigger trusses.

Within the artistry of Robertson’s designs lies a responsible concern for structural safety. Seminal structural engineering safety contributions from his pioneering work with the World Trade Center, New

Shanghai World Financial Center

York include the:

- development and implementation of the first use of the boundary layer wind tunnel in the design of a high-rise building (ca. 1967)
- creation and first use of mechanical damping units to reduce wind-induced swaying (World Trade Center, New York, ca. 1967)
- first use of prefabricated multiple-column and spandrel-wall panels (World Trade Center, New York, ca. 1972)
- first use of a space-frame mega-structure and outrigger or hat truss system for a high-rise building (the World Trade Center and the U. S. Steel Tower, ca. 1970)
- and the creation of the shaft-wall partition system now almost universally used for fire-resistive partitions in high-rise buildings (circa 1968).

But Leslie Robertson's vanguard responses to structural safety appear also in numerous post-World Trade Center design endeavors. Notable, on completion in 1989, the Bank of China Tower (Hong Kong) held the structural engineering distinction as the world's first skyscraper with a composite mega-structure space frame to resist all loads imposed by typhoon winds and the weight of the building. Beyond visual beauty, cultural sensitivity and creative technical articulation, Leslie Robertson's structural designs developed out of a lifelong respect for the environment.

The decision to span the underlying valley without intermediary supports to preserve the forested hills, as well as to use a ceramic in-fill for a stainless steel grating system to prevent the erosion of rainwater in the Miho Museum Bridge, Japan, 1997, exemplify a few of the many environmental considerations woven into his designs.



Miho Museum Bridge, Shiga-raki, Japan



World Trade Center at Sunrise

IABSE Prize

The IABSE Prize was established in 1982 to honour a Member early in his, or her career for an outstanding achievement in the field of structural engineering, in Research, Design or Construction. The Prize is presented to Individual Members of IABSE, forty years of age or younger. The Executive Committee of IABSE has conferred the IABSE Prize 2011 to Yongxin Yang, China,

“in recognition of his outstanding contribution to bridge engineering through his research work, in particular in wind resistance on long-span bridges in China”.

Yongxin Yang, received his bachelor’s degree in Bridge Engineering from Tongji University in 1997. After graduation from Tongji University majoring in Bridge and Tunnel Engineering with Ph.D. degree under the guidance of Prof. Haifan Xiang and Prof. Yaojun Ge, he was appointed as Assistant Professor at Tongji University in 2002. Five years later, he was promoted to Associate Professor and appointed as the Deputy Director of Wind Tunnel Laboratory in the State Key Laboratory for Disaster Reduction in Civil Engineering.



He has been carrying out fundamental researches on bridge aerodynamics and its application in the design and construction of long-span bridges, with emphasis on Atmospheric Boundary Layer wind characteristics, aerodynamic and aero-elastic responses of bridges under wind action, aerodynamic instability mechanism of long-span bridges and counter measurements to improve the aerodynamic stability of bridge structures. He has published more than 30 academic papers and his work has been financially supported by the Natural Science Foundation of China the Hi-Tech Research and Development Program of China and the China-Japan NSFC-JST Cooperative Research Project.

In addition to his contributions to the advancement in the fundamental researches on bridge aerodynamics, he has also been actively taking engineering responsibilities in wind-resistant designs of major long-span bridges, including Xihoumen Bridge, Wuhan Erqi Yangtze River Bridge, Shanghai Yangtze River Bridge, Donghai Bridge, Qingdao Bay Bridge, Lupu Bridge, Jiujiang Yangtze River Bridge and so on. For his contributions, he has been awarded the First and Second Class of Shanghai Science and Technology Award in 2006 and 2009. He is a member of IABSE Working Commission 1 ‘Structural Performance, Safety and Analysis’.

Outstanding Paper Award

The Outstanding Paper Award is remitted each year to the author(s) of a paper published in the preceding year's issues of the IABSE Journal *Structural Engineering International (SEI)*, encouraging and rewarding contributions of the highest quality. It was first launched in 1991.

The Outstanding Paper Award Committee, chaired by Professor Jun Kanda, Japan, has conferred the Outstanding Paper Award to Doris M.S. Yau and Michael C.H. Hui, China, for their Paper:

“The Aerodynamic Behaviour of the Deck of Stonecutters Bridge, Hong Kong”
published in Structural Engineering International (SEI) February 2010.

