

# STAYING ADAPTIVE IN THE NEW MILLENNIUM

(1995–2004)







TOP:  
Construction work  
along Robertson Quay.

**T**he mid-1990s hailed the era of digitisation as developing countries all over the world began investing heavily in information technology. Singapore was no different. As the city-state crossed into the millennium, new challenges and progressions began to unfold for the young economy. Globalisation, together with increasingly integrated economies and the introduction of higher and more sophisticated technology, paved the way for numerous changes ahead.

Additionally, Singapore experienced several major setbacks during this decade. Two substantial recessions and two viral outbreaks – Severe Acute Respiratory Syndrome (SARS) and subsequently Avian Influenza – tested the country's capabilities as a developing nation at that time.

Parallel to its economic developments, Singapore's workforce also saw a shift towards more highly-skilled and better-paid occupations. There was a higher concentration of workers in service-oriented industries, with the business and finance sector seeing a steady rise in workers.

While the manufacturing sector saw a decline in workers in 2000, injury and fatality rates remained concentrated in this sector, and the Government continued to tackle these problem areas to ensure the safety and health of workers at work.

## MANAGING PERENNIAL ISSUES WITH APTITUDE

Building on previous decades' efforts in propagating Workplace Safety and Health (WSH), the Ministry of Manpower (MOM) began to focus its efforts on resolving recurrent issues in sectors registering high accident and fatality rates. Incentives and enforcement schemes were implemented with the goal of nipping transgressions in the bud.

In 1998, the Department of Industrial Health (DIH) collaborated with the Ministry of Finance (MOF) in introducing the Tax Incentive Scheme for Noise and Chemical Hazard Control for factories. The scheme was intended to ease the financial burden of implementing measures to control noise and chemical hazards in factories.

Companies under the scheme could claim a 100 per cent depreciation allowance in the first year for expenditures on such measures. Conferences were held to promote the tax incentive scheme and seminars were held to inform participants of solvent hazards controls, noise control awards, as well as associated safety and health concerns at work. Various visual display units illustrating safety and health safety practices in confined spaces were also exhibited at the seminars.

(See how Epson Industrial utilised the tax incentive scheme to improve its working conditions on page 93.)

Another recurrent cause of concern for the Ministry was construction companies with poor safety records. In April 2000, MOM introduced the Debarment Scheme, aimed at improving safety standards in the construction industry. Under the scheme, a Demerit Points System (DPS) was used to identify contractors with poor safety work practices. Contractors with bad safety records would subsequently be debarred from employing foreign workers. Over the years, DPS has undergone numerous reviews and it remains relevant in enhancing WSH standards in the construction industry today.

After extensive consultations with the construction industry, including the WSH Council's Construction and Landscape Committee and the Singapore Contractors Association Limited, the latest enhancements were finalised and came into effect on 1 July 2015. Broadly, there were four key changes made to the DPS:

- It was simplified to a single-stage system where the accumulation of demerit points would trigger the debarment of foreign workers.
- The number of demerit points had been calibrated to deter employers from putting their workers at unnecessary risks at work.
- The validity period of the demerit points was extended from 12 to 18 months to bring about sustained adherence to good WSH practices.
- The demerit points would be accumulated on a company-wide basis and debarment of a contractor's access to foreign workers would apply to the entire company instead of by contract.

The enhancements aim to drive contractors to make greater efforts in improving workplace safety to safeguard the lives and limbs of workers.

At the forefront of curbing occupational hazards, the Division released a series of enforcement and promotional efforts in 2001. These initiatives were aimed at reducing the cases of over-absorption of chemicals in industries dealing with particularly high quantities of hazardous chemicals. Three high-risk

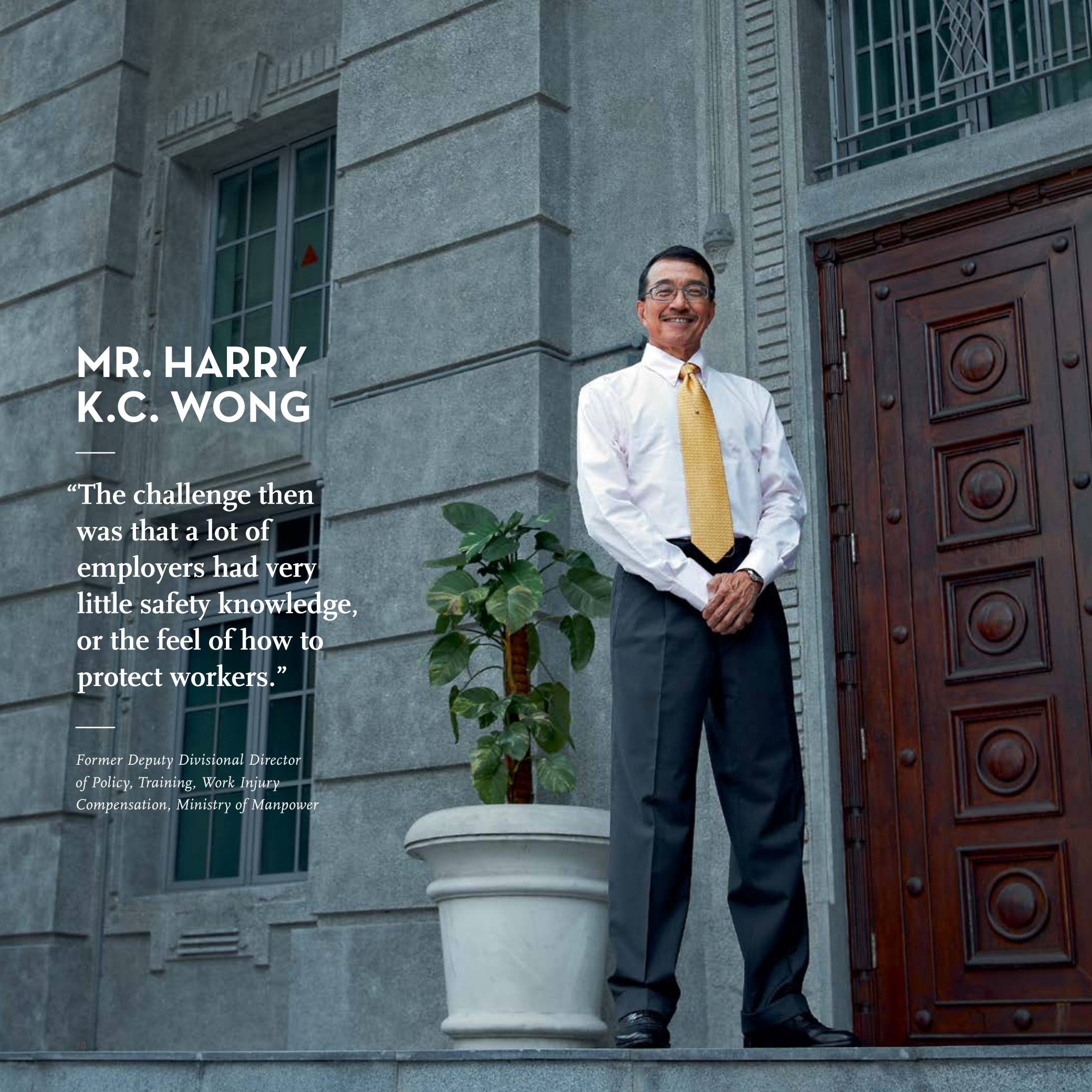
industries – printing, ink and plastic manufacturing – were given particular attention. In that year, the Division's efforts paid off and cases of workers with over-absorption of chemicals saw a dip to 12, compared to the previous year of 36.

