SECTION 2
EDUCATION & TRAINING

10. Highest Engineering Educational Attainment: **Master of Engineering (Highway Bridges and Tunnels Engineering)**

11. University/college: **Xi'an Highway Institute (now Chang'an University)**

12. Published works / technical papers given: (Total 15 Points = 2 points for each technical papers published in journals or 1 point for each technical papers presented in local or international seminars and conferences)

(List as many, but attach maximum top 10 in the appendix)

Journal Articles

(1) Feng Y., **Su, Q.,** Hao, J. M., et al. (2023). A comparative study on the transient wind-induced response of long-span bridges subject to downbursts and typhoons. *Engineering Structures*, 2023, 280: 115649. (SCI/EI)

(2) Feng Y., Hao J., Han W., **Su Q.**, Wu T. (2022). An optimized numerical tornado simulator and its application to transient wind-induced response of a long-span bridge. *Journal of Wind Engineering and Industrial Aerodynamics*, 227, art. no. 105072.

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(SCE/EI)

(3) **Su, Q.**, Zhu, Y., Chen, Y., et al. (2022). Hong Kong Zhuhai Macao Bridge-Tunnel project immersed tunnel and artificial islands – From an Owners' perspective. *Tunnelling and Underground Space Technology incorporating Trenchless Technology Research.* 121: 104308. (SCI/EI)

(4) Gao W., Li G., **Su Q.**, Han W. (2022). Impact of rigid central clamps on longitudinal deformation of long-span suspension bridges under vehicle excitations. *Structure and Infrastructure Engineering*, 18 (6): 760 - 774. (SCI/EI)

(5) Chen H., Jin Z., **Su Q.**, Yue G. (2021). The roles of captains in megaproject innovation ecosystems: the case of the Hong Kong - Zhuhai - Macau Bridge. *Engineering, Construction and Architectural Management*, 28 (3): 662 - 680 (SCI/EI)

(6) Yu H., Yan X., Bobet A., Yuan Y., Xu G., **Su Q.** (2018). Multi-point shaking table test of a long tunnel subjected to non-uniform seismic loadings. *Bulletin of Earthquake Engineering*, 16 (2): 1041 - 1059. (SCI/EI)

(7) Yu H., Yuan Y., Xu G., **Su Q.**, Yan X., Li C. (2018). Multi-point shaking table test for long tunnels subjected to non-uniform seismic loadings - part II: Application to the HZM immersed tunnel. *Soil Dynamics and Earthquake Engineering*, 108: 187 - 195. (SCI/EI)

(8) Jiang W., Liu X., Yuan Y., Wang S., **Su Q.**, Taerwe L. (2015). Towards early-age performance control in precast concrete immersed tunnels. *Structural Concrete*, 16 (4): 558 - 571. (SCI/EI)

(9) Liu, X., Yuan Y., **Su, Q.** (2014). Sensitivity analysis of the early-age cracking risk in an immersed tunnel. *Structural Concrete* 15(2): 179-190. (SCI/EI)

(10) Liu X., Jiang W., De Schutter G., Yuan Y., **Su Q.** (2014). Early-age behaviour of precast concrete immersed tunnel based on degree of hydration concept. *Structural Concrete*, 15 (1): 66 - 80. (SCI/EI)

(11) Li G.-L., **Su Q.-K.**, Han W.-S., Xu X. (2023). Method of Wear Evaluation on Sliding Supports in Expansion Joints Based on Theories of Mechanism Motion and Wear [基于机构运动及磨损理论的伸缩装置滑动支承磨损评估方法]. *Zhongguo Gonglu Xuebao/China Journal of Highway and Transport*, 36 (2): 166 - 178. (EI)

(12) Feng Y., Hao J.-M., Huang P.-M., Han W.-S., **Su Q.-K.** (2022). Numerical Simulation Parameter Optimization of Tornado Based on Surrogate Model [基于代理模型的龙卷风数值模拟参数优化]. *Zhongguo Gonglu Xuebao/China Journal of Highway and Transport*, 35 (8): 175 - 185. (EI)

(13) Hao J.-M., Feng Y., **Su Q.-K.**, Han W.-S. (2022). Analysis and simulation of non-stationary typhoon field on long-span bridge [台风非平稳特性分析及全桥风场模拟]. *Chang'an Daxue Xuebao (Ziran Kexue Ban)/Journal of Chang'an University (Natural Science Edition)*, 42 (6): 66 - 76. (EI)

(14) Li G.-L., **Su Q.-K.**, Gao W.-B., Han W.-S., Yan C. (2021). Influence of Rigid Central Clamps on Dynamic Characteristics of Suspension Bridge and Vehicle Excitation Responses of Short Suspenders [中央扣对悬索桥动力特性及短吊索车载激励响应的影响]. *Zhongguo Gonglu Xuebao/China Journal of Highway and Transport*, 34 (4): 174 - 186. (EI)

(15) Gao, W., **Su, Q.**, Zhang, J., et al. (2020). Steel Bridge Construction of Hong Kong–Zhuhai–Macao Bridge. *International Journal of Steel Structures*, 20: 1498-1508. (SCI/EI)

