ice
Institution of Civil Engineers
Hong Kong

Institution of Civil Engineers Hong Kong Association
Graduates and Students Division

South Africa delegation 2025

From underground to overground: exploring the innovative and sustainable side of South Africa

Study report

Published by:
Institution of Civil Engineers Hong Kong Association
Graduates and Students Division
17/F, 88 Lockhart Road, Wanchai, Hong Kong

T: **+852 3153 4180**
E: **gs.hka@ice.org.uk**
W: **ice.org.uk/hongkong**

Foreword

It is my honour to prepare the foreword to the report of our South Africa delegation 2025. Together with the Japan delegation 2025, the Graduates and Students Division has continued to deliver two overseas delegation campaigns this Session, a testimony to serving our Members as an early careers organisation of a global professional institution.

Overseas delegations are often regarded as a miniature of our campaigns and activities locally, and comprise visits to sites of technical significance, sharing in the form of seminars and webinars, networking with fellow professionals and enrichment through experiencing culture. The South Africa delegation was no exception, and further featured dialogues with professional institution representatives on teenage outreach, STEAM initiatives, university curriculum, graduate training as well as membership promotion. Among the knowledge sharing sessions, particular memorable were the caving techniques employed in mining, and the endless possibilities with structural timber. I was also particularly inspired by how the industry has together promoted inclusivity throughout a project lifecycle across various levels, and devoted much into the career development of students and professionals.

The planning of an overseas delegation has always been a strenuous hunt for opportunities, all while continuously juggling between budgeting, marketing and liaison. I am immensely proud and grateful to the delegation team of Session 2024-25, who has demonstrated exemplary performance in risk management and meticulous care, without which the delegation would never have been as rewarding. My thanks also go to the advisors and sponsors, for they have linked us with promising opportunities, and turned the tables for a financial infeasible initiative. Thanks also go to the hospitality by Mr Alain Jacquet, former ICE representative of South Africa; and Professor Hannes Gräbe, head of department of civil engineering at the University of Pretoria; both of which have generously introduced some of the most rewarding knowledge sharing opportunities for us.

The South Africa delegation was the finale of Graduates and Students Division Session 2024-25, with our AGM following in less than 20 hours after our touchdown. Surely it ended our Session on a high note, and I feel truly blessed to be part of one of the first attempts by a Hong Kong early careers professional body to set foot in Africa. I look forward to the Session 2025-26 reaping from the connections we have built and driving forward knowledge exchange on an international level.

Mr Sampson Tam
Immediate Past Chairman | Session 2025-26
Graduates and Students Division
Institution of Civil Engineers Hong Kong Association

Table of content

Foreword	3
Table of contents	4
About ICE	5
South Africa delegation 2025	6
South African Airways Museum Society (31 May)	7 - 9
Apartheid Museum and Mandela's House (1 June)	10 - 11
Melville Koppies Nature Reserve (1 June)	12 - 13
Kloofendal Nature Reserve (1 June)	14
The University of Pretoria - welcoming session and visit to Engineering 4.0 & Centrifuge Laboratory (2 June)	15 - 16
Rovos Rail depot (2 June)	17 - 18
Zutari (3 June)	19 - 20
The University of Pretoria - seminar series (3 June)	21 - 22
Lesedi Cultural Village (3 June)	23
Cullinan Mine (4 June)	24 - 25
The South African Institution of Civil Engineering (SAICE) (4 June)	26
Pilanesberg National Park (5 - 6 June)	27 - 29
Bonthongo Wondercave (6 June)	30
Student prize awardees sharing	31 - 34
Conclusion	35 - 36
Participant list	37
Organising committee	38
Notes	39 - 41
Sponsors and special acknowledgement	42
Diamond sponsor profile and advertisement	43 - 45
Platinum sponsor profile and advertisement	46 - 47

About ICE

The Institution of Civil Engineers (ICE) is a 97,000-strong global membership organisation with over 200 years of history.

It is a centre of engineering excellence, qualifying engineers and helping them maintain lifelong competence, assuring society that the infrastructure they create is safe, dependable and well designed.

Its network of experts offers trusted, impartial advice to politicians and decision makers on how to build and adapt infrastructure to create a more sustainable world.

ICE Hong Kong

Hong Kong is one of the largest regions outside the UK, and comprises ICE Representative, the Hong Kong Association (HKA), the Graduates and Students Division (G&S), and the Regional Support Team serving over 8,500 members. HKA has been the host of well received activities with the prime objective to foster member's professional development. We believe in the walking the talk of lifelong learning, and we make sure our members are well supported in their continuous pursuit of skills and expertise across a variety of disciplines.

ICE HKA G&S

G&S is a sub-division of the ICE HKA. Comprising recent graduates and current students embarking on a civil engineering career in Hong Kong, the G&S emphasises both professional and personal development and connects graduate and student members with the industry.

G&S presents a variety of opportunities, spanning site visits, hands-on workshops, enrichment seminars, networking opportunities, overseas delegations and much more. We spare no effort in promoting civil engineering among the next generation, with initiatives covering industry visits, experiential learning, idea pitching and career talks. G&S also maintains strong ties with young committees of local professional institutions and local branches of reputable institutions.

To find out more about ICE Hong Kong, please visit our website: ice.org.uk/hongkong

ICE HKA G&S

icehk_official

ICE HKA G&S

ICE Hong Kong

South Africa delegation 2025

South Africa presents an exciting opportunity for early career civil engineering professionals to explore sustainable solutions in development, best engineering practices, as well as the ethnic and culture diversity.

Through various visits and lectures, delegates have explored sustainable urban development and long distance transportation systems. Delegates also engaged with a community shaped by diverse cultural influences as they explore historically and culturally significant sites. This presents the perfect occasion to explore the significance of ethnic and cultural diversity in our professional practice in Hong Kong.

Image credit: Shutterstock

South African Airways Museum Society (31 May)

by Teddy Hsu and Jason Tam

A Walk through of Boeing 747-244B

This was a rewarding experience that provided a comprehensive insight into the history of South Africa's civil aviation. SAA museum, founded in 1986 by SAA employees and volunteers, is an aviation gem that consists of photographs, scale models, and a great choice of static aircraft. The flagship of the fleet is the lead Boeing 747-244B (ZS-SAN) called ‘Lebombo’, a reflection of the airline's history and engineering excellence.