As a multitude of promotional, preventive and enforcement efforts were rolled out, outstanding issues were being tackled head on. With much to accomplish, the Division was also fully aware of the economic terrain that surrounded the industry. Careful to navigate the tricky financial waters that swept the industry early in the millennium, it was important for the Division to carry out its affairs with tact and dexterity.

**BOTTOM:**

The 1990s saw the Ministry focusing on the construction sector to improve safety conditions at worksites.



A full-page photograph of Mr. Harry K.C. Wong, a middle-aged man with glasses, smiling. He is wearing a white long-sleeved shirt, a yellow patterned tie, and dark grey trousers. He stands with his hands clasped in front of him. To his left is a large white planter containing a green plant. The background is a grey stone building with a large, ornate wooden door on the right and a window on the left.

## MR. HARRY K.C. WONG

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“The challenge then was that a lot of employers had very little safety knowledge, or the feel of how to protect workers.”

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*Former Deputy Divisional Director  
of Policy, Training, Work Injury  
Compensation, Ministry of Manpower*

## PIONEER PROFILE

# A Tireless Champion of Safety

Smart, eloquent and full of gusto, Mr. Harry K.C. Wong proves that age is just a number. Despite having retired for 10 years, the charismatic speaker still holds strong and passionate views about Workplace Safety and Health (WSH) issues. It is this tangible passion that has made Mr. Wong a highly revered figure in the eyes of many of his peers and ex-colleagues.

Mr. Wong's role in improving Singapore's safety landscape spanned three decades. Having laid the foundations of today's exceptional standards for WSH, he paved the way for legislations and policies concerning WSH promotion, training and workmen's compensation from the 1970s to the early 2000s. Brimming with personal maxims, Mr. Wong imparts how this journey started, and the wisdoms he learnt along the way.

In 1972, Mr. Wong began his career at the then Ministry of Labour (MOL) after completing his undergraduate training at the University of Tasmania. After 18 months of serving as the understudy to the World Health Organization expert who was posted in Singapore, Mr. Wong set up the Industrial Hygiene Section in 1973. This section was then operating under the Industrial Health Unit. He was later posted to the Factory Inspectorate, where he worked in various roles until his retirement in 2005 as Deputy Divisional Director of Policy, Training and Work Injury Compensation.

Mr. Wong looks upon those early years as an uphill but necessary battle for him and his team. "In those days in the 70s, even up to 1978, we had to fight tooth and nail for everything that we needed to promote safety," he recalls.

When Singapore was still developing its economic infrastructure by investing heavily in the industrial revolution, many did not prioritise safety, but the Ministry did. "The challenge then was that a lot of employers had very little safety knowledge, or the feel of how to protect workers," Mr. Wong remarks.

Promotion was therefore crucial to ensure that both employers and employees were informed and trained on WSH legislation and policies. "It takes at least three to four years for [legislation] to be internalised, for it to be accepted in the industry – that's why we need promotion," Mr. Wong explains.

However, promotion was costly, and it proved arduous to acquire funding. With a light-hearted chuckle, Mr. Wong recalls the moments when he had to roll up his sleeves and work twice as hard to get the funding required for promotional and educational work.

"As the saying goes – we have to be innovative," he says with a knowing smile. In the 1980s, Mr. Wong began setting up exhibition and seminar committees that would source funding from the industries to package exhibitions and safety orientation programmes for manufacturing industries.

At the height of the Ministry's promotional activities, Mr. Wong recalls providing safety orientation programmes for 120,000 workers and 20,000 to 25,000 supervisors a year – a valiant feat for MOL at the time.

Mr. Wong's efforts did not sail by without results. After several years of staging mobile exhibitions, MOL succeeded in setting up a proper Occupational Safety and Health Training Centre in 1991 with the aid of the Ministry of Finance. "That's really my pride and joy – that we finally had a place." Mr. Wong beams.