(16) Song S.-Y., Guo J., **Su Q.-K.**, Liu G. (2020). Technical challenges in the construction of bridge-tunnel sea-crossing projects in China [中国桥隧一体化跨海工程建设的技术挑战]. *Journal of Zhejiang University: Science A*, 21 (7): 509 - 513. (EI)

(17) Jiang Z., Bai Y., **Su Q.** (2017) Element joint stiffness properties of large immersed tube tunnels. *Modern Tunnelling Technology*, 54 (1): 168 - 174. (EI)

(18) **Su Q.-K.**, Xie H.-B. (2016). Summary of steel bridge construction of Hong Kong-Zhuhai-Macao bridge. *Zhongguo Gonglu Xuebao/China Journal of Highway and Transport*, 29 (12): 1 - 9. (EI)

(19) Yu H.-T., Xiao W.-H., Yuan Y., **Su Q.-K.**, Xu G.-P. (2016). Experiment on stiffness ratio of immersion joint to immersed tunnel element. *Zhongguo Gonglu Xuebao/China Journal of Highway and Transport*, 29 (12): 134 – 141. (EI)

(20) Yuan Y., Yu H.-T., Yan X., Xu G.-P., **Su Q.-K.** (2016) Multi-point shaking table test simulation and analysis of a super-long immersed tunnel. *Zhongguo Gonglu Xuebao/China Journal of Highway and Transport*, 29 (12): 157 - 165. (EI)

(21) Liu X., Liu X., Jiang W., Yuan Y., **Su Q.** (2015). Analysis model for the early performance of in a factory immersed tunnel elements. *Modern Tunnelling Technology*, 52 (1): 105 - 113. (EI)

(22) Jiang W., Liu X., Liu X., Luo Y., Yuan Y., Wang S., **Su Q.** (2015). Full-scale test of the early performance of a factory-prefabricated immersed tunnel. *Modern Tunnelling Technology*, 52 (2): 135 - 142. (EI)

(23) Zhang M., Ma J., **Su Q.**, Wu W. (2015). Model test on bearing capacity characteristics of steel tubular composite piles. *Xinan Jiaotong Daxue Xuebao/Journal of Southwest Jiaotong University*, 50 (2): 312 - 318. (EI)

(24) Wang S., **Su Q.**, Fan Z., Li Q., Zhou X., Li K. (2014). Durability design principle and method for concrete structures in Hong Kong-Zhuai-Macau sea link project. *Tumu Gongcheng Xuebao/China Civil Engineering Journal*, 47 (6): 1 - 8. (EI)

(25) Zhang M., Ma J.-L., **Su Q.-K.**, Wu W.-S., Liu K.-R. (2014). Model test research on work performance of steel tubular composite pile with shear ring, drilling mud skin and anti-corrosion coating. *Yantu Lixue/Rock and Soil Mechanics*, 35 (2): 389 – 396. (EI)

Conference Papers

(26) Li C., Yuan J., Yu H., **Su Q.**, Yuan Y. (2014). Seismic response analysis of long immersed tunnel to longitudinal non-uniform excitation. *11th World Congress on Computational Mechanics, WCCM 2014, 5th European Conference on Computational Mechanics, ECCM 2014 and 6th European Conference on Computational Fluid Dynamics, ECFD 2014*: 1416 - 1424. (SCI/EI)

(27) **Su Q.**, Gao W., Xia Z., Zhang J., Zhu Y. (2022). The Durability and SHM System of Hong Kong-Zhuhai-Macao Bridge. *IABSE Congress Nanjing 2022 - Bridges and Structures: Connection, Integration and Harmonisation, Report*: 1378 - 1386. (EI)

(28) Zhang J., Gao W., **Su Q.**, Xia Z., Zhu Y. The Construction of Hong Kong-Zhuhai-Macao Bridge (2022) *IABSE Congress Nanjing 2022 - Bridges and Structures: Connection, Integration and Harmonisation,* Report: 107 - 116. (EI)

(29) **Su Q.K.**, Li K.F., Li Q.W., Fan Z.H. (2021). Durability assessment and re-design of massive concrete structures in sea-linking projects. *Bridge Maintenance, Safety, Management, Life-Cycle Sustainability and Innovations - Proceedings of the 10th International Conference on Bridge Maintenance, Safety and Management, IABMAS 2020*: 3 - 8. (EI)

(30) **Su Q.**, Xie H. (2016). An overview of steel structures in Hong Kong-zhuhai-macao bridge project. *IABSE Conference, Guangzhou 2016: Bridges and Structures Sustainability - Seeking Intelligent Solutions - Report*: 26 - 35. (EI)

(31) Xie H., **Su Q.**, Huber P. (2016). Application of tuned mass dampers for the Hong Kong-

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Zhuhai-Macau bridge for mitigation of wind vibrations. *IABSE Conference, Guangzhou 2016: Bridges and Structures Sustainability - Seeking Intelligent Solutions - Report*: 812 - 819. (EI)

(32) Zeng J.J., Wang S.N., Lv W.Q., **Su Q.K.**, Shui Z.H. (2014). Water-binder ratio monitoring as a quality control tool for the high-performance concrete used in the construction of the submerged tunnel. *Proceedings of the 4th International Conference on the Durability of Concrete Structures, ICDCS 2014*: 376 - 381. (EI)