‘Lebombo’ is a significant aircraft in South African aviation history. It was delivered to SAA in October 1971 and was one of the initial 747s to be delivered to the airline, a landmark in SAA's development of long-haul routes. This Pratt & Whitney-powered plane was in service for 32 years until its retirement in 2004. The pinnacle of its glorious career was the low-flying dramatic flypast over the Ellis Park Stadium during the 1995 Rugby World Cup final, with ‘Good Luck Bokke’ on its belly, an event which brought pride to the nation.

As we moved through the interior of the aircraft. We can see the photos of the controlling panel of the airplanes and samples of uniforms worn by flight attendants and pilots at that time. In addition, we were astonished at the sophisticated systems deployed to maintain passenger safety and comfort for such extended distances. The museum's emphasis on preservation also led to the significance of sustainable engineering practice since volunteers meticulously preserve such aircraft to withstand time and weather stresses.

This experience left me with an even deeper sense of wonder at the intricacy of aviation engineering and the commitment involved in maintaining such large machines in working order. It led me to consider how creativity, attention to detail, and passion for heritage can influence future engineering resolutions, whether in aviation or beyond. The tale of ‘Lebombo’ is an excellent reminder that engineering involves more than just making machines; it also involves making lasting symbols of human accomplishment.

Engineering Inspiration

During our analysis of the Boeing 747 airplane, we admired its impressive feats of engineering. One of the most remarkable features of the legendary airplane is its ability to carry an extra engine that sits on a specialised pylon underneath the wing. This unique design allowed the 747 to carry an auxiliary engine to assist an airplane in distress, effectively playing an essential role for stranded planes with engine malfunctions. However, with the rapid development within the aviation industry, such arrangements are outdated now.

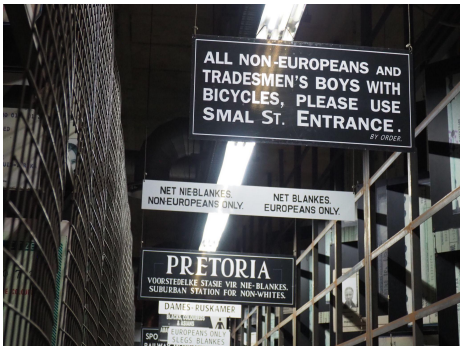
Currently, the global engineering designs and logistics systems have become so advanced that planes no longer need to carry spare engines for rescue purposes. Instead, any international airport on the globe is capable of efficiently providing engine repairs or replacements, thus cutting back on downtimes and fostering seamless operations. This development symbolises the remarkable advancements within the realms of engineering and aviation technology that make air travel highly efficient and reliable as it has ever been. The ability of the Boeing 747 to carry an extra engine is an indicator of human innovativeness, but the efficiency of the current industry in terms of promptly overcoming technical shortcomings on an international level is nothing but remarkable. It is inspiring to note the way continued innovation in engineering solves hitherto insurmountable problems. The Boeing 747 is not just the benchmark of achievements in aviation history but an indicator of the relentless development that is driving the future of flight.

Apartheid Museum and Mandela's House (1 June)

by Denson Lo and Clement Wong

Visiting the Apartheid Museum and Mandela's House is one of the must-go spots to understand the modern history of South Africa. Before going, I already had some basic knowledge about apartheid from school, but seeing these places in real life gave me a much deeper understanding. I also saw how buildings and spaces can hold emotional and historical meaning, which made me think differently as a civil engineering student.

We first went to the Apartheid Museum in Johannesburg. From the outside, the building looked very serious and modern, with a lot of concrete and steel. The whole atmosphere already felt very heavy even before we went in. Unfortunately, we didn't go through the "White" and "Non-White" entrance activity that some visitors do, but even without it, the museum still made a strong impact on me.



Inside, the museum was quiet and dim, and everything was laid out in a way that made you stop and think. There were a lot of photos, newspaper clippings, and videos from the time of apartheid. One section showed how people were classified by race and how strict and unfair the laws were. Another section showed protests and people who stood up against the system. Some were arrested, tortured or even killed. These stories were very emotional, and I could feel how much pain and suffering people went through.

The layout of the museum also impressed me. Some hallways were narrow and made you feel trapped, while others opened up more as the story moved towards the end of apartheid and the start of democracy. I could tell that the design of the building was not just about structure but about telling a story through space. This made me think that as future engineers or architects, we're not just building for function, we're also building for feeling and meaning.

After the museum, we went to Mandela's House in Soweto. This was a much smaller and simpler place, but it felt just as powerful. The house is located on Vilakazi Street and used to be Nelson Mandela's home before he was sent to prison. It's not fancy at all, just a small red-brick house with a few rooms. But walking through it, I could feel the history. There were old photos of Mandela and his family, letters, and even damage from attacks during the apartheid era. Some bullet holes and scorch marks were still on the walls.

Even though the house is small, it made a big impression on me. I could imagine what life was like for Mandela, both as a regular man and as a future national hero. I also liked how the house was preserved, not just to show people where he lived, but to help people connect with his story in a personal way. The simplicity of the house made me realise that you don't need a grand space to create a strong message.

Visiting both the museum and Mandela's House gave me a new perspective on how history can be kept alive through buildings and design. These weren't just places to walk through, they made me feel things, remember things, and ask questions. As a civil engineering student, this made me realise that the buildings we design can be more than just practical, they can carry stories and emotions too.

Overall, I'm really grateful I had the chance to visit these two places. They were moving, educational and very inspiring. It made me think more about how I can use my future profession to contribute to society, not just by building things that work, but by creating spaces that mean something to people.

Melville Koppies Nature Reserve (1 June)

by Jason Chan and Marco Wong

Situated on the ancient Kaapvaal Craton, which dates back more than 3 billion years, the Koppies offer a unique window into Earth's distant past. As we explored the reserve, we encountered granite outcrops, layers of quartzite, shale, conglomerate and even dolerite intrusions. These rock formations provided a striking example of how time and tectonic forces have shaped the landscape. The reserve lies at the base of the Witwatersrand Supergroup, home to the world-renowned gold-bearing 'banket' conglomerates, which highlight South Africa's rich mineral heritage.

Throughout the visit, we learned about the region's complex geological processes, from the formation of quartzite ridges and shale valleys to the ancient river deltas and shallow seas that once covered the area. One key geological feature is dolomite, found in the Transvaal Supergroup. Dolomite, which forms karst landscapes and hosts significant groundwater systems, played an important role in shaping the area's hydrology and topography.

We also discussed the region's meteorite history. The Vredefort Dome, one of the largest and oldest impact craters in the world, has had a lasting impact on the geology of the area, influencing the rock layers and preserving gold-bearing strata. This ancient impact, formed over 2 billion years ago, is a remarkable example of how meteorite strikes have shaped Earth's geological landscape.