This paper gives a summary of the investigations concerning the deck of the Stonecutters Bridge in Hong Kong with a main span of 1018 m, one of the longest span cable-stayed bridges in the world at on its completion at the end of 2009. The design of the bridge deck contains a number



Doris M.S. Yau, China



Michael C.H. Hui, China

of interesting aerodynamic features including the streamlined steel twin box-girder deck structure and the associated guide vanes installed at the underside of the deck. A bridge of this span is subject to a variety of wind-induced vibration problems, including vortex-induced response, buffeting response and flutter instability. This, coupled with the extreme typhoon wind climate in Hong Kong, necessitated extensive aerodynamic investigations to address the above-mentioned aeroelastic problems.

The major aerodynamic aspects of the super-long-span cable-stayed Stonecutters Bridge were carefully looked at in great detail during the planning and design stage to ensure that its aerodynamic performance would be satisfactory. The various experimental and analytical studies associated with the three major aspects, that is, vortex induced response, buffeting response and flutter instability confirm that the bridge will have no problems associated with these aeroelastic phenomena in its in-service condition.

Outstanding Structure Award - The Winner

The Outstanding Structure Award was established in 1998. It is one of the highest distinctions awarded by IABSE and recognises, in different regions of the world, some of the most remarkable, innovative, creative or otherwise stimulating structures completed within the last few years. The Outstanding Structure Award Committee is chaired by William J. Nugent, USA. The 2011 Outstanding Structure Award is awarded to the:

Burj Khalifa Tower, Dubai, UAE

“an aesthetically striking super tall building that utilises a Y-shaped, buttressed concrete core and a stepped, spiraling vertical shape to address never before seen structural requirements and achieve a record setting height”.

At 828 meters, the Burj Khalifa Tower is the world’s tallest structure. Remarkably, its height eclipses the previous tallest building structure by more than 60 percent and the previous tallest structure of any type by more than 30 percent. To achieve this record setting height, it was necessary to push the limits of current analytical, materials, and construction technologies. The Tower’s designers utilized a y-shaped, buttressed concrete core and a spiraling vertical, exterior shape with strategically placed set-backs to “confuse the wind” and address never before seen structural requirements. In doing so, they created an aesthetically pleasing and functional super tall building that achieved the project’s goal to not simply be the world’s highest building, but to embody the world’s highest aspirations

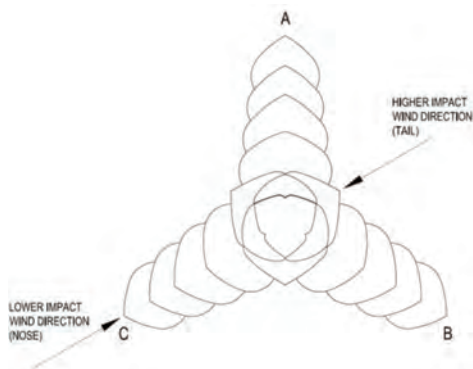
The Burj Khalifa Tower, UAE



Structural System Description

Each of the wings buttress the others via a six-sided central core, or hexagonal hub. This central core provides the torsional resistance of the structure, similar to a closed pipe or axle. Corridor walls extend from the central core to near the end of each wing, terminating in thickened hammer head walls. These corridor walls and hammer head walls behave similar to the webs and flanges of a beam to resist the wind shears and moments. Perimeter columns and flat plate floor construction complete the system. At mechanical floors, outrigger walls are provided to link the perimeter columns to the interior wall system, allowing the perimeter columns to participate in the lateral load resistance of the structure; hence, all of the vertical concrete is utilized to support both gravity and lateral loads. The result is a tower that is extremely stiff laterally and torsionally.

It is also a very efficient structure in that the gravity load resisting system has been utilised so as to maximise its use in resisting lateral loads. As the building spirals in height, the wings set back to provide many different floor plates. The setbacks are organised with the tower's grid, such that the building stepping is accomplished by aligning columns above with walls below to provide a smooth load path. As such, the tower does not contain any structural transfers. These setbacks also have the advantage of providing a different width to the tower for each differing floor plate. This stepping and shaping of the tower has the effect of "confusing the wind": wind vortices never get organised over the height of the building because at each new tier the wind encounters a different building shape.