(33) Yang H., Xiong J., **Su Q.**, Yan Y. (2014). Exposure test on two surface anticorrosion technologies for marine concrete structure. *Proceedings of the 4th International Conference on the Durability of Concrete Structures, ICDCS 2014*: 116 - 121. (EI)

Selected Keynote Lectures

(34) The Construction of the Hong Kong-Zhuhai-Macao Bridge (HZMB) and the Latest Development of Bridges in China. *World Engineers Summit (WES) 2023*, November 2023, Singapore (***Invited Keynote***)

(35) The sustainable innovation ecology of major cross-sea engineering. The *4th International Forum on Water Security and Sustainability*, November 2023, China (***Invited Keynote***)

(36) The Construction of the Hong Kong-Zhuhai-Macao Bridge (HZMB) and the Latest Development of Bridges in China. *The 2nd ASCE Greater China Conference*, September 2023, China (***Invited Keynote***)

Book Monographs

(37) Zheng, S., **Su, Q.**, & Wei, D. (2023). Technical Coordination Management and Innovative Achievements of the Overall Engineering of the Hong Kong-Zhuhai-Macao Bridge. People's Communications Publishing House.

(38) **Su, Q.**, Ding, H., & Yan, Y. (2023). Technical Coordination Management and Innovative Achievements of the Main Engineering of the Hong Kong-Zhuhai-Macao Bridge Tunnel. People's Communications Publishing House.

(39) Sheng, Z., **Su, Q.**, & Gao, X. (2023). Theory of Complex Engineering System Management and Engineering Management Practices of the Hong Kong-Zhuhai-Macao Bridge Project. Beijing: Science Press.

(40) Meng, F., **Su, Q.**, & Xu, W. (2018). Key Technologies for Long-Life Steel Bridge Deck Pavement. People's Communications Publishing House.

(41) Li, K., **Su, Q.**, & Wang, S. (2018). Durability Design and Construction Technology of Concrete Structures of the Hong Kong-Zhuhai-Macao Bridge. People's Communications Publishing House.

(42) Wang, S., **Su, Q.**, & Li, K. (2018). Durability Evaluation and Redesign of Concrete Structures of the Hong Kong-Zhuhai-Macao Bridge. People's Communications Publishing House.

(43) Meng, F., **Su, Q.**, & Zhang, H. (2018). Key Technologies for the Construction of Offshore Assembly Bridge Piers. People's Communications Publishing House.

(44) Jiang, S., **Su, Q.**, & Zhou, J. (2018). Key Technologies for Disaster Prevention and Reduction in Offshore Long Immersed Tube Tunnels. People's Communications Publishing House.

(45) Xu, G., Yuan, Y., & **Su, Q.** (2018). Key Technologies and Innovations in Seismic Resistance for Immersed Tube Tunnels. People's Communications Publishing House.

(46) **Su, Q.**, Xing, Y., & Yang, X. (2018). Key Technologies for Energy Saving and Emission

Reduction in the Island and Tunnel Project of the Hong Kong-Zhuhai-Macao Bridge. People's Communications Publishing House.

(47) **Su, Q.**, & Shi, G. (2005). Bridge Construction Supervision Methods and Key Points (Revised edition). People's Communications Publishing House.

(48) **Su, Q.**, Yin, S., & Peng, L. (2005). Guidelines for Supervision of Transportation Engineering Facilities. People's Communications Publishing House.

(49) **Su, Q.**, & Zhang, W. (2004). Handbook for Correcting Violations in Bridge Construction. People's Communications Publishing House.

Selected Patents for Inventions

(50) Life prediction method for concrete structures in chloride salt environment based on prototype monitoring data, 2019, Patent No.: ZL201710104033.4

(51) An ultrasonic phased array inspection method for U-rib corner welds of steel box girders,2015, Patent No.: ZL 201310166560. X

(52) A water-based two-component polyurethane primer coating and its preparation method,2020, Patent No.: ZL201610829179.0,

(53) A control method for unmanned driving vehicles to exit the road.， 2021, patent NO.：ZL202111144868.5

(54) A method for handling vehicle failure in a super high-speed private land transportation system., 2021, patent NO.： ZL202111146714.X

(55) A control method for unmanned driving vehicles to enter the road.， 2021, patent NO.：ZL202111146724.3

SECTION 3
AFFILIATIONS

List name of Affiliations, Positions held, Date (Year):

13. ***Professional Organisations:***

(1) **Co-Chairman,** The Scientific Committee of the International Bridge Association Academic Conference, 01/2015-01/2016

(2) **Chairman,** Guangdong-Hong Kong-Macao Greater Bay Area Transportation Construction Intelligent Maintenance and Safety Operation Engineering Technology Research Center, 2019-2022

(3) **Vice President,** The Bridge and Structural Engineering Branch of China Highway & Transportation Society, 2010-2016

(4) **Vice Chairman,** The Council of the Bridge and Structural Engineering Branch of the China Civil Engineering Society, 2023-Present

(5) **Standing Council Member,** Guangdong Society of Civil Engineering and Architecture, 2008-2013