For us, as civil engineers, this visit proved invaluable. Observing the interplay between hard quartzite, softer shale and soluble dolomite deepened our understanding of foundation stability and design considerations. The steeply tilted rock layers, some dipping around 70°, underscored the importance of accounting for geological forces when planning infrastructure projects. Understanding the formation of gold-bearing conglomerates helped us appreciate the role of structural geology in excavation and material sourcing, particularly in areas with complex sedimentary layers.

We extend our sincere thanks to guide of Melville Koppies. His guidance and interpretive stories brought the koppies to life—not just as rocks and ruins, but as layers in Earth's biography and human heritage.

This trip reaffirmed something we both feel strongly: real understanding doesn't come from slides or textbooks—it comes from being out here, touching the stones, feeling the landscape, and letting it tell you its story. As aspiring engineers, we're leaving with more than technical insight—we're carrying a deeper sense of respect for the ground beneath our feet and a commitment to thoughtful, geology-informed design in every project we tackle.

Kloofendal Nature Reserve (1 June)

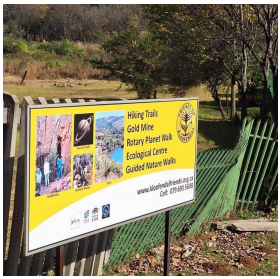
by Harry Tang and Jay Ng

Kloofendal Nature Reserve, a 128-hectare municipal nature reserve located in Roodepoort, represents one of the first established nature reserves in Johannesburg and holds significant ecological, historical and educational value. Our field study examined the reserve's biodiversity, geological features, historical significance and conservation efforts, revealing a unique ecosystem that serves as a transition zone between three major biomes while providing urban green space for environmental education and recreation.

The Nature Reserve sits within the historically significant Witwatersrand Basin, renowned as one of the world's richest goldfields. The geological complexity of the area results from the intersection of two major geological faults: the Rietfontein and Witpoortjie faults. These geological features created the conditions that led to gold mineralisation and ultimately the establishment of Johannesburg as the ‘City of Gold’.

The visit also provided valuable first-hand insights into the complex interplay between ecology, history and community conservation efforts. Observing the reserve’s biodiversity, natural landscapes and historical mining remnants helped translate theoretical knowledge into tangible experience. Walking through the Rocky Ridge and Dassie trails allowed for direct interaction with the region’s natural features. The historical component of the visit was particularly striking. The preserved Confidence Reef Mine site illustrated how resource extraction played a pivotal role in Johannesburg’s early development.

To sum up, the field visit provided valuable first-hand insights into the complex interplay between geology and history of gold mining at Johannesburg, reinforcing the importance of protecting urban green spaces, not only for biodiversity but also for education, recreation and historical remembrance. It highlighted the critical need for integrated approaches to conservation that consider ecological, cultural and social dimensions.

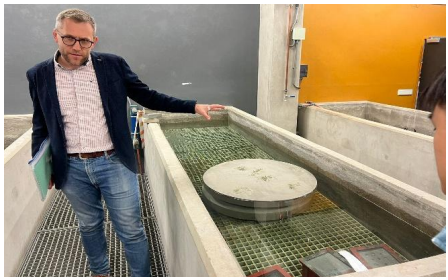


The University of Pretoria - welcoming session and visit to Engineering 4.0 & Centrifuge Laboratory (2 June)

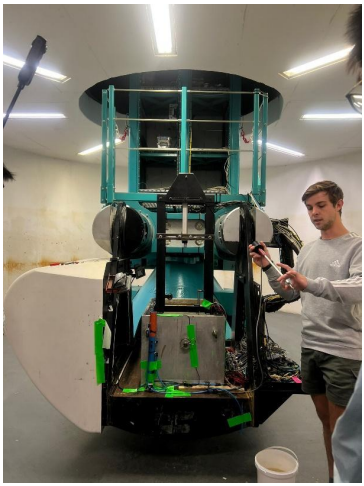
by Irene Li and CK Choi

The welcoming session was led by senior faculty members who introduced University of Pretoria's strategic vision and its commitment to producing highly skilled engineers to address South Africa's infrastructure challenges. They emphasised the university's role as the largest campus-based university in South Africa, with a strong focus on research, innovation and industry collaboration to foster innovation and training opportunities.

A key part of our visit was the comprehensive tour around the Engineering 4.0 facility. The facility houses several specialised laboratories to improve South Africa's transportation engineering skills and infrastructure quality, including the Concrete and Timber Laboratory. During our visit, we observed the concrete lab's advanced capabilities to test the construction materials, which include preparation areas, curing and humidity-controlled rooms and a robust 900 mm deep test floor designed for extensive structural and pavement research. This laboratory plays a critical role in testing concrete materials used in road construction and infrastructure, ensuring durability and performance standards are met. It supports both academic research and industry projects, contributing to the development of sustainable and resilient construction materials.



Following the concrete lab tour, we visited the Geotechnical Centrifuge Laboratory, equipped with sophisticated instrumentation. It houses a fourth-generation C67 geotechnical centrifuge, manufactured by Actidyn in France in 2011, capable of accelerating small-scale physical models weighing up to one tonne to 150 times Earth's gravity (150 g). This high acceleration is critical because it replicates the full-scale stress conditions in soil, which is necessary for realistic modeling of geotechnical behavior due to soil's highly nonlinear stress-strain characteristics. This lab allows researchers to simulate geotechnical conditions by testing physical models under controlled environments, providing valuable insights into soil behavior, foundation stability, and mining-related challenges.



In summary, the University of Pretoria exemplifies cutting-edge research and innovation. The Engineering 4.0 facility integrates real-world data collection, advanced materials testing and smart infrastructure research to address pressing civil engineering challenges. The concrete laboratory's advanced testing capabilities and the centrifuge lab's geotechnical simulations highlight University of Pretoria's comprehensive approach to engineering education and applied research. This visit provided valuable insights into how integrated research facilities and industry partnerships can drive sustainable infrastructure development. We appreciate the warm hospitality and the opportunity to engage with University of Pretoria's academic and research community.

Rovos Rail depot (2 June)

by Caitlin Chan and Ardery Man

The visit to the Rovos Rail Depot was akin to a journey through history. The depot, located in Pretoria, stands as a distinguished symbol of South Africa's railway heritage and the operational heart of Rovos Rail, known as the provider of the "world's most luxurious train." It was originally established as a railway station in 1948 which belonged to South African Railways. The site offers guided tours, allowing visitors to witness the fabulous engine mechanisms of the train and the exceptional operations and services that uphold Rovos Rail's reputation.

