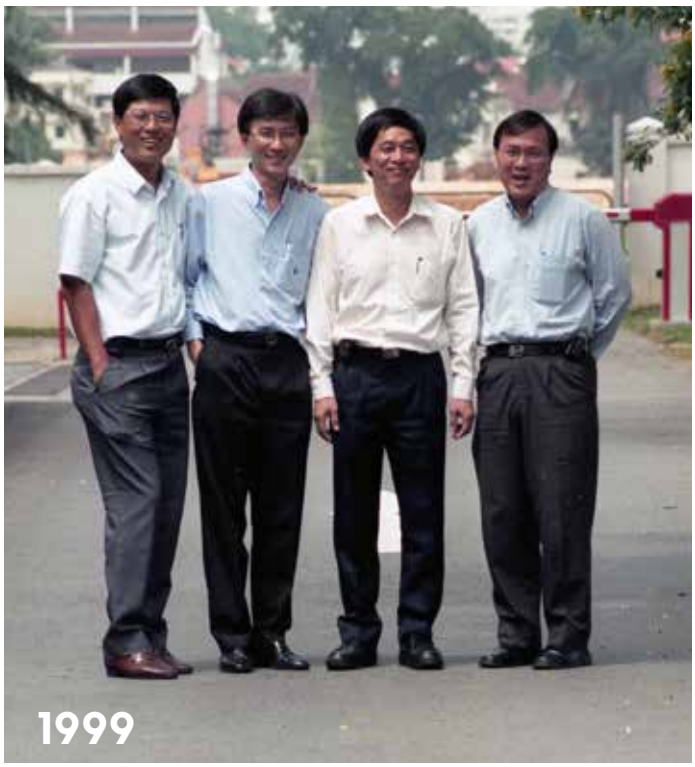
RAIL ENGINEERING'S FANTASTIC FOUR

In 1999, four engineers from the Land Transport Authority (LTA) were featured in Chinese daily Lianhe Zaobao. They were lauded as key figures of Singapore's rail engineering who joined the then Mass Rapid Transit Corporation (MRTC) in the 80s as young engineers and dedicated themselves to the development of Singapore's rail system.



Source: Lianhe Zaobao © Singapore Press Holdings Limited. Reprinted with permission.

10 years is too easy for these stalwarts #LTA20YearChallenge

Twenty years on, after more than three decades on the job, they are the steady stalwarts who have steered Singapore's rail system through all its significant milestones. They helped to shape the nation's transport network, from breaking new ground with driverless trains on the North East Line (NEL) and ground freezing on the upcoming Thomson-East Coast Line (TEL), to extending the rail network with the Downtown Line (DTL), TEL and the upcoming Cross Island Line (CRL).

Today, they are still in service and tirelessly improving connectivity for commuters. They also walk alongside a new batch of young engineers, imparting their wisdom to the next generation who will eventually take over the helm of Singapore's land transport system.

For the quartet, each career spans over three decades, a feat that shows commitment to their job.

Rail engineering's Fantastic Four – Chua Chong Kheng, Sim Wee Meng, Ng Kee Nam, and Ow Chun Nam – share insights into the highs and lows of their careers, their most memorable projects, lessons learnt and how they have striven to provide the best transport experience for commuters.

CHUA CHONG KHENG

DEPUTY CHIEF EXECUTIVE (INFRASTRUCTURE & DEVELOPMENT)

BREAKING NEW GROUND

Autonomous vehicles might be the hot topic in recent years, but few realise that Singapore already had one up and running years ago, in its rail system.

The North East Line (NEL) boasts many firsts. Opened in 2003, it is the world's first fully automated and driverless high-capacity rapid transit line, and the first MRT line to run entirely underground.

One of the men behind the ground-breaking line is Chua Chong Kheng, who was then NEL's senior project manager.

"There were many 'firsts' with the NEL. It was the first line with an integrated control system and also the first to use an off-site facility with a customised test track built for us in France."

The NEL project, he adds, "provided a 'base' for the subsequent implementation of similar fully automated systems for the Circle and Downtown lines. We broke a lot of ground and it was a bold move at the time."

DRIVEN TO SUCCEED

Like the NEL, Chong Kheng is a man of many "firsts". Another milestone project that he led was the Jurong East Modification Project (JEMP) in 2011, where a train platform was added at Jurong East MRT station to ease crowding, and additional tracks added to separate the North-South and East-West line operations. It was the first time train service had to be disrupted for upgrading work.

"It was the first-ever planned MRT service disruption. And the project involved a few weekends where we had to work 52 hours non-stop, starting on Friday night and re-opening service on Monday," says Chong Kheng.

The team took two years to plan it and to make sure work would be executed safely.

Furthermore, there were inclement weather conditions to deal with. "On one Sunday, we had to stop work for 4 to 5 hours due to lightning. It was nerve wracking, and we worked until the last minute."

Despite the Herculean task of the upgrading work, the LTA team completed it safely and on time.