Besides being admired for his tenacity, Mr. Wong was also known to throw hardballs to curb all sorts of WSH offences.

"I was not the most popular person back in the day," he reminisced. "Every few years, I would up the penalty," he says, referring to the legislation in shipbuilding, ship repairing, and construction industries.

This forthright attitude was already evident in his younger years. Concerned by the lack of control on silica dust in sand and granite quarries and related worksites, the then fledgling engineer penned a robust and candid letter to a major construction agency and followed through with other measures to ensure that the department understood the gravity of the problem.

Simply put, Mr. Wong was not afraid of ruffling feathers if it helped to get the message across and put others on the right track to safety. He sums up this principle with an old Chinese saying, "有理走天下 (yǒu lǐ zǒu tiān xià)."

"It means, [if] you feel that you're right, you go for it all the way!" Mr. Wong says triumphantly.

At the heart of Mr. Wong's dedication is an understanding that good WSH could help save lives and improve the well-being of many. This human aspect of promoting WSH was what inspired him to go the extra mile everyday.

After Mr. Wong left the Ministry, he went on an extended trip to complete his personal projects. He later teamed up with a group of friends to engage in charity work in Singapore. Today, Mr. Wong continues to offer advice and guidance on WSH matters on a pro bono basis.

# DR. MAGDALENE CHAN

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“I felt this was  
interesting work  
that I could make  
a contribution to.”

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*Former Director of the Occupational Health  
Department, Ministry of Manpower*



## PIONEER PROFILE

## Helming the Fort With Passion and Commitment

Sometimes we find our life's mission in the most unexpected places. Dr. Magdalene Chan was just a young medical student when she found her calling amidst the arid grind of granite quarries and an asbestos factory. And she had another pioneer in occupational health to thank for it.

The realisation came to her when she took part in field trips conducted by Dr. Chew Pin Kee, then Director of the Industrial Health Unit. Witnessing in person the health risks that workers had to cope with at the time sparked her desire to make a difference. "I felt this was interesting work that I could make a contribution to," Dr. Chan recalls.

Upon joining the Ministry of Labour in 1973 as Medical Advisor, Dr. Chan quickly immersed herself in the subject of occupational health. Fatal and debilitating diseases such as silicosis, asbestosis and occupational cancer became common terms in her lexicon as she set her mind on learning about and tackling these diseases head-on. Sharing her passion in this mission was a multidisciplinary group of occupational health professionals, including doctors, nurses and industrial hygiene and inspectorate staff.

Following in the footsteps of Dr. Chew Pin Kee and Dr. Phoon Wai Hoong, her eminent predecessors, Dr. Chan became Director of the Occupational Health Department in 2001. "By [then], we had an experienced team of occupational health specialists," she notes with pride.

Helming the Department was an enriching experience for Dr. Chan, who always embraced new opportunities to learn and grow. In her capacity as Director, she oversaw the wide-ranging scope of work that the Department engaged in, which included standard-setting, research, training and promotion.

However, the beginning of the new millennium was not without its share of challenges. Among them was the slew of health crises that rocked Singapore in the early 2000s. "Singapore was as unprepared as the rest of the world for the new threats of SARS and Avian Influenza," Dr. Chan recalls.

These proved to be a massive test for the Ministry and other government agencies involved. Dr. Chan was among those in the thick of the action, and she recounts the tenacity with which every individual pulled together to curb the potential epidemics, each committed to do his or her best.

"[It was] a coordinated national effort with prompt and decisive action and the support of the community – particularly in compliance with stringent quarantine and infection control measures."

Dr. Chan also played a significant role in shaping the backbone of the Occupational Safety and Health Division (OSHD). "I was fortunate to be involved in reforming the now much strengthened OSHD under the stewardship of Er. Ho Siong Hin," she says.

She also helped see through the OSH Framework in 2005, which served as a personal milestone for her. "My involvement in this initial journey was a rewarding experience," she attests.

Yet the crowning reward for Dr. Chan's hard work might be the encouraging changes she has seen in the current WSH landscape. "There has been a shift in attitudes from stakeholders – particularly [in] employers," she affirms. "WSH is not merely seen as a cost associated with regulatory compliance [anymore], but [also] good for business."

Dr. Chan is equally heartened to see the impact that OSHD has made on the international stage.

"Despite our small size, Singapore is recognised internationally for its efforts and contributions in the area of Workplace Safety and Health (WSH). OSHD is now a World Health Organization Collaborating Centre for Occupational Health and the International Labour Organization-CIS National Centre for Singapore," she shares.

Looking towards the future of WSH, what does Dr. Chan hope to see? "Continued success in Singapore's WSH activities and international recognition of the efforts of OSHD, the WSH Council and [its] stakeholders," she replies.

After her retirement in 2006, Dr. Chan continues to enrich her life with new experiences. This means setting her sights on matters beyond WSH. While enjoying her pleasant duties as a doting grandparent, she finds time to appreciate what Singapore and the world have to offer in terms of leisure and learning. She also volunteers as a member on the Research Committee of the Singapore Children's Society, which conducts research to help identify social trends and issues related to children, youths and families in Singapore.

A full-page photograph of Mr. Tan Pui Guan, an elderly man with glasses, wearing a white shirt and a blue patterned tie. He is standing with his arms crossed in front of a modern building with a glass facade. The image has a teal color cast.

# MR. TAN PUI GUAN

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“Promoting  
safety has to  
be a two-way  
process.”

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*Former Chief Inspector of Factories  
and Director for Occupational  
Safety and Health Division,  
Ministry of Manpower*

## PIONEER PROFILE

# Leading the Way Through Dialogue and Action

**H**aving dedicated much of his life to advocating Workplace Safety and Health (WSH), it is fair to say that Mr. Tan Pui Guan has seen it all. From Singapore's early chapters of industrialisation to its vibrant and multifaceted economy today, Mr. Tan has been entrenched in the thick of the WSH landscape since the beginning of his career.