As one of the few remaining long-distance trains running in South Africa, Rovos Rail faces a critical challenge from the country's history. Historically, South Africa relied heavily on its rail network for the transportation of goods. However, in the 1990s, due to a lack of maintenance and capital, constant vandalism, and theft, freight traffic was forced to shift towards road transport. The shift caused fatigue cracking, rutting and formation of potholes which accelerated the degradation of pavements.

The depot fell into disrepair until Rohan Vos, founder of Rovos Rail, acquired a long lease in 1999. He presented a restoration proposal that focused on the economic and tourism benefits, convincing authorities to support the project.

The depot's transformation was extensive. The main red brick station building was reconstructed, and a new 300 metres platform was added to the front. Authentic features such as a signal box and clock tower were constructed to evoke the golden era of steam travel. The site now encompasses 60 acres, having expanded from its original 12, and includes state-of-the-art carriage and locomotive sheds, repair and maintenance facilities, laundries, kitchens, storerooms, and lush gardens planted with thousands of trees and shrubs.

One of the main attractions of the Rovos Rail Depot is its railway museum. It exhibits a curated collection of rail memorabilia, including vintage trains, original phone boxes, parking meters, and collector's items. The model railway display, complete with semaphore signals and a footbridge, recreates how a classic railway system operated, offering visitors and passengers a nostalgic journey into the past.

The locomotives are preserved with great care, aiming to restore the most authentic appearances and to meet modern operating standards. Some of the steam engines, which are iconic symbols of the Industrial Revolution, are integrated with diesel to balance operational and environmental constraints. These adaptations of the locomotives are also useful in routes covering mountainous terrains in South Africa.

Rovos Rail's dedication to maintain harmony with wildlife is also notable. As we entered the deport, we were warmly welcomed by meerkats and peacocks. The deport also takes care of a few rescued resident animals like donkeys, horses, ostriches and cows. To minimise disruption or harm to the animals along the railway tracks, cell towers and fiber-optic cables for internet connectivity are not installed.

The overarching goal of the Rovos Rail Depot is to preserve South Africa's rich rail history while delivering a world-class luxury experience. By combining heritage conservation with operational excellence, the Rovos Rail Depot aspires to be both a functional headquarters and a premier destination for rail enthusiasts and travelers worldwide.

Zutari (3 June)

by Enoch Lee and Terence Yiu

Zutari is a consulting engineering firm founded in 1954 in South Africa. It specialises in infrastructure, engineering and consulting services across various sectors, including transportation, water, environment and energy. The company is known for delivering sustainable solutions and has a strong presence across Africa and internationally.

In this session, we learnt about their ongoing projects and discussed their services, progress and future plans, covering multiple infrastructure, environmental and social projects across the region.

Lesotho Highlands Water Project

We were provided with an update on the development of the Lesotho Highlands Water Project, which emphasised its importance on regional water security and hydroelectric power generation. The presentation highlighted progress of tunnel construction and reservoir management.

Polihali Major Bridges

The presentation covered the design, construction and current status of the Polihali bridges, which are critical for regional connectivity and transport.

Energy Situation in Burundi

Zutari discussed Burundi's energy challenges, including existing capacity and potential renewable solutions aimed at enhancing energy access and sustainability.

Jiji Mulembwe Hydropower Scheme

Details were shared regarding the Jiji Mulembwe Hydropower Scheme, focusing on its capacity, environmental considerations and expected contribution to Burundi's electricity supply.

Built Environment and Social Projects

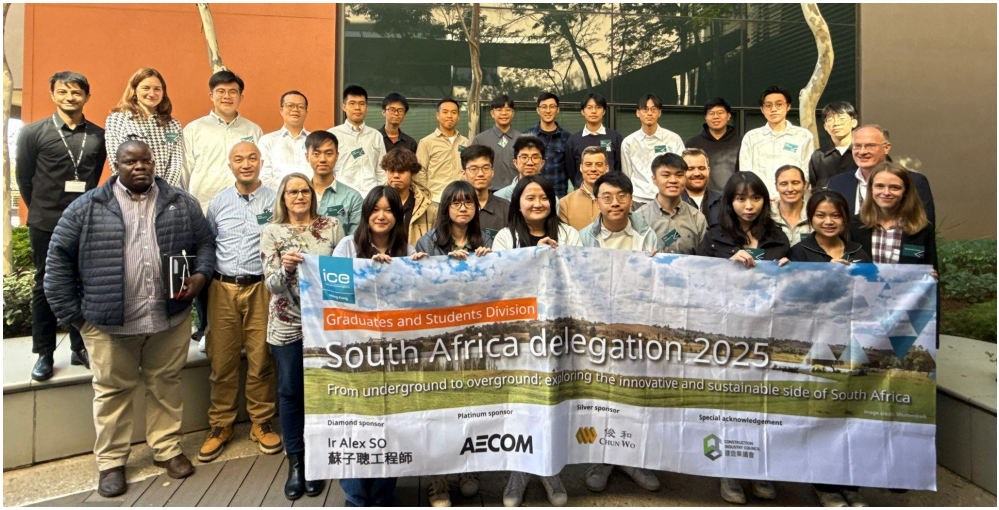
- Social Work on the Wild Coast: Zutari outlined their community engagement initiatives aimed at promoting sustainable development and supporting local communities on the Wild Coast.
- Black Rock Project: Progress on infrastructure and environmental management efforts in the Black Rock area was presented, emphasising on sustainable development practices.
- Zambia Rail: Updates on rail infrastructure projects were shared, focusing on improving regional rail connectivity and trade facilitation.
- Ports and Coastal Developments: Zutari discussed upgrades and improvements to port facilities and coastal infrastructure to bolster regional trade resilience.

Rehabilitation of the Sinkhole on National Route N1 (Sowannah to Canto)

The presentation detailed the assessment and planned interventions for the sinkhole on the N1 route, including stabilisation techniques and safety measures to restore route integrity.

Throughout the visit, the company demonstrated extensive technical expertise across a wide range of infrastructure sectors. Their integrated and multidisciplinary approach effectively aligns with regional development priorities, ensuring strategic value in complex projects. They also demonstrated that continued collaboration is key to enhance project delivery outcomes and maximise long-term impact.

Overall, the visit was very productive, providing valuable insights into Zutari's capabilities and ongoing initiatives, which significantly benefited regional development efforts. The delegates gained insights into the benefits of various international approaches, which enabled them to reflect on Hong Kong's current strategies and better understand their strengths and weakness.