Plan View of Tower



The Tower under Construction

Outstanding Structure Award Finalist



photo credit: Mara McLeod

Moses Mabhida Stadium Durban, South Africa

..is a world-class multi-purpose sporting facility and an iconic, innovative and sustainable landmark in Durban (completed in October 2009). Ideally situated close to the city centre, and part of the Kings Park Sporting Precinct, the stadium was one of the hosts for the 2010 FIFA World

Cup in South Africa, and the venue for the semi-final. The stadium was designed to not only serve as a venue for the 2010 Soccer World Cup but also as a sustainable recreational and sporting facility of the greater Durban area. The innovative but practical design met the City of Durban's brief, which required a state-of-the-art landmark sports facility with excellent amenities, architectural and engineering ingenuity and a sustainable recreational and multidisciplinary sporting venue.

Moses Mabhida Stadium has been designed as a symbol of the unification of a nation with a passion for sport. This is epitomised in the 106 metre high central arch that supports the lightweight cable stayed roof which covers 85% of the seats. The stadium's normal capacity is 56 000, which was extended to 70 000 for the FIFA World Cup with additional seating being installed on Level 6.

Spanning the length of the stadium, the 360m long arch supports a web of interlocking galvanised steel cables totalling over 36km in length which add form to the tensile roof. The 30-storey high arch weighs 2600 tons and consists of 56 sections, each measuring 10m in length. The iconic arch, inspired by the Y-shape of the South African flag, has become a tourist attraction as it features a high-tech cable car designed to take visitors up to its highest point, where they can disembark for panoramic views of the city and stadium.

More than 100 columns of varying heights surround the stadium, the highest being 46 metres. A total of 550 aluminium fins are fitted between the main columns. The levels of the stadium are supported by 1750 columns and 216 raking beams that provide the main support to the seating panels. 1780 pre-cast concrete seating panels create the bowl form around the floor space within the stadium structure. 225 520 t of concrete and 9 150 t of reinforcing steel has been used.

Outstanding Structure Award Finalist



Pont Gustave Flaubert

Rouen, France

..is a large vertical lift bridge with a simple and efficient design. The elegant structure reflects a strong and thorough co-operation between engineers and architects, and departs radically from previous approaches to lift bridges design. Rouen is a historical

harbour city located half way between Paris and Le Havre harbour. As early as 1972, urban planning showed that a new North-South highway connection was required, with a new crossing of the River Seine, at a location where maritime traffic had to be maintained in order to allow large cruise-ships, as well as historical sail-ships, to reach the city heart. It was decided that this new crossing had to allow seagoing ships, with sizes up to 40000 DWT, to sail through it.

This new construction raised many environmental and urban issues, until a decision was taken to build a vertical lift bridge. A global approach, combining structural and functional optimisation with sensible architecture has led to an elegant, efficient and economical structure.

The design brief specified that the bridge comprise two independent spans carrying three roadway lanes and a 2.5 meter wide walkway, which leads to 18 metre wide decks. Furthermore, in order to facilitate maintenance, each span has to be lifted independently.

Towers design was the main issue and the concept was developed to place towers in between the spans, with lifting equipments overhanging out on both side, symmetrically. The lifting principle chosen was to have cables attached to overhanging structures located at towers top. Lifting is obtained by a combination of counter weights and winches. Each span may be lifted independently of the other by the action of winches located into large caissons supporting the towers. Each tower comprises two hollow concrete shafts, resting upon an elliptical caisson. In order to minimise interference with the river flow, this caisson is parallel to the river main direction, while the tower shafts are at right angle to the bridge alignment. At the top, an elegant steel structure supports the pulleys with three parallel frames, designed in such a way that members carry normal forces only. Its shape led to call it the "butterfly".

Outstanding Structure Award Finalist



Stonecutters Bridge

Hong Kong, China

..is a truly outstanding structure which has been designed and built to the highest quality standards. It spans across the Rambler Channel and forms the centrepiece of the section for the new Route 8 between Cheung Sha Wa and Tsing Yi, providing a long lasting solution to Hong

Kong's growing traffic demands. Following concept selection via an international design competition, significant technical challenges in design and construction were overcome through state of the art techniques of modelling, testing, planning and erection. The 1018m span cable stayed bridge stands in an area of severe typhoons, and utilises a twin deck structure to ensure aerodynamic stability.

The Stonecutters bridge is certainly one of the great bridges built at the start of the 21st century, demonstrating that substantial progress has been made in cablestayed bridge technology over the last two decades. It is an interesting departure from other long span cable-stay bridges with A, inverted Y or diamond shaped towers and single decks. The towers are the highest freestanding monopole bridge towers in the world and incorporate a unique composite stainless steel-concrete upper section. The streamlined split deck is ideally suited to cope with severe typhoon winds. The cross section was developed with straight inner faces of the longitudinal girders which has a number of advantages over a continuously curved soffit: improved joint between cross girder and longitudinal girder, which is easier to fabricate and inspect; less susceptible to Reynolds Number effects and more predictable behaviour; easier to install secondary structures such as guide vanes and rail for inspection gantry.

The architectural lighting scheme for the bridge highlights its unique architectural features at night contributing a prominent feature that blends with the tall buildings and surrounding hills in the skyline of the urban landscape around the Victoria Harbour. A comprehensive set of facilities for inspection and maintenance of the structure has been included in the design. The overall approach has been to ensure that normal inspection and maintenance activities can be carried out with minimum disturbance to the traffic whilst providing easy and safe access for maintenance personnel.

Honorary Membership

Honorary Membership is presented to an Individual Member of IABSE, for exceptionally great services rendered to the Association. The Executive Committee of IABSE has awarded Honorary Membership to Jacques Combault, France. The Award was presented at the Permanent Committee meeting on September 19, 2011,

“in high appreciation of his outstanding and dedicated services to the Association”.



Jacques Combault, earned his Masters in engineering from the École centrale de Lyon, France in 1967. He subsequently worked with the company Campenon Bernard until 1993. For more than 20 years, he was a key designer and technical director of Vinci, where he provided major innovations in the fields of pre-fabricated concrete and steel-concrete composite bridges. Jacques Combault has taught at the Centre des hautes études de la construction, the École nationale des travaux publics, the École supérieure des travaux publics, and at the École nationale des ponts et chaussées since 1988. Today he works as a technical advisor and is Technical Director of Finley Engineering Group, Florida, USA. He has played a major role in the construction and design of the Sunshine Skyway Bridge in Tampa, the Brotonne Bridge over the Seine, the Rion-Antirion Bridge, Greece, and the world's longest cable-stayed span, the Sutong Bridge, China. Among several honours, he was awarded the *fib* Medal of Merit in 2004, and named Chevalier de la Légion d'Honneur in 2009 by the French President on the recommendation of the French Ministry of Ecology, Energy, Sustainable Development, and Land Management.

Since joining IABSE in 1987, Jacques Combault has always been very active within the Association. He has been a Member of many Scientific and Organising Committees for IABSE Conferences and is currently a Scientific Committee Member for the 2012 IABSE Conference in Cairo. He was Chair of Working Commission 3 on 'Concrete Structures' (1993-2001) and Member of the Technical Committee of IABSE (1997-2001). First Vice-President of IABSE from 2011-2006, he then became President of IABSE from 2007-2010 and Member of the IABSE Administrative Committee. Under his presidency he consolidated the attractiveness and visibility of IABSE through the higher involvement of National Groups and Young Engineers. Under his presidency the By-laws were amended in 2008 and following conferences were held: the Helsinki Conference 2008, the Chicago Congress 2008, the Bangkok Symposium 2009, the China Workshop and Bridge Tour 2009, the Dubrovnik Conference and the Venice Symposium 2010.

Nominations for IABSE Awards

Members of IABSE can propose nominations for the IABSE Awards by contacting the Chair of their National Group. The Chairs will submit their proposals to the Executive Committee by following dates:

December 15, 2011:

- International Award of Merit in Structural Engineering 2012
- IABSE Prize 2012
- Honorary Membership 2012

June 30, 2012:

- Outstanding Structure Award 2013

About IABSE

The International Association for Bridge and Structural Engineering (IABSE) is a scientific and technical Association with 3900 Members in 100 countries and 50 National Groups around the world.

IABSE's mission is to promote the exchange of knowledge and to advance the practice of structural engineering worldwide in the service of the profession and society, taking into consideration technical, economic, environmental, aesthetic and social aspects. IABSE was founded in 1929 and has its seat in Zurich, Switzerland.

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