(6) **Standing Council Member,** Guangdong Province Highway Society, 03/2012-Present

(7) **Standing Council Member,** The Bridge and Structural Engineering Branch of China Highway & Transportation Society, 07/2023-Present

(8) **Standing Council Member,** The Highway Branch of China Association for Engineering Construction Standardization, 11/2023-Present

(9) **Member,** The Joint Provincial and Ministerial Expert Panel for Dalian Bay Tunnel Project, 2018-2023

(10) **Member,** Shenzhen-Zhongshan Link Technology Expert Group, 03/2017-12/2024

(11) **Member,** The 5th Expert Committee of the Ministry of Transportation, 06/2019-06/2024

(12) **Member,** National Sichuan-Tibet Railway Joint Technical Expert Group, 06/2019-Present

(13) **Member,** The National Expert Committee on Integrated Development of Transportation and Energy, 2019-2024

(14) **Member,** The 1st Technical Committee of Special Pavement Technology Innovation and Development Alliance, 06/2021-Present

(15) **Member,** National Field Scientific Observation Research Station for Material Corrosion and Engineering Safety of Guangdong-Hong Kong-Macao Bridge, 10/2021-Present

(16) **Member,** The Expert Committee of the Greater Bay Area Sub-center of the National Engineering Research Center for Highway Bridge Construction, 06/2022-Present

(17) **Member,** Transportation Strategy Consulting Expert Committee of Luzhou Government,11/2022-Present

(18) **Member,** The Key Special Overall Expert Group of National High-tech Center, 04/2023-Present

(19) **Member,** The Academic Committee of Guangdong Provincial Key Laboratory of Intelligent Disaster Prevention and Emergency Technologies for Urban Lifeline Engineering, 09/2023-Present

(20) **Member,** The Macau Institution of Engineers, 03/2024-Present

(21) **Member,** Shenzhen City Urban Safety and Disaster Prevention and Reduction Professional Committee, 10/2021-Present

(22) **Member,** Consultative Committee for High-Quality Construction of Xiong'an New Area, 02/2024-02/2026

14. ***Other Organisations:***

(1) **Chairman,** The Trade Union of the Hong Kong University of Science and Technology (Guangzhou), 2022-Present

(2) **Chairman of the Supervisory Board,** The Education Foundation Committee of the Hong Kong University of Science and Technology (Guangzhou), 2023-Present

(3) **Member**, The 13th National Committee of the Chinese People's Political Consultative Conference (CPPCC), 03/2018-02/2023

SECTION 4
JOB HISTORY

15. ***Present position and brief history of job:***

i. **04/2022 – Present**
Name and address of companies/universities/organisations: **The Hong Kong University of Science and Technology (Guangzhou), No. 1 Du Xue Rd, Nansha District, Guangzhou, China.**
Brief history and nature of job: **Chief Engineer and Professor of Practice.**
On the campus, Prof. Su founded the Institute for Cross-sea Engineering and Integrated Transportation to conduct research in the fields of transportation infrastructure and marine engineering. He proposed and led the Marine Hydrodynamic Research Facility, the largest of this kind in South China. He integrates university research with engineering practice and is committed to the industrialization of research achievements.

16. ***Previous positions held name of company/universities/organization***

(1) **Engineer,** Guangdong Provincial Research Institute of Transportation Science, 1987 - 1990

(2) **Vice Station Master,** Guangdong Highway Engineering Quality Supervision Station, 1990 - 1991

(3) **Deputy Representative of Chief Supervision Engineer, Representative of Chief Supervision Engineer, and Chief Supervision Engineer,** Shantou Bay Bridge, Fushan-Kaiping Highway project, Taishan Zhenhaiwan Bridge, Xiamen Haicang Bridge and Guangzhou-Huizhou highway projects, 1991 - 2003

(4) **Chief Engineer,** Guangdong Hualu Traffic Technology Co., Ltd., 2001 - 2004

(5) **Chief Engineer,** HZMB Preliminary Work Coordination Group Office and the subsequent HZMB Authority, 2004 - 2022

(6) **Adjunct Professor,** Southeast University, 2012 – 2017

(7) **Ph.D. Supervisor,** Chang'an University, 2017 – Present

(8) **Adjunct Professor,** Central South University, 2021 – Present

(9) **Adjunct Professor,** Shandong University,2021 - Present

SECTION 5
CAREER HISTORY

17. ***Provide information which would help the judges understand the challenges, problems, and scope of the nominee's area of activity.***

The nominee has been a frontliner in sea-crossing infrastructure construction for more than 35 years. He has participated in lots of famous bridge construction projects, such as the Shantou Bay Bridge (1992-1995, China's first long-span suspension bridge), Zhenhaiwan Bridge in Taishan, and Haicang Bridge in Xiamen (1996-1999, China's fourth long-span suspension bridge and the first super-long three-span steel box girder suspension bridge in China). Due to his extensive engineering practical experience and esteemed industry reputation, the nominee was appointed as the Chief Engineer of the main project of the Hong Kong-Zhuhai-Macao Bridge (HZMB) by the governments of Guangdong, Hong Kong, and Macao in 2004. Since then, he has worked in this position for an impressive 18 years, taking charge of all technical aspects of the project including planning and feasibility, design, construction, and operation technology. The HZMB is a remarkable sea-crossing cluster project that encompasses bridges,

islands, and tunnels. It follows two-way six-lane highway construction standards and is designed to withstand typhoons of magnitude 16 and earthquakes of magnitude 8. With a 120 years designed service life, HZMB is a milestone in the history of China's transportation construction with the most complex technology and the highest construction requirements and standards. Its excellence has been recognized internationally. For example, HZMB was honored as one of the "Seven Wonders of the New World" by the British Guardian.