Like some of his fellow pioneers, Mr. Tan's early role echoes the most urgent WSH challenge in newly-industrialised Singapore. Starting out as a Factory Inspector, Mr. Tan inspected machineries that powered Singapore's rapidly growing industries back then, from pressure vessels to cranes and other lifting equipments.

He reflected on the steep learning curve involved in monitoring safety amid this tumultuous period. "In the 1960s, Singapore just started industrialisation, so our industry was not very safe. There were not many inspectors at the time and all of us were very new. In early 1970s the Ministry engaged an expert from the International Labour Organization to teach us. We realised then that we needed to learn [the] best practices from leading countries."

His keen insight and resilience continued to follow him as his career progressed. These qualities made him the perfect fit to helm the newly burgeoning Occupational Safety and Health Division (OSHD) in its early years.

In his new role, Mr. Tan was astute in leveraging on the transitional changes of the decade. The turn of the millennium saw Singapore embracing a new wave of technologies as computerisation became increasingly prevalent in workplaces. Seeing its potential, Mr. Tan nudged OSHD to adopt this new technology, a move that greatly improved its efficiency.

The switch to online computerised systems proved especially useful when it came to dispensing work permits. "Initially, the construction workers were issued with [a] block permit," Mr. Tan explains. "In a block permit, the names of 20 to 30 persons working in a company were written on one sheet of paper. Each work permit holder was then given a photocopy. I changed the system so that each individual would get a hard copy with a photograph. This [allowed] the enforcer to check the identity of the work permit holder," Mr. Tan adds proudly. While processing used to take many days, the online computerised system ensured the permits could be dispensed between one to two days.

In addition to keeping up with the times, Mr. Tan tirelessly led the efforts to engage industries to better regulate themselves. "The industries needed the knowledge of [safety management]. The Ministry had to help them acquaint with knowledge on how to improve [their safety records]. This was where lectures, training and promotion came in," he says. "We set the standards for them to follow. We produced publications that were distributed to the industry free of charge to disseminate information and encourage them to improve safety."

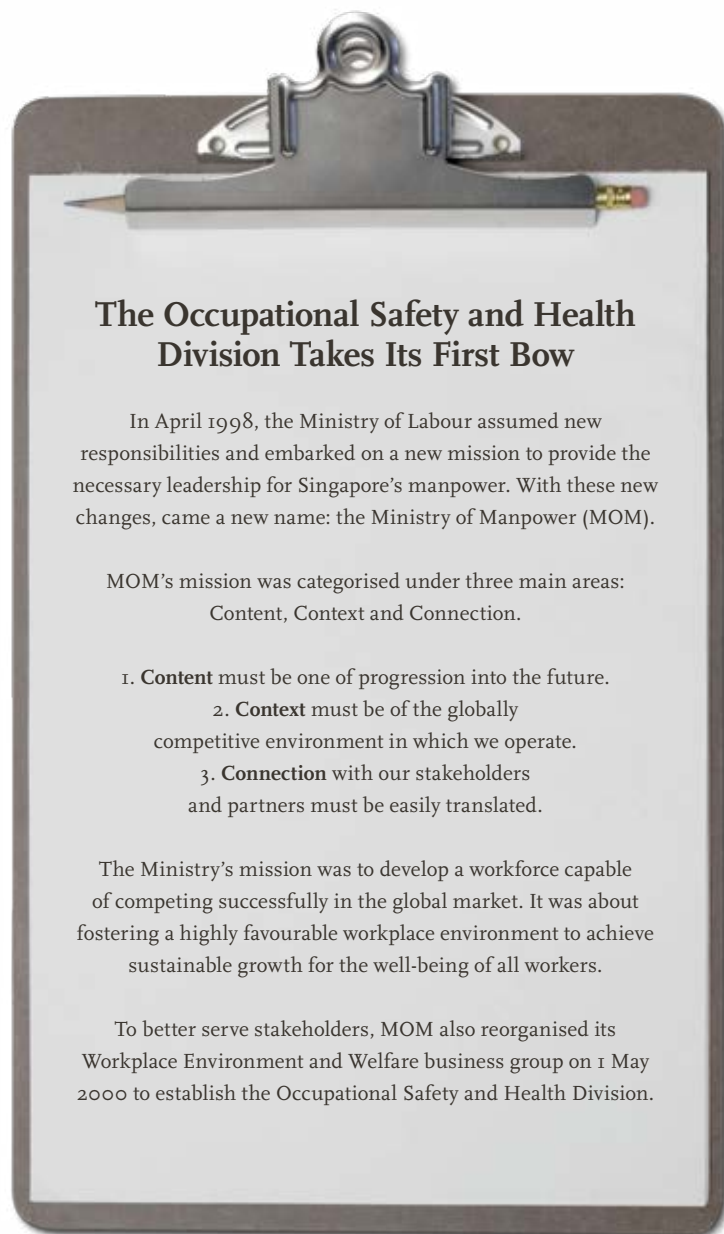
As Mr. Tan sees it, promoting safety has to be a two-way process. "We engaged in dialogue sessions with the management." At the time, Mr. Tan recalls, construction and marine were two industries where accident rates were the highest. "So every six months, I had [a] dialogue session with each [of] these two industries. During the dialogue session, the Ministry would brief the industries on past serious incidents. Measures to be taken to improve the safety of workplaces would also be discussed. An action plan would be worked out. Each party had to follow up on the action plan and [provide] feedback in the next dialogue session."