The success of JEMP, he says, gave them a blueprint for similar future projects, such as a new platform planned for Tanah Merah station in 2024.

Chong Kheng is always on the lookout for ideas to improve the commuting experience. Other noteworthy projects under his belt include installing giant fans at above-ground train platforms, such as at Pioneer station, to help commuters stay cool, and retrofitting platform screen doors to enhance commuters' safety and reduce track intrusions.

"There's never a dull moment," he observes about his work.

"I always encourage young engineers to think out of the box. We should not always think that what's there cannot be changed, or that it's good enough. There is always a better way of doing things."

SIM WEE MENG

SENIOR GROUP DIRECTOR (RAIL)

FULFILLING HIS PASSION

For Sim Wee Meng, being a rail engineer was written in the stars. As a child, he enjoyed dismantling moving parts and was curious to find out how things worked.

"I liked to tinker with mechanical objects, and was always intrigued by moving parts, such as those of a bicycle or clock," he recalls, adding with a laugh, "I would dismantle a clock to see how it worked, and get a scolding when I could not put it back together."

Mr Sim, as he is known to everyone in LTA, attended a technical school before heading to the University of Glasgow to study electrical and electronic engineering.

As a student, he rode the London Tube and was impressed with the system.

"I told myself that if Singapore had a metro system, I would want to be part of the team to build it."

Upon returning home in 1978, however, his first job was with the Public Utilities Board where he worked on laying cables that supplied power to new towns. He later joined a consulting firm, designing power systems.

But building a rail system remained a dream. And the chance to fulfill it came in 1982, when he answered a recruitment advertisement in the newspapers for electrical engineers to build Singapore's MRT system.

He got the job, and worked on constructing the North-South and East-West lines, Singapore's first and second MRT lines.

"I told my former employer, 'I am resigning. I want to fulfil something that I've been telling myself to.' They were surprised because I had to take a pay cut. But I said I had made up my mind."

This steely resolve is evident in Mr Sim's approach to tough jobs. Mr Sim recalls facing many complex issues getting core systems to work together during the final testing stage for the NEL, which he says is his biggest challenge to date.

"Every night, after completion of planned testing at around midnight, the project team and contractors would huddle together on the top floor of Sengkang Depot to go through the list of failed tests and work out solutions. Many contractors were based overseas and had to call in to the discussions," he explains. "If software patches were required, the offshore contractors were required to examine the logs and provide software patches the following day."

His hard-nosed approach and perseverance paid off. With close cooperation, intense effort and great teamwork, Singapore's – and the world's – first fully automatic steel wheel and steel rail MRT system was ready for its trial run in May 2003, to Mr Sim's great relief.

"You must be passionate about your work, get your hands dirty and be prepared to work long hours to learn the trade. You can't get far if you only work from 9 to 5."

To young engineers, his advice is:

"It will be rewarding at the end of the day. You will see a product that can serve the community for a long time. Your work will touch the lives of many."

NG KEE NAM

GROUP DIRECTOR, THOMSON-EAST COAST & CROSS ISLAND LINES (CIVIL)

TRANSFORMING THE LANDSCAPE

Today's Sembawang is a bustling residential town in northern Singapore. But Kee Nam still remembers the rural backwater of the past.

Once dotted with farms, it was also home to a British naval base. Even up till the 1970s, there were hardly any amenities there.

Sembawang was a blank canvas, and Kee Nam was one of the artists who would breathe new life into the area. He was part of the project team that built the Sembawang MRT station in 1992, which altered the landscape for good.

The opening of Sembawang MRT station, as part of the Woodlands MRT Extension, spurred the development of Sembawang New Town. The station served as a central hub around which residential, commercial and industrial zones began springing up.

The project remains etched in his mind today. There were some technical challenges but it was extremely rewarding for Kee Nam to see the benefits the station brought to whole communities.

"The viaduct between Sembawang and Admiralty stations traversed thick vegetation and farmlands," he recalls. "There were many wild dogs, and we could only reach the area using four-wheel drive vehicles."

"It is a thriving town now, and I am glad to have been involved in this transformation of the Singapore landscape."

These days, Kee Nam spends a lot of his time mentoring young engineers who face a whole new set of challenges.

"As our transport network gets denser, our stations become obstacles themselves. Building new lines is becoming more challenging," he notes.

"New stations will be sited near residential areas and businesses. This means we have to either under-cross or over-cross these structures, and look for innovative solutions to lessen the impact on the surroundings while protecting the environment."

"Conventional ways may not work anymore. So we must look into innovative solutions and be bold to try new ways of doing things. An example would be our use of ground freezing technology," Kee Nam adds, referring to the method of using ice walls to stabilise the earth in the tunnelling of the Thomson-East Coast Line.

Training, he believes, cannot be just about theory. "Besides spending time with younger engineers, I invite them to ask questions, test them and let them take the lead while I observe. I have identified a few high-potential engineers along the way who are ready to write the next chapter of our rail story," he shares.