The HZMB main project spans a length of 29.6 km. The area on the east side is generally scoured, while the west side is sedimented. A 22.9 km long bridge was constructed on the west side, while an immersed tunnel 6.7 km long was built on the east side to accommodate the main navigational channel for 3×10^5 t oil tankers and to meet the height clearance limitation from the Hong Kong airport. Two artificial islands, each with a land area of 1×10^5 m^2, were built to link the bridges at both ends of the tunnel. The feasibility study of the HZMB was initiated in 2004, and the construction began in January 2011. The project was completed in February 2018 and opened to traffic in October 2018. The Ministry of Transport of China presided over the Completion Accreditation in 2023.

The design and construction of the HZMB adopted the concept of "large scale, factory-based, standardized, and assembled" to overcome various significant challenges. The bridge and its construction have the following notable characteristics:

(1) 4×10^5 t of steel was used for the superstructure, breaking a world record.
(2) The anti-ship-collision ability of the bridge was enhanced by utilizing a steel pipe composite structure in the pile foundation.
(3) The piers of the non-navigational bridge were prefabricated in the factory and installed on-site in one go to meet the schedule, enhance safety, and control the risk.
(4) The towers of the three navigable bridges were designed to symbolize a Chinese knot, a dolphin, and a windsail. In particular, the dolphin tower rises to a height of around 100 m and weighs over 2600 t; it was prefabricated and installed monolithically. This unique symbol, in combination with the modern construction method, imbues the bridge with a strong cultural atmosphere.
(5) Due to the weak tidal hydrodynamic environment of the Lingding Bay at the Pearl River Estuary and considerations for flood control and drainage, the Pearl River Water Resources Commission of the Ministry of Water Resources stipulated that the overall water-blocking ratio should be controlled within 10%, the length of the artificial island should be as short as possible, and the bridge cap should be buried below the seabed. These requirements present challenges that are seldom encountered worldwide.

The artificial islands and the tunnel have the following notable characteristics:

(1) The scale of the project was supremely large. The tunnel is 6.7 km long, with the immersed tube section measuring 5664 m long and consisting of 33 tubes. The standard tube is 180 m long, 11.4 m high, 37.95 m wide, and weighs about 80,000 t, making it the largest tunnel tube in the world.
(2) The alignment of the immersed tunnel is 20 m below the seabed, and the top surface of the tunnel is positioned 40 m below sea level, making this tunnel the longest, deepest, with the thickest weak foundations, and the largest highway immersed tunnel in the world.
(3) The construction conditions are complex. The work site was situated in a harsh environment such as typhoons, strong convection, summer flooding, and winter monsoons; the passage of over 4000 vessels per day; and the passage of the island-tunnel site through the core conservation region for the Chinese white dolphin, a first-class protected species by the State Government of China, requiring a very high level of environmental protection. Under these conditions, the underwater foundation, prefabrication, and undersea

installation of the immersed tunnel, which was over 6 km long, were implemented safely and successfully. Building such a large-scale immersed tunnel under these construction conditions is unprecedented in the world.

Additionally, the HZMB is the first mega-large sea-crossing transportation project jointly constructed by Guangdong, Hong Kong, and Macao under the framework of "One country, two systems". It involves different political and social systems, laws and regulations, management procedures, and cultural backgrounds, facing new challenges in cross-border construction management and cross-border operation management, decision-making mechanisms, and strategic resource supply chain management. Safety and environmental protection, disaster prevention and reduction, energy conservation, and emission reduction also need to be coordinated and determined by the overall principle of "high standard first" construction standards in the three places.

18. ***Describe the nominee's exceptional achievements or contributions to the promotion, advancement, and development of engineering professions in the FEIAP region.***

The nominee successfully led the team in overcoming critical technical challenges during the construction of the HZMB, the longest bridge-tunnel-island complex system in the world. He led a National Key R&D Program of China, with a total funding of 120 million RMB. He has established long-life construction and safe operation theories, methods, standards, and technical systems for sea-crossing projects. Furthermore, he established an engineering collaborative innovation management system based on industrialized construction, making outstanding contributions for China to the forefront of the world in sea-crossing cluster project construction and management technologies. These remarkable achievements won him numerous scientific and technological awards from prestigious organizations such as the International Association for Bridge and Structural Engineering, the International Tunnelling and Underground Space Association, and the China Highway and Transportation Society, as well as recognitions from Guangdong Province and Shanghai City.

(1) Led research on key technologies for long-life construction and safe operation of bridge-island-tunnel projects in marine environments.