His staunch commitment to improving the industry had not gone unnoticed. In 1998, the Association of Singapore Marine Industries (ASMI) commended Mr. Tan with the ASMI gold award for his invaluable contributions.

The same commitment also saw Mr. Tan and OSHD going the extra mile to help neighbouring countries improve their WSH standards. Working in conjunction with the Ministry of Foreign Affairs, the Division organised Safety Officers' Training Courses for ASEAN countries. Each year, two safety inspectors from each ASEAN country were sponsored to attend the course.

Fondly reminiscing on his career, Mr. Tan shares the thought that has motivated him to stay the course for more than three decades. "The main reason is not money. It's about saving people's lives. I always tell people: no one knows that his life was saved by us, but we know how many lives were saved from the statistics. When you know you've done your job to save people's lives and prevent injuries, you feel happier."

After Mr. Tan retired from the Ministry in 2005, he opened a new chapter in his career. Together with a group of senior officers from the Ministry, Mr. Tan set up a safety and consultancy firm named Team-6 Safety Training and Consultancy (S) Pte. Ltd. to provide safety training and consultancy services to the industries. He was also engaged by Keppel Shipyard Ltd. as a part-time Occupational Safety and Health Consultant to advise the yard on WSH matters. He also served as Alternate Chairman of the Health and Safety Technical Committee at the Institute of Engineers, Singapore. In 2009, he left his lifelong career in WSH to spend more time with his family.



## The Occupational Safety and Health Division Takes Its First Bow

In April 1998, the Ministry of Labour assumed new responsibilities and embarked on a new mission to provide the necessary leadership for Singapore's manpower. With these new changes, came a new name: the Ministry of Manpower (MOM).

MOM's mission was categorised under three main areas:  
Content, Context and Connection.

1. **Content** must be one of progression into the future.
2. **Context** must be of the globally competitive environment in which we operate.
3. **Connection** with our stakeholders and partners must be easily translated.

The Ministry's mission was to develop a workforce capable of competing successfully in the global market. It was about fostering a highly favourable workplace environment to achieve sustainable growth for the well-being of all workers.

To better serve stakeholders, MOM also reorganised its Workplace Environment and Welfare business group on 1 May 2000 to establish the Occupational Safety and Health Division.

## STAYING THE COURSE THROUGH FINANCIAL CRISES

In 1997, Asia was hit by a massive economic crisis caused by plunging currencies all across Asia. Despite not taking a direct hit, close economic ties to Singapore's neighbours brought forth the spill over effects that seeped into Singapore's financial landscape.

Singapore's export and regional demand dropped dramatically and its banks were weakened by the economies in third-country markets. Many companies went bankrupt and many others turned to cost-cutting measures such as downsizing and retrenchment.

Shortly after, Singapore was hit by yet another recession in 2001 – this time registering as one of

the longest-drawn recessions of its time. The dotcom bust, falling global demand for electronics and the September 11, 2001 terrorist attacks on New York's World Trade Centre contributed to an economic downturn that lasted two years. In 2001 alone, 79,900 jobs were lost as companies scrambled to recover losses and avoid bankruptcy.

While the nation responded to this challenge with the vigour and resilience that characterised its people, the recession did not pass without leaving a significant impact on the WSH sector.

"Let's be honest about it – [each] of these [incidents] have an impact on the Ministry's work in occupational safety and health," said former MOM Deputy Divisional Director of Policy, Training and Work Injury Compensation, Mr. Harry K.C. Wong.

Due to the underlying belief that WSH meant extra expenses, convincing the industry to institute safety measures during times of economic turmoil proved to be an uphill battle. However, the Ministry was sympathetic to these financial concerns and was careful to manage their policies in a way that would alleviate the costs attached to them.



**TOP:**  
Economic turmoil in the late 1990s and early 2000s sent companies all over scrambling to recover and protect their fiscal assets.

**BOTTOM:**  
The Ministry began persuading contractors to switch to metal scaffolding in the early 2000s to increase the overall safety of worksites.

In a pertinent example, Mr. Wong quoted the transition of wooden scaffolding to metal scaffolding in the late 1980s. Prior to the 1980s, contractors would employ wooden scaffolding imported from Batam. However, as the construction industry advanced, wooden scaffolds were no longer adequate to withstand heavier and more complex structures. These wooden scaffolds were bordering on becoming hazardous fixtures, endangering the safety of workers.

Aware of these impending dangers, the Ministry began to formulate new legislations of replacing wooden scaffolding with metal scaffolding at worksites. The introduction of metal scaffolding was not without a hefty price tag, however. The overall expenditure was going to cost the construction industry approximately S\$200 to S\$250 million, and the Ministry knew that this was going to be met with resistance from contractors who would bear these costs.

“The contractors in those days are big firms. They’re not going to spend aggregately S\$200 million to improve your scaffolding, and probably another S\$50 to S\$60 million to change from wooden platforms to system platforms, which we have been pushing in terms of technology [and] mechanisation,” Mr. Wong explained.

Despite the daunting cost and potential contention from contractors, the Ministry still had a responsibility to implement their WSH duties. The shift to metal scaffolding was crucial in ensuring safer working conditions and to prepare the industry adequately for the future.

With that in mind, MOM worked fastidiously with MOF and the Ministry of National Development. The three Ministries endeavoured to implement the pricey legislation in a way that would take into consideration the challenges facing the industry.

“The Ministry is not unfeeling,” Mr. Wong reasoned. “We were not going to bring this [legislation] in at the height of the Asian Financial Crisis in 2001, or even two years down the road in 2003.”

And so the Ministries adopted the strategy to incentivise the shift of wooden scaffolds to metal scaffolds by amortising the payment in three years instead of five. This arrangement not only allowed contractors to clear payments in a shorter time, but it also prevented them from spending on interest that would have accompanied a longer payment period.