The University of Pretoria - seminar series (3 June)

by Tommy Shum and Miki Leung

Following the initial introduction to the University of Pretoria during our previous laboratory visit, we delved deeper into the ongoing research initiatives of the University. Under the theme "Innovative Nature-based Solutions (NbS) for a Sustainable South Africa: Integrating Ecology, Engineering, and Community," we explored the interdisciplinary studies that address sustainability challenges through ecological and engineering advancements, while fostering community involvement.

Prof Ida Breed from the Department of Architecture first discussed the implementation of community-scale NbS in Johannesburg. While the project may not match the large-scale developments typically seen in Hong Kong, it demonstrates the efforts for collaboration between professionals and communities. Beyond addressing environmental degradation caused by urban sprawl, the initiative plays a crucial role in reconnecting the divided local community. It fosters engagement, bringing valuable skills and sustainability knowledge to residents while enhancing their surrounding environment.

With nature-based solutions (NbS) are gaining traction in South Africa, engineers must find sustainable ways to construct these initiatives. Mr Ferdinand Senam Hassan highlighted mass timber construction as a viable approach, given its renewability, low-carbon footprint and structural benefits. Properly treated, timber offers high strength-to-weight ratio and fire resistance, making it ideal for low-density development. However, he argued that misconceptions about timber's combustibility and structural adequacy have hindered its use, making it more of a marketing issue than a technical one. Despite its proven fire-resistant treatments and strong properties, outdated perceptions persist. To overcome this, he advocated for education, awareness and industry engagement to highlight timber's sustainability and reliability, and encouraged its adoption in South African construction.

Meanwhile, South Africa's rich biodiversity offers a valuable opportunity for researchers to examine the relationship between human development and wildlife. Prof Mark Keith from the Department of Zoology and Entomology highlighted the application of AI and machine learning in mammal research, demonstrating how advanced technology aids in ecological studies. His work focuses on mammal species and guilds, analysing how they adapt to land use changes. By deploying high-accuracy monitoring equipment and detection software, he extracts detailed wildlife data, enabling researchers to assess species distribution, behaviour and resilience. These insights are essential for developing conservation strategies, ensuring that human expansion does not compromise South Africa's ecological integrity.

Prof Hannes Gräbe further showcased his research in mitigating train-wildlife collisions in the Greater Kruger. Despite the construction of various underpasses along the railway line, many species rarely use them, resulting in a strong correlation between mortality rates and underpass non-use. Additionally, the railway acts as a barrier, fragmenting wildlife habitats, which is similar to challenges seen in highway construction. To address this, his team employed LiDAR technology to analyse the height uniformity of track ballast and sleepers, identifying common wildlife crossing locations outside underpasses. These insights enable railway operators to implement precautionary measures in high-risk areas and pave the way for future physical wildlife crossings, improving habitat connectivity and species survival.

Our delegates also took the opportunity to share the current research work in Hong Kong with our South African counterparts. One of our delegates, Mr Edwin Li, presented the latest geotechnical study on modelling the behaviour of energy geostructures, offering perspectives on integrating sustainable energy solutions into infrastructure. Meanwhile, another delegate Mr Tommy Shum introduced his work on stochastic pedestrian stream models, analysing movement dynamics across several signalised crosswalks in Hong Kong, contributing to urban planning and traffic optimisation. This knowledge exchange fosters cross-disciplinary collaboration, opening avenues for joint research initiatives that bridge expertise from both regions.

Lesedi Cultural Village (3 June)

by Tommy Shum and Miki Leung

Visiting the Lesedi Cultural Village as part of the South Africa delegation 2025 organized by the ICE HKA G&S was an invaluable experience. It is located within the Cradle of Humankind which was established in 1993, and serves as a living museum and museum of some South Africa's indigenous groups, including the Zulu, Xhosa, Pedi, Basotho and Ndebele.

One of the most impressive aspects of Lesedi Cultural Village is its vital role in preserving and promoting local heritage of South Africa. From offering guided tours of traditional homestands, local style meals, to the dancing performance, all of these allow us to fully immerse ourselves into the local's lifestyle and traditions.

The tour began with a multi-sensory presentation on the origins of South Africa's indigenous inhabitants. This was followed by a guided walk through the tribal homesteads, where we observed traditional dwellings and learned about the customs and daily lives of the tribes.

A highlight of the visit is the 'Ingoma' dance performance. The vibrant performance brought ancestral culture and rituals to life through choreographed movements, drumming, and singing. The energy and passion of the performance made this an unforgettable experience. Moreover, we enjoyed traditional South African cuisine (Boma) at the village's restaurant.

Cullinan Mine (4 June)

by Kris Chui and Alan Leung

Visiting the Cullinan Diamond Mine was an eye-opening experience that provided us with a direct look at both the civil engineering challenges and technical innovations behind one of the world's most famous diamond mines. We began the tour at the open pit, where detailed panels and site briefings explained the formation of the pit—initially excavated to approximately 1,000 metres by 500 meters and 400 meters deep, with an average sidewall dip of 85°. The pit's development, which yielded over 14 million carats between 1903 and 1945, demonstrates the scale of earthworks and the necessity for advanced slope stability monitoring. The mine employs a comprehensive system utilising radar, GPS and visual inspections, enabling real-time detection of wall movement and supporting both operational safety and long-term planning.

Transitioning underground, the site displays and schematics provided an in-depth overview of block caving, the primary mining method at Cullinan. Block caving involves undercutting a large ore section, causing it to collapse under its own weight into pre-constructed tunnels, where the ore is then extracted via draw points and conveyed to the surface. This mechanised approach allows for high-volume extraction—up to 14,000 tonnes per day—at only one-tenth the cost of conventional methods, while also significantly reducing surface waste disposal requirements. The extensive underground network, exceeding 66 kilometres below the 500-meter level, is reinforced with concrete, mesh and rock bolts to ensure stability as caving progresses.

The mine's technical displays further highlighted Cullinan's status as a leading source of large and rare diamonds, including the 3,106-carat Cullinan Diamond and numerous Type II blue diamonds. Panels explained that Type II diamonds, formed under extreme pressure and lacking measurable nitrogen impurities, represent a unique geological and engineering achievement.

Attention was also given to the operational philosophy, with site boards emphasising teamwork, continuous improvement and an advanced mechanical system for conveying mines as integral to safe and sustainable mining. Safety protocols, risk management and ongoing staff engagement are prioritised throughout the operation.

In summary, the Cullinan Diamond Mine exemplifies the integration of advanced civil engineering, geotechnical monitoring and efficient mechanised mining. The site visit and technical materials collectively demonstrated how engineering innovation underpins productivity, sustainability and site safety at a globally significant mining operation.

The South African Institution of Civil Engineering (SAICE) (4 June)

by Ralph Lau and Sampson Tam

The South African Institution of Civil Engineering (SAICE) was established in 1903 to promote civil engineering excellence. It serves as a professional body for civil engineers, fostering collaboration, knowledge sharing and ethical practices. SAICE plays a vital role in advancing infrastructure development and engineering standards across South Africa.

We were warmly welcomed by SAICE's president, who emphasised the importance of utilising data to optimise engineering works. His address set a positive tone for our discussions on enhancing engineering practices. We were particularly impressed by the presence of SAICE members from various cities, showcasing the diversity and commitment within the engineering community.

During our visit, we explored SAICE's library, a valuable resource for members, and attended presentations on their notable civil projects. These insights provided a deeper understanding of the unique challenges and solutions faced by engineers in South Africa.

The networking session allowed us to engage with SAICE members individually, fostering connections that could lead to future collaborations. Reflecting on the discussions, it is evident that Hong Kong faces similar challenges, particularly in data utilisation and infrastructure optimisation. This exchange of ideas will undoubtedly inform our practices back home, enhancing engineering solutions in our local context.

In conclusion, the delegation visit to SAICE highlighted the importance of international collaboration in civil engineering. By sharing knowledge and experiences, we can address common challenges effectively. This partnership not only fosters professional growth but also enhances the quality of engineering practices in both Hong Kong and South Africa.

Pilanesberg National Park (5-6 June)

by Edwin Li and Jack Li

One of the highlights of the trip was the visit to Pilanesberg National Park in South Africa, a location renowned not only for its breathtaking natural beauty but also for its commitment to sustainable development and wildlife conservation.

Pilanesberg National Park: A unique natural reserve

Pilanesberg National Park is a nature reserve located in the North West Province of South Africa. Covering over 55,000 hectares, the park is notable for its biodiversity-rich ecosystem, which supports over 7,000 animals, including the famous Big Five (elephant, lion, leopard, buffalo, and rhinoceros), as well as over 300 bird species.

What makes Pilanesberg unique is its location within the crater of an extinct volcano—one of the largest alkaline ring complexes in the world. This geological formation has created diverse habitats, ranging from savanna and grasslands to rocky outcrops, making it an ideal spot for wildlife and a haven for nature enthusiasts.

Integration of sustainable practices

Pilanesberg National Park is a model for integrating sustainable practices into wildlife conservation. The following initiatives highlight the park's commitment to both environmental stewardship and coexistence with mankind:

1. Rewilding and Conservation
The park was created in the 1970s through a groundbreaking project called Operation Genesis, which involved reintroducing species that had been eradicated from the area. Over 6,000 animals were relocated during this initiative, transforming farmland into a thriving natural ecosystem. This effort demonstrates the potential for restoring balance between human development and nature.

2. Eco-Tourism
Tourism in Pilanesberg is carefully managed to minimise its environmental footprint. Accommodations and guided tours are designed with sustainability in mind, using renewable energy sources and promoting responsible wildlife viewing. Revenue from tourism directly supports conservation projects and local community development.

3. Human-Wildlife Coexistence
The park actively works to mitigate human-wildlife conflict by building wildlife corridors that allow animals to migrate safely without disrupting human settlements, educating local communities about the importance of conserving biodiversity and supporting sustainable agriculture practices that reduce dependence on land encroachment.

4. Anti-Poaching Efforts
Pilanesberg employs advanced technologies, such as drones and thermal imaging, to combat poaching. These efforts have been instrumental in protecting vulnerable species, particularly rhinos, from illegal hunting.

As a young civil engineer, the visit to Pilanesberg National Park provided valuable insights into how civil engineering can contribute to sustainable development and the coexistence of humans and wildlife. Some key takeaways include that engineers can play a vital role in promoting sustainability by integrating nature into urban planning through designs that preserve natural habitats, such as green corridors and wildlife-friendly infrastructure. Engaging local communities in development projects is equally important, as it ensures long-term sustainability and fosters social equity by addressing the needs and concerns of those directly impacted. Additionally, adopting sustainable construction practices, including the use of renewable energy, eco-friendly materials and waste reduction techniques, can significantly minimise the environmental impact of construction projects, contributing to a more harmonious relationship between development and the environment.

In conclusion, Pilanesberg National Park highlighted the critical importance of balancing human development with environmental conservation. The park serves as a testament to how engineering, when guided by sustainable principles, can foster harmony between mankind and wildlife. As civil engineers, we can draw inspiration from Pilanesberg's success in integrating sustainable practices into every aspect of its operation, ensuring that future generations inherit a thriving planet.

Bonthongo Wondercave (6 June)

by Cory Ngai and Jensen Leung

Bonthongo Wondercave is a part of the Cradle of Humankind and a UNESCO World Heritage Site located in Gauteng, South Africa. It was discovered by miners in 1898 and mined for calcite compounds used for cement, toothpaste and gold extraction until 1902. It is the third-largest cave chamber with an area of 46,000 square metres in South Africa, after the Cango and Sudwala Caves.

Delegates were given opportunities to discover this 5-10 million-year-old natural wonder filled with cave pearls, calcite formations and a rim stone pool.
We explored the cave via a steep staircase and an elevator, descending 22 metres below the surface and then another 18 metres into the cave. The guided tour provided detailed explanation about the formation of the stalactites, stalagmites and crystal-like structures that have remained unchanged adorn the ceiling and walls of the cave for millions of years.

After the visit, we gained geotechnical knowledge in terms of the formation processes and mineral composition of the cave and also learnt about the historical significance of the mining. We appreciated the conservation efforts from the South Africa's Government which raised our awareness to conserve and protect the natural habitats and biodiversity.

Bothongo Wondercave was a valuable experience blending natural beauty, history and adventure.

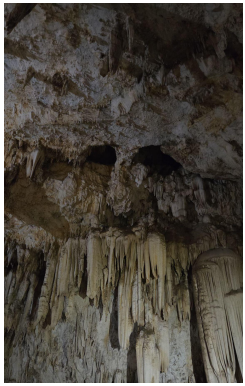
Student prize awardees sharing

by Ardery Man

It is my pleasure to participate in the 2025 South Africa delegation and to have been nominated as the student prize awardee. Aligned with the year's theme, “From underground to overground: exploring the innovative and sustainable side of South Africa,” the delegation provided profound inspiration across multiple perspectives: underground infrastructure, transportation, impacts on the natural environment and resources, and connections with professionals in Johannesburg and Pretoria.