"A good engineer is made through exposure and experience."

OW CHUN NAM

DIRECTOR & CHIEF TUNNEL ENGINEER

CHALLENGING THE GROUND

Ow Chun Nam would be the first to tell you that his job is "not glamorous", and that most civil engineers like him are the "pai kias" (bad boys in Hokkien) who do the "dirty work". But in truth, a civil engineer's work is as distinctive and invaluable as it is sophisticated.

Chun Nam, who is LTA's chief tunnel engineer, has weathered various crises and is battle-hardened.

In 2008, tunnelling works for the Circle Line caused a cave-in off Holland Road and he was woken up by a call at 4am.

"When you are doing tunnelling work, you can't sleep well every night," he reveals. "You are worried when your phone rings. You wake up and, most of the time, there is an issue."

He rushed down to the site. A 10m-wide stretch along Cornwall Gardens had been swallowed up after loose ground caused the road to cave in, resulting in a 4m-deep crater. The water supply to some homes was cut off as the pipes had snapped when the road crumbled.

It was memorable because of the unprecedented challenge, but he stepped up to it. He had to immediately secure the area, and minimise the impact on activities around the accident site. Thankfully, there were no casualties.

It was an important lesson on the risks that come with tunnelling. Today, Chun Nam constantly tells his engineers to familiarise themselves with all the different techniques and the various types of tunnelling machines, as each one is suited to a specific type of terrain. "Singapore's geology is not homogeneous but stratified, with layers of rock, clay and other soil types," he says. "This poses a lot of challenges, including the importance of assessing the terrain and ground conditions. During tunnelling, one stretch may be soft soil, but another may be hard rock."

A slurry tunnel boring machine, for instance, is used in highly permeable and unstable terrain, or under civilian structures sensitive to ground disturbances.

The sinkhole was not the first such setback for the Circle Line project. The most serious incident occurred in 2004, when a cave-in at the Nicoll Highway tunnel killed four persons.

Chun Nam was asked to lead LTA's crisis management team. To him, the work is not only about solving engineering problems. The human element is also one of the most important aspects.

"The accident happened in the day. I went to the site at night and it was unusually quiet," he recounts.

"I saw the silhouette of a man. He was a manager from the Japanese company contracted for the project. He was feeling down and meditating."

"I placed my hands on his shoulders and didn't say a word. I didn't know what to say. It was a sad moment."

Yet, there is a learning moment from every crisis.

"We learn through experience and, sometimes, mistakes."

He was the first Singaporean resident engineer hired by LTA, among the pioneer LTA engineers who were mentored by the late Terry Hulme, a founding member of the Tunnelling and Underground Construction Society (Singapore). "He was my guru."

Chun Nam has earned his stripes the hard way.

"If you didn't take the initiative and ask questions, they wouldn't share information," he says, referring to the expatriate engineering experts who came mainly from Australia and Britain in the early days of his career. "They didn't have much time for everybody. You had to ask, and learn through observation."

His advice to young engineers:

"Be inquisitive. Always make an effort to learn."

OW CHUN NAM

Studied
Civil Engineering at then Singapore University

Joined
Mass Rapid Transit Corporation in 1984

"Use your initiative. Don't be afraid of making mistakes."

NG KEE NAM

Studied
Civil Engineering University of London

Joined
Mass Rapid Transit Corporation in 1984

"The level of job satisfaction is on a whole new level because you see the benefits to communities, the transport convenience and connectivity. I developed a lifelong career here and never looked back."

SIM WEE MENG

Studied
Electrical and Electronic Engineering at University of Glasgow

Joined
Provisional Mass Rapid Transit Authority in 1983

"If you have no passion for your work, you will not last very long."

CHUA CHONG KHENG

Studied
Electrical and Electronic Engineering at then Nanyang Technological Institute (NTI)

Joined
Mass Rapid Transit Corporation in 1985

"I have been involved in MRT development for over 30 years but I am still learning new things every day. It is deeply satisfying to know that you have been a part of building a legacy that will benefit generations of people today and many years down the road."

CROSS ISLAND LINE

FIRST PHASE TO OPEN BY 2029

Our 8th MRT line, the Cross Island Line (CRL) will serve commuters in the eastern, western & north-eastern parts of Singapore.

The 1st phase (CRL1), which begins work in 2020, will serve residents in areas such as Tampines, Pasir Ris and Ang Mo Kio.

Commuters can look forward to shorter travelling times, more route options across the rail network, and easier access to destinations such as Bishan-Ang Mo Kio Park, Changi Beach Park, Hougang Mall and Ang Mo Kio Hub via public transport!

WATCH this video for more about the CRL1

KEY FACTS

about CRL1

- **12** MRT stations
- **29** KM long
- **4** Interchange stations

Connecting to NSEWL, NEL and the upcoming TEL

Works to begin in 2020, estimated completion by 2029