Gradually, contractors came on board to install metal scaffolding in replacement of wooden ones. This success was regarded as one of the Ministry’s biggest victories. The empathetic style heralded MOM’s new approach to policymaking. Instead of a purely aggressive push, the Ministry sought to engage industries with an encouraging nudge in the right direction.

This method of incentivising costly rollouts was also applied to future systems later on, such as that of the gondola – a system of hanging scaffolding used commonly in construction sites and shipyards.

On top of keeping the economy afloat, the beginning of the millennium also saw the nation overcoming the threat of two major global epidemics.



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*A coordinated national effort through prompt and decisive action, with the support of the community, particularly in compliance with stringent quarantine and infection control measures, is important to limit the consequences [of] such outbreaks.”*

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Dr. Magdalene Chan, former Director of the Occupational Health Department, Ministry of Manpower

**BOTTOM:**  
Quick to take action: Former Deputy Prime Minister and Minister for Finance Mr. Lee Hsien Loong, Former Prime Minister Mr. Goh Chok Tong, Former Minister for Home Affairs Mr. Wong Kan Seng and Former Minister for Health and Second Minister for Finance Mr. Lim Hng Kiang discussing the issue of SARS with grassroots leaders at the Kallang Theatre in May 2003.

## STEERING THROUGH TROUBLED WATERS

In March 2003, trouble brewed when a young Singaporean woman returned from Hong Kong with the first case of Severe Acute Respiratory Syndrome (SARS). The virus claimed 33 lives within four months before SARS was officially eradicated on 16 July 2003.

MOM was swift to take precautionary measures when news of the global epidemic reached Singapore's shores. Together with the Ministry of Health (MOH), MOM took the first step by managing manpower-related issues, with the objectives of preventing and containing the outbreak of SARS, ensuring business continuity, as well as educating and helping companies to manage the outbreak.

Foreign workers arriving from SARS-hit countries were required to be quarantined in dormitories for 10 days. Infected workers were admitted to the hospital for treatment. Workers who showed no symptoms of the infection were allowed to start work. Those that did were sent to Tan Tock Seng Hospital for examination. Even if examination results showed that workers were not infected, these workers were still placed in isolation away from other workers until their symptoms subsided.

The Occupational Safety and Health Division (OSHD) also conducted briefings to employers on SARS and workplace-related issues, including how to minimise the risk of SARS at the workplace. Advisories were prepared, in the form of posters and pamphlets, and given to foreign workers and their employers to educate them on precautionary measures to safeguard their health and prevent the spread of SARS. To bridge the language barrier, advisories were produced in different languages such as English, Mandarin, Malay, Tamil and the various languages of the foreign workers. The advisories could also be conveniently found on the MOM website. An important part of Singapore's national effort to contain the SARS outbreak, was to trace the contacts of a person who had probably contracted SARS, and quarantining them if necessary. OSHD was part of the multi-ministry effort to do contact tracing.

As a result of the intensive public health measures undertaken by the Whole of Government, the SARS outbreak in Singapore was contained within two months. On 31 May 2003, Singapore was declared free from SARS by the World Health Organization (WHO). WHO subsequently declared that SARS outbreaks had been contained worldwide in July 2003.