Since the Shantou Bay Bridge in 1991, the nominee has led the research and continued to explore improvements in corrosion problems of marine concrete structures. He took the lead in the major scientific problem of the relationship between structural quality and life. He spent 20 years exploring the relationship between service life and design standards, presenting a durability design theory based on reliability, and realizing the technological breakthrough of durability quantitative design of concrete structures in marine corrosive environments; his team created a comprehensive design method of additional anti-corrosion measures of "corrosion risk, protection effect, full life cost" to reduce construction and maintenance costs and set up an integrated life-long maintenance technology system of "monitoring (inspection) - evaluation - redesign" for the durability of sea-crossing bridge and tunnel structures. These research results have built the scientific and technological foundation for the 120-year construction and safe operation of marine infrastructure. They have also been widely used in the Shenzhen-Zhongshan Bridge and multiple overseas projects. The technologies have been incorporated into several specifications. This quantitative relationship model between concrete quality and structural based on failure probability is called the "HZMB Model" by domestic and foreign peers.

He led the research of seismic reduction and isolation test technology for long sea-crossing bridges and domestically produced large-tonnage seismic reduction and isolation devices.

With these achievements, the longest sea-crossing bridge in the world with the integrated, prefabricated assembly of piers and abutments was built, which solved the problem of underwater plastic hinges of traditional seismic design bridge piers and their durability problem. He also established the seismic design method and shaking table test simulation technology of ultra-long submarine-immersed tunnels, revealing the mechanical properties of immersed element tubes and joints, and the seismic disaster rules of tunnel structures. He constructed the seismic performance of an ultra-long deep immersed tunnel indicator system and evaluation technology.

He also developed a comprehensive test platform for disaster prevention and reduction of immersed tunnels and carried out the first multi-condition evacuation and escape tests in real fire scenarios. These research outcomes reveal the occurrence and development patterns of fire-hazard conditions in immersed tunnels, the scope of structural damage, and the bearing capacity under fire-hazard. Based on these, the nominee proposed a fire-resistant protection method and fire escape measures and established a safety risk hierarchy system, first forming a series of technologies for disaster prevention in the ultra-long sea-crossing immersed tunnels in China.

(2) Built an engineering collaborative innovation system based on industrialized construction.

The nominee established the method of "Multi-objective optional solution set; Technical solution optimization; Selection and evaluation of stakeholders" to solve the problem of decision-making quality and efficiency of complex giant systems through a spiral optimization approximation management method. With the inconsistency of multi-stakeholder and engineering construction concepts, this method could support the important decisions of the HZMB project, such as bridge location, important structure type, landing point, port, and white dolphin ecological protection. For example, he built a panoramic innovative ecological governance system and a life-cycle comprehensive management system with all-subject collaboration, whole-process collaboration, and all-factor coordination. He also developed a comprehensive technology management system and standards that integrate technological innovation and management innovation. He established an incentive mechanism to promote knowledge integration and symbiotic cooperation, transformed the competitive relationship between members into a partnership, and formed a self-motivated innovation booming among participating enterprises.

(3) Created a collaborative management model for multiple territory systems under different laws, systems, and rules.

He is responsible for the creation of the distributed hierarchical management system and linkage mechanism between Hong Kong, Zhuhai, and Macao. This formation enables rapid adaptation of various management processes among these cities and supports the efficient organization and operation of cross-border engineering project construction management.

As the Chief Engineer of the mega project, the nominee took the lead in designing the bridge-island-tunnel cluster engineering solution and established a multi-level technical standard system for cross-sea bridge-island-tunnel projects. His responsibilities cover the entire process of project planning, design, construction, and operation to adapt to the requirements of Hong Kong, Zhuhai, and Macau, and to support the construction of the HZMB. This project also provides a paradigm for the infrastructure interconnection of the Guangdong-Hong Kong-Macao Greater Bay Area and the "One Belt, One Road" initiative. The nominee has presided over scientific research projects of the National Science and Technology Support Program, forming five innovative technology groups and developing more than 60 standards and specifications, including offshore artificial islands, deep-buried immersed tunnels, fabricated bridges, 120-year durability, and cross-border project management. These achievements realize the industrialized construction of sea-crossing bridges and tunnels and the goal of the

century project. Relevant results have been applied in China and many other countries such as Germany, the United States, Norway, and Serbia.

(4) Developed the integrated intelligent operation and maintenance technologies for the HZMB.

After the HZMB was completed, he led a National Key R&D project ttiled "Integrated Intelligent Operation and Maintenance Technologies of the Hong Kong-Zhuhai-Macao Bridge", to build the integrated digital model and life-cycle evolution theory for bridge-island-tunnel complex based on big data technologies.

He and his team also developed 12 key technologies, such as holographic sensing of sea-crossing cluster facilities and 13 sets of key equipment, forming an operation and maintenance business collaborative interconnection data standard (36 items) and intelligent connection platform. For the first time, this study established the digital operation and maintenance technology system and standards for transportation infrastructure, ensuring the safe operation of the HZMB for 120 years and reducing operation and maintenance costs by about 30%.