Visits to Melville Koppies and Kloofendal Nature Reserve revealed innovative approaches to preserving geological heritage amid urban pressure. Melville Koppies showcased 3-billion-year-old rock formations and Iron Age smelting sites, demonstrating ancient sustainable metallurgy alongside modern conservation strategies. At Kloofendal, community-led initiatives maintained historical gold mines while combating invasive species, especially on the synergy between heritage preservation and environmental stewardship. The Bonthongo Wondercave shows geotechnical features and challenges in balancing limestone cave conservation with regional mining activities, emphasising adaptive reuse for eco-tourism.

The delegation has also examined the history and preservation of transport infrastructure in South Africa. The South African Airways Museum Society displayed aviation engineering evolution, featuring historical aircraft like the Boeing 747SP. At the Rovos Rail Depot in Pretoria, restoration techniques for steam locomotives demonstrated heritage engineering, while the Gautrain project recreated the furnished designs of historic wood-panelled trains. By exhibiting countless collections of rail memorabilia and linking destinations with off-train excursions, Rovos Rail Depot showcased engineers’ unique ability to transform industrial heritage into living operational systems.



Knowledge exchange with organisations and institutions in South Africa was one of the vital aims of the delegation. The University of Pretoria laboratory tour showed soil mechanics research for geology features and wetland-based water management solutions in South Africa. On the other hand, seminars presented by Zutari, featuring overviews of infrastructure and social projects including the Polihali Bridges, the Jiji-Mulembwe Hydropower Scheme and social initiatives on the Wild Coast enlightened us regarding Zutari's capabilities, societal commitment and valuable engineering insights. During the visit to the South African Institution of Civil Engineering (SAICE), Mr Friedrich Slabbert, Pr Eng, 2025 President of SAICE, delivered the presidential address outlining the institution's goals. Other SAICE engineers shared 2024 initiatives focused on expanding opportunities for minorities and educational programs for children, students and engineers, aligning practices with Sustainable Development Goals.

The delegation has provided opportunities for us to understand South African culture and traditions. The Apartheid Museum exposed how infrastructure enforced segregation, contrasting with post-1994 projects like Gautrain that promote spatial equity. The visit to Mandela's House has demonstrated the past life of Mandela and his community-centered design principles, while Lesedi Cultural Village demonstrated how traditions of aboriginal peoples of South Africa, such as Zulu, Xhosa and Pedi, influence lifestyles and regional demands, revealing the unique cultural heritage of South Africa's ethnic groups.

This delegation has increased my understanding of sustainable civil engineering through South Africa's innovative geotechnical practices, transport heritage and community-driven infrastructure. The 2025 South Africa delegation has enhanced my understanding of engineering's important role in social equity and environmental responsibility. Such an invaluable opportunity will increase my professional development and contribute to the future of Hong Kong.

Student prize awardees sharing

by Caitlin Chan

From the bustling urban centres to the breathtaking natural wonders of Johannesburg and Pretoria, this delegation marks a remarkable journey of discovery through South Africa. Over a span of nine days, we immersed ourselves in its dynamic convergence of engineering, sustainable and cultural practices.

With South Africa's intricate geological heritage, we explored its implications for engineering opportunities. At the Kloofendal Nature Reserve, we learned about the Witwatersrand Supergroup rock formations that shaped the region to be one of the world's gold mining capital. The Bontebok Wondercave showcased its calcite mining amid the spectacular stalactites, stalagmites and flowstone draperies. Our grasp on mining was further broadened with the block caving and staged caving techniques cultivating the world's largest diamond at the Cullinan Mine. Together with the fossil deposits found in the UNESCO World Heritage Site, Cradle of Humankind, these archives allowed us to witness the evolution of civilisation.

Warmly welcomed by leading engineering institutions including The University of Pretoria, Zutari and The South African Institution of Civil Engineering (SAICE), our knowledge-sharing sessions and laboratory visits enriched us with invaluable insights. We significantly enhanced our understanding of how they utilise cutting-edge technologies and academic research to address local challenges, especially with their focus both in ensuring sustainability and inclusiveness in engineering and on serving the community. The meaningful exchange of technical knowledge and perspectives with academia and industry will enrich our continued professional development.

One of the main highlights was venturing into South Africa’s extraordinary biodiverse landscapes firsthand through the safari tours in Pilanesberg National Park. As part of its efforts in maintaining coexistence with innovation and nature, part of the revenue from ecotourism and engineering projects funds the wildlife protection initiatives of the park. This is prominent as we observed the thriving animal population during our safari tour. The link between economic activities and sustainable development offers an exemplary framework for global sustainability practices.

This delegation demonstrated South Africa's unique amalgamation of engineering advancement with responsible care for our natural world, from the tools and techniques of advanced mining to wildlife conservation supported by ecotourism, sustainable development was present every step of the way.

These experiences are creating a new narrative for sustainable global development where the design and use of geological resources results in developments that drive technological advancement and ecological protection. South Africa's model also demonstrates that responsible development involves a paradigm that balances human aspiration with stewardship of nature, and it has presented invaluable lessons for future developments around the world.

Conclusion

by Tommy Shum

This South Africa delegation was definitely a significant breakthrough for young groups to understand the engineering development in Africa and comparatively less developed countries. The visits provided us with a brand new perspective to run engineering projects.

'People, Planet, Prosperity' was definitely a phrase that can best describe this delegation. Not only was it first broadly proposed in the same city (Johannesburg) in World Summit of Sustainable Development in 2002, but it was also well observed throughout our technical and cultural visits in Johannesburg and Pretoria.

People - striving for equity and inclusion

South Africa is a country which has suffered from severe racial inequality during the apartheid era. From Apartheid Museum and Mandela's House, we understood how the people managed to learn from history and avoid making the same mistakes in the future. In the University of Pretoria, we also learnt about efforts from various governmental and non-governmental organisations in assisting the minorities to access to proper tertiary education and enabling them to achieve financial ability to support their ethnic groups.

Meanwhile, Lesedi Cultural Village showcased the diverse traditions of South Africa's major ethnic groups, empowering local communities to share their cultures through storytelling, performance and education. By involving community members as hosts and educators, the village created a space where diversity is celebrated and shared heritage becomes a bridge for social unity.

Planet - treasuring the beauty of nature

On the other hand, the country is famous for having tremendous natural resources. As observed in Pilanesberg National Park, a comprehensive wildlife ecosystem and non-interfering park management was key to sustain the wildlife habitat.

As an engineer, we also took a quick glance at the unique geological features of Johannesburg. We first had a tour in Melville Koppies Nature Reserve, understanding the basic geological profile of the region. Through interactive and comprehensive explanation, we understood the formation process of gold ore and other minerals that has empowered the country's development. Then, we visited Kloofendal Nature Reserve, which preserved one of the oldest gold mine in the city, and learnt about the traditional hand-dig method that was adopted a hundred years ago. We also went to Bothongo Wondercave, exploring deep underground to see ancient rock formations. Of course, we also had the opportunity to visit Cullinan Mine, an active diamond mine where we learnt about the latest up-to-date mining techniques and construction methods.

Prosperity - fostering sustainable growth and opportunity

Engineers are made to solve problems. With the people and the natural resources, we have to design solutions to achieve prosperous development. Zutari has been involved in various projects that fosters community development whilst delivering infrastructure development. The N2 Wild Coast Toll Road project best showcased how involvement with local communities can generate synergy effect for project success. In the seminar series delivered by the University of Pretoria, we understood how latest technology can effectively preserve the wildlife habitat and enable sustainable nature development. And back to people, we exchanged with our overseas counterpart - SAICE about the pathway in South Africa to become engineers. Though we may look different, through interactive conversations we found ourselves with many similarities and we all agreed that mutual respect and collaboration is the key to sustainable development.

It was all in all an unforgettable trip, especially for the many of us who have never travelled to Africa before. Both the visits and the people we met have provided us with new perspectives on how to view a whole engineering project. They broadened our understanding of how culture, sustainability and community values complement with infrastructure, reminding us that engineering is not just about numbers and formulas, but also about people, planet, prosperity.

Participant list

Ms Chan Lei Suen, Caitlin

Mr Chan Ping Hei

Ms Choi Chung Kiu

Mr Kris Chui

Mr Hsu Sung Hei, Teddy

Mr Ralph Lau

Mr Lee Yee Nok, Enoch *

Ms Miki Leung

Mr Leung Chun Hin

Mr Alan Leung

Mr Li Sau Long

Ms Irene Li

Mr Jack Li

Mr Lo Siu Fung

Ms Man Hoi Yan

Mr Ng Kwan Sheung

Mr Ngai Chun Hin, Cory

Mr Shum Hei Chun, Tommy

Mr Tam Sampson Shum Yin

Mr Tam Chun Hin, Jason

Mr Harry Tang

Mr Wong Kai Hei Clement

Mr Marco Wong

Mr Terence Yiu

* Team leader for this delegation

Organising committee

Delegation manager:	Enoch Lee
Deputy delegation manager:	Bianca Lee
Committee:	Sampson Tam
	Monique Hui
	Tommy Shum
	Megan Fong
	Hayden Yeung
	Tristan Leung
	King Ho
	Janice Lee
	Stephanie Pong

Image credit

Images are taken by our delegates

Acknowledgement

The organising committee wishes to express its gratitude to Mr Alain Jacquet, former ICE representative of South Africa; Professor Hannes Grabe, University of Pretoria head of department of civil engineering; and Dr Johnny Cheuk, AECOM Asia Company Limited senior vice president and Hong Kong executive leader, ICE HKA session 2025-26 chairperson for their valuable advice when developing the itinerary of this delegation trip.

Notes

Diamond sponsor

Ir Alex SO
蘇子聰工程師

Platinum sponsor

AECOM

Silver sponsor

俊和
CHUN WO

Special acknowledgement

CONSTRUCTION
INDUSTRY COUNCIL
建造業議會

Diamond sponsor profile and advertisement

Ir Alex So

Ir Alex So is a passionate Associate at Binnies Hong Kong Limited with 15 years of experience. He is a Chartered Civil Engineer, CIC-certified BIM Manager, and a NEC4 ECC Project Manager specialising in solar farms, waterworks and sewerage design. Previously, he was a Site Agent at Ming Hing contributing to WSD Contract No. 6/WSD/13 on Replacement and Rehabilitation of Water Mains.

An active member of the engineering profession, Alex humbly served the Institution of Civil Engineers Hong Kong Association from 2017 to 2019 and its Graduates and Students Division from 2014 to 2015. He also enjoys giving back to the community as a Rotarian.

Academically, Alex graduated from the Hong Kong University of Science and Technology with a Master's Degree in Civil Infrastructural Engineering and Management, as well as MTR Academy with an Advanced Diploma in Railway Engineering. Prior to that, he pursued degree studies in the United Kingdom at Birmingham, LSE and Imperial.


TOGETHER, WE
FIGHT HUNGER
Hunger hides in every community. That's why Rotary clubs support programs to provide healthy food and develop sustainable solutions to food insecurity. Fighting hunger to build stronger communities — that's what people of action do. **Learn more at Rotary.org.**
Rotary
ROTARY INTERNATIONAL
PEOPLE OF ACTION


TOGETHER, WE
END POLIO
Rotary believes healthy communities are strong communities. That's one reason we've worked tirelessly to help immunize 2.5 billion children against polio. Bringing the world closer to eradicating a deadly disease — that's what people of action do. **Learn more at Rotary.org.**
Rotary
ROTARY INTERNATIONAL
PEOPLE OF ACTION

Platinum sponsor profile and advertisement
AECOM Asia Company Limited

AECOM is a global infrastructure leader, committed to delivering a better world. As a trusted professional services firm powered by deep technical abilities, AECOM solves their clients' complex challenges in water, environment, energy, transportation and buildings. Their teams partner with public and private sector clients to create innovative, sustainable and resilient solutions throughout the project lifecycle — from advisory, planning, design and engineering to program and construction management. AECOM is a Fortune 500 firm with a revenue of USD$16.1 billion in fiscal year 2024. Learn more at aecom.com.


AECOM
Delivering a better world
As the trusted global infrastructure leader in our industry, our services are in great demand, making it an exciting time to be at AECOM. Joining a global, publicly traded firm, you will have access to industry-leading technology and innovative thinking, transformational work with significant impact, collaboration with a global network of technical experts and award-winning technical training and professional development programs.
aecom.com

Institution of Civil Engineers

ICE is the leading source of professional expertise and excellence in civil engineering. Established in 1818, for over 200 years we have been qualifying, teaching and uniting engineers. With 97,000 members around the world, we link Government to industry and place civil engineers at the heart of society.

Institution of Civil Engineers
Hong Kong Association
Graduates and Students Division
17/F, 88 Lockhart Road, Wanchai,
Hong Kong

T: **+852 3153 4180**
E: **gs.hka@ice.org.uk**
W: **ice.org.uk/hongkong**

ice
Institution of Civil Engineers
Hong Kong