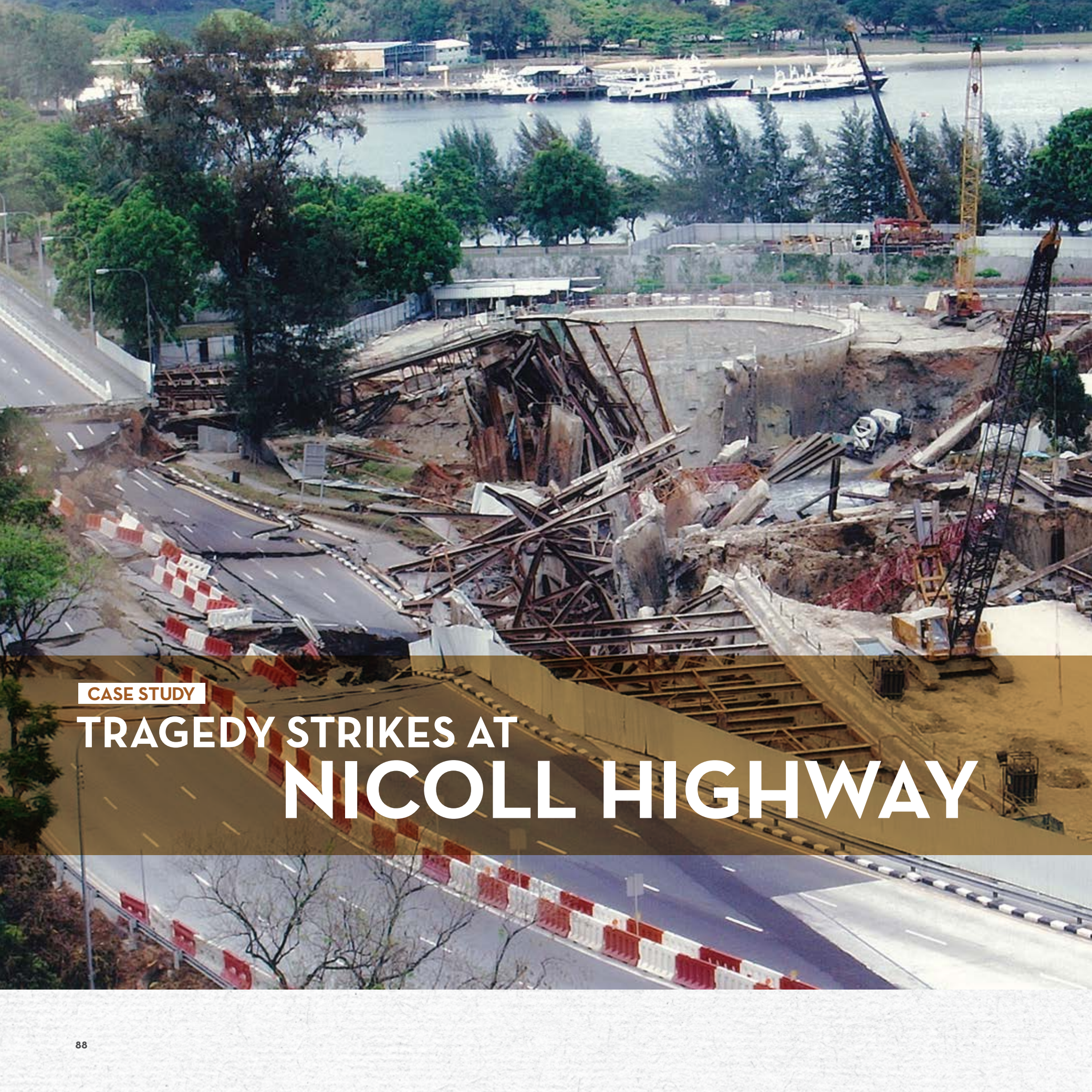
## APPROACHING THE MILLENNIUM WITH A NEW WSH FRAMEWORK

WSH emerged as a critical area of concern in 2004 with major accidents coming under public scrutiny, such as the Nicoll Highway collapse, along with other high-profile accidents such as the Keppel Shipyard flash fire and the collapse of the steel structures at Fusionopolis. Despite overall standards having improved in recent years, this string of devastating accidents served as a grave lesson in the dangers of complacency. Coverage of the event also led to a rise in public expectations for better safety performance, and a decisive turning point in Singapore's safety journey. The call for meaningful WSH change culminated with the reform of the WSH framework in 2005.

### BOTTOM:

As the decade raised WSH standards to new heights, workers across all sectors were reaping the benefits of a safer and healthier workplace.





CASE STUDY

# TRAGEDY STRIKES AT NICOLL HIGHWAY



**LEFT:**  
Inspectors measuring the fallen diaphragm wall that was used to support the structure.

**BOTTOM:**  
Scaffolding and machinery buried under the debris.

**RIGHT:**  
The adjacent road of the worksite that gave way, affecting traffic flow from both sides.



**LEFT:**  
A bird's eye view of the tragic collapse of Nicoll Highway.



On the afternoon of 20 April 2004, adversity struck when a construction tunnel beneath Nicoll Highway gave way, killing four people in its collapse.

The tragedy did not occur in an instant. Omens of the impending cave-in were already showing on the morning of the disaster. As early as 9 a.m., construction workers could hear reverberating noises from the waler beams that supported the tunnel. Upon inspection, it was found that several beams had buckled and sagged, and this anomaly was conveyed back to the project management team.

Believing that the buckling beams were nothing more than minor irregularities, orders were given out to pour cement into various areas of the structure to stabilise the unit. Everyone pitched in to accomplish the order, but as it was later discovered, this was still highly inadequate to hold the structure in place.

At 3 p.m., workers noticed that something was amiss and a sense of panic began to creep in. The previously poured concrete had started to flow out of the structure – an indication that the structure was starting to bend inwards. Additionally, the clanging noises were also becoming more frequent. Workers talked amongst themselves, saying that things were “getting from bad to worse”, and two workers refused to continue working. Cementing works were still being carried out at this point.

At 3.30 p.m., disaster struck. Workers were still working in the excavation pit when the surrounding walls of the structure started to cave in. Joints, metal beams and large cranes began falling into the pit as the earth beneath gave way. Workers scrambled to rush out of the pit – all whilst dodging tumbling scaffolding and falling metal beams through clouds of smoke and dust. While many of the workers survived the ordeal, four lives were lost in the tragic incident.

The tragedy left an indelible mark in Singapore's history. Wrenching tales from survivors and the victims' loved ones poignantly drove home the

**BOTTOM:**  
An unhinged strut, part of the collapsed support assembly.

**RIGHT:**  
The intersection of the fallen structure.



incalculable cost of overlooking safety. While buildings or bridges can be rebuilt, nothing can make up for the loss of a loved one.

The grief and shock soon gave rise to a new sense of urgency, and the wheels of reform turned quickly. Two days after the incident, a Committee of Inquiry was appointed to carry out the investigation. On top of identifying the factors that led to the failure of the excavation work, the Committee was tasked with proposing recommendations to prevent a repeat of this tragic incident. Bestowed with this urgent mission, the Committee worked to gather the facts at a brisk pace.

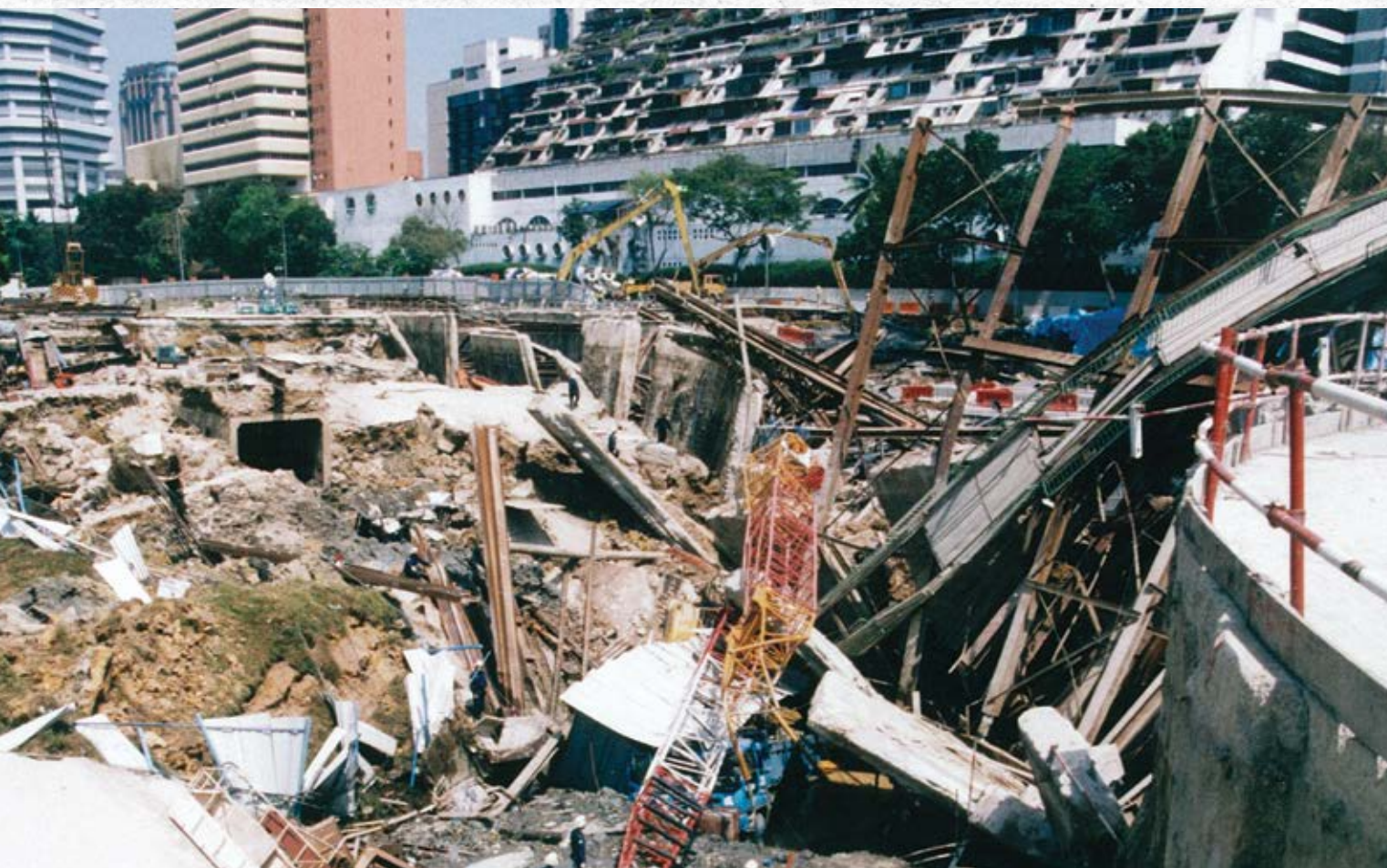
By 30 August 2004, 103 out of 155 witnesses had spoken at the inquiry. While the inquiry was unfolding, the Committee also prepared an Interim Report. The full document was submitted to the Ministry of Manpower (MOM) on 3 September 2004, ahead of the completion of the hearing. In the official response to the Interim Report, published on 13 September 2004, the Government readily accepted the broad thrusts of the recommendations. This included the necessity of establishing risk management, safety processes and a stronger commitment to safety culture.

To restore public confidence, the response also shared the steps taken to bolster the safety of the Circle Line (CCL) project sites. For example, following the collapse of Nicoll Highway, the Building & Construction Authority (BCA) asked the Land Transport Authority (LTA) to suspend deep excavation works at all CCL Project Sites as a precaution. Subsequently, BCA and LTA's Building Control Unit carried out a comprehensive review of the 14 active CCL project sites.

Where necessary, extra measures were implemented to prevent material overstress. An early warning system was also put in place. This included the establishment of a formalised procedure for taking readings, evaluation of results and reporting. When properly set up, such measures would allow workers to identify foreseeable risks.

Based on the Committee's inputs, contractors would also be held to a higher standard of professionalism. For example, contractors would be required to seek approval from Professional Engineers, Qualified Persons and LTA. The aim was to ensure that only those with the requisite competence would be allowed to undertake specialised construction works.





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*We must act decisively to regain our high safety standards. The fatalities in these six months are a cruel reminder that there is no room for apathy and complacency in your efforts to ensure the safety of your workers [...] I therefore urge all of you to make safety at your workplace a personal priority.”*

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Dr. Ng Eng Hen, former Minister for Manpower, speech at the Annual Safety Performance Awards 2004 on 22 July 2004

## Nicoll Highway opens after \$3m in repairs

AT 1pm yesterday, Nicoll Highway was back in business.

Tourists, construction workers and curious passersby stood on either side of the semi-expressway, cheering as the first vehicle — a white Mercedes-Benz — sped down the newly laid asphalt.

Perhaps because few knew about the reopening, there were relatively few vehicles on the six-lane highway.

Before parts of it collapsed in April, peak-hour traffic was 2,500 vehicles an hour in each direction.

More than seven months after the tragedy that killed four men, and after a \$3 million reconstruction, SBS Transit driver Ng Hun Chew said it's time for a new chapter.

"It was a tragedy, but we have to let it go now. Let's hope that whatever happens on this highway in future will be positive."



THE SIX-LANE HIGHWAY, which was closed in April, used to have peak-hour traffic of 2,500 vehicles an hour in each direction.

PHOTO: LAU FOOK KONG

LEFT:  
Overlooking the depth of the collapse.

TOP:  
The reopening of Nicoll Highway was met with cheers by tourists and locals alike.

## S'pore's longest public inquiry

THE Nicoll Highway case became Singapore's longest public inquiry, involving 173 witnesses and 