(5) Part of the nominator's work has formed various standards, including national standards of the People's Republic of China, industry standards, association standards, etc. Parts of the achievements are listed as follows:

- Data standard system for intelligent operation and maintenance of bridge-island-tunnel crossings — Guidelines on the establishment of standards, **Co-editor**, T/GBAS 1-2022,
- Data for intelligent operation and maintenance of bridge-island-tunnel crossings— General rules for data expression, **Chief editor**, T/GBAS 2-2022.
- Data for intelligent operation and maintenance of bridge-island-tunnel crossings — Bridge structure, **Co-editor,** T/GBAS 3-2022.
- Technical Guideline for Construction of Hong Kong-Zhuhai-Macao Bridge Division II: immersed Tunnel Engineering, **Chief editor**, T/CHTS 10057-2022.
- Technical Specifications for Construction of Sea-crossing Steel Box Girder Bridge Assembled with Large Segments, **Co-editor**, JTG/T 3652-2022.
- Specifications for Geological Investigation of Sea-crossing Highway Engineering, **Chief editor**, JTG/T 3221-04-2022.
- Technical specification for suspended inspection, **Chief editor**, T/T 1430-2022.
- Guidelines for Design of Hong Kong-Zhuhai-Macao Bridge Division: Immersed Tunnel Engineering, **Co-editor**, T/CHTS 10020-2019.

19. ***Summarise the nominee's most outstanding humanitarian effort and have made a substantial contribution in the field of engineering benefiting society as a whole.***

The nominee promoted new construction concepts and industrialized construction modes of "large scale, factory-based, standardized, and assembled" during the construction of the HZMB, transforming traditional offshore construction into factory-based prefabrication on land and assembling at sea. This approach greatly reduces the intensity of workers' offshore operations and improves workers' working conditions, safety, and product quality. The relevant research results won the 2019 Science and Technology Award Grand Prize (the highest award) from the China Highway and Transportation Society and the 2022 Ugo Guerrera Prize (the highest award) from the International Institute of Welding (IIW).

At the same time, the nominee proposed research on white dolphin protection, energy conservation, emission reduction, etc., to build the HZMB into the most environmentally friendly and energy-saving bridge in China, leading to the environmentally friendly and low-

carbon era of construction. Relevant research results won the 2018 Science and Technology Progress Special Award Grand Prize in Guangdong Province.

The construction of the HZMB has promoted the development of related industries, scientific and technological research, new equipment development and upgrading, new materials and new technologies, product research and development, etc. It has laid the foundation and cultivated talents for the subsequent construction of river-crossing and sea-crossing projects. After its completion, the HZMB has become a landmark, promoting economic and cultural exchanges, tourism, and employment among Guangdong, Hong Kong, and Macao.

The main project of the HZMB passed the Completion Accreditation organized by the Ministry of Transport, the National Development and Reform Commission, and the Hong Kong and Macao Affairs Office of the State Council on April 19, 2023. The Completion Accreditation Committee concluded that the main project of the bridge had set many world records and evaluated the project quality level and comprehensive evaluation level as excellent, commenting it as a "high-quality project, a model project, a safe project, and a clean project". This project accumulated valuable experience in the construction of mega sea-crossing channel projects.

To promote academic exchanges and share experience summaries, the nominee often organizes and participates in academic conferences and delivers keynote speeches. He consistently encourages and inspires young engineers and scholars to be innovative and actively participate in engineering. Some of the recent conferences he has organized or attended include:

(1) World Engineers Summit (WES) 2023, November 2023, Singapore (Invited Keynote): Construction of Hong Kong-Zhuhai-Macao Bridge (HZMB) and the Latest Development of Bridges in China.
(2) The 4th International Forum on Water Security and Sustainability, November 2023, China (Invited Keynote): The sustainable innovation ecology of major cross-sea engineering.
(3) The 2nd ASCE Greater China Conference, September 2023, China (Invited Keynote): The Construction of Hong Kong-Zhuhai-Macao Bridge (HZMB) and the Latest Development of Bridges in China.
(4) Symposium on Latest Advances in Marine Land Development Technology, May 16th, 2023, Hong Kong, China. Co-Chairs.
(5) The release of the third batch of China's industrial heritage protection list & the founding meeting of the China Association for Science and Technology's United Nations Consultation on Sustainable Cities, Communities and Historical Heritage Protection Special Committee, September 2023, Keynote Speech: Innovative thinking and craftsmanship in super projects.
(6) WTC 2023 Parallel Forum & One Belt One Road International Transportation Seminar, June 2023, Keynote Speech: Inheritance and Integration of Technical Standards for The Hong Kong-Zhuhai-Macao Bridge.
(7) The 18th Conference on Engineering Geophysical Exploration and Testing, November 2023, Keynote Speech: Sustainable Innovation Ecology for Major Cross-ocean Projects
(8) IABSE Congress Nanjing, September 21st-23rd, 2022, Nanjing China, Keynote Speech: The Durability and SHM System of Hong Kong-Zhuhai-Macao Bridge.
(9) China Bridge Academic Conference, December 2020, Keynote Speech: Construction, Operation, Maintenance, and Intelligent Technology of the Hong Kong-Zhuhai-Macao Bridge.
(10) The first high-level forum on "Engineering Consultancy and Engineering Philosophy", December 2020, Keynote Speech: The Manifestation of Philosophical Thinking in The Engineering Design of the Hong Kong-Zhuhai-Macao Bridge.
(11) The 2nd Bridge Intelligent Detection and Safety Assessment Technology Forum, November 2019, Keynote Speech: Cross-sea Cluster Project Concrete Structure Durability

Monitoring-evaluation-re-design.

(12) The 4th International Transportation Infrastructure and Materials and National Asphalt Pavement Construction and Maintenance Technology Symposium, July 2019, Keynote Speech: Hong Kong-Zhuhai-Macao Bridge Durability Monitoring Assessment and Redesign Technology.

(13) The 35th INTERNATIONAL BRIDGE CONFERENCE, June 2018, Keynote Speech: Technical Innovation of the Hong Kong-Zhuhai-Macao Bridge Project.

(14) The 2nd International Symposium on Service Life Design for Infrastructure, October 4-6, 2010, in Delft, The Netherlands. Keynote Speech: The Probabilistic Durability Design of the HK-Zhuhai-Macao Bridge Concrete Structure Based on The Local Long-term Exposed Test and Marine Construction Inspection.

20. ***Please list and supply evidence of any commendations, statements from authorities, honours, and awards received which attest to and substantiate the nominee's achievements or contributions.***

Honours and Awards:

(1) National Outstanding Engineer Award, China Government, 2023.

(2) The Ugo Guerrera Prize of IIW (Ranking 4th), International Institute of Welding, 2022.

(3) The 6th China's Outstanding Professional and Technical Talents, 2021.

(4) Nanyue Innovation Award of Guangdong Province, 2021.

(5) Outstanding Project to the Year of FIDIC AWARDS, International Federation of Consulting Engineers, 2021.

(6) Guangdong Provincial Science and Technology Progress Award (Ranking 1st, Grand Prize), 2019.

(7) Award of Science and Technology Award of China Highway Society (Ranking 2nd, Grand Prize), 2019.

(8) ITA Tunnelling and Underground Space Awards in the Category Major Project of the Year 2018.

(9) Shanghai Science and Technology Award (Ranking 4th, First Class), 2018.

(10) Senior Prize of IABMAS, 2017 (Individual medal).

(11) Outstanding structures awards of IABMAS, 2019 (Project medal).

(12) Mega project Prize from IBC, 2018 (Project medal).

(13) Science and Technology Award of China Highway Society (Ranking 2nd , First Class), 2017.

(14) Science and Technology Innovation Award of the Year, China Government, 2017.

(15) National Excellent Engineering Consulting Achievement Award (First Class), China Engineering Consulting Association, 2010.

(16) Shaanxi Scientific and Technological Progress Award (Ranking 2nd, Third Class), Shaanxi Government, 1993.

Government statements and peer reviews

(1) Comments from Hong Kong, Macau, and Guangdong Provincial Governments on "Mr. Su Quanke's Work on the Hong Kong-Zhuhai-Macao Bridge". "Mr. Su Quanke has made outstanding contributions to the Hong Kong-Zhuhai-Macao Bridge".

(2) Comments from peers from Hong Kong (Dr. Lau Ching-kwong, former Director of the Civil Engineering Department of Hong Kong, and Mr. Cheng Ting-ning, Executive Director of the Hong Kong Manufacturing Council). "Mr. Su Quanke's pioneering work

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and exemplary achievements in the Hong Kong-Zhuhai-Macao Bridge have been appreciated by academic groups and experts in Hong Kong."

(3) Comments from peers from Macau (Mr. Chen Hanjie, former Director of the Macao Construction and Development Office). "Mr. Su Quanke built a technical system for the engineering construction of cross-sea bridges and tunnels."

(4) Comments from peers from international cooperators (Mr. Hans de Wit, CEO of Tunnel Engineering Consultants (TEC) and chief expert on immersed tunnels). "Mr. Su and his team had an enormous task and facing many challenges in the one of world's most complicated bridge-island tunnel projects."

21. ***Summarise the reason why you (the nominator) believe that your nominee should be selected as FEIAP Engineer of the Year.***

The nominee has actively contributed to engineering and research works in sea-crossing construction over 35 years. His exceptional achievements have significantly advanced the capabilities, industrialization, and upgradation of marine infrastructure construction in the FEIAP region. Serving as the Chief Engineer of the HZMB, he played a pivotal role in the construction of the century project, including planning, design, construction, and operation and maintenance. Moreover, he successfully organized technology and research innovation in crucial areas, ensuring effective management and impactful achievements. These accomplishments have supported the bridge's construction and operation and advanced the civil engineering industry. The completion of this mega project under such complex conditions at the mouth of the Pearl River in China can be viewed as a groundbreaking achievement, laying a solid foundation, and accumulating invaluable experience for engineering projects within the FEIAP region and beyond.

SECTION 6
NOMINATION

Nominated by FEIAP Member Economy:

Organisation : China Association for Science and Technology (CAST)
Address : No.3 Fuxing Road, Haidian District
Tel : 861068578284
Fax :
Email : international@cast.org.cn

Signature of President/Chairman of FEIAP Member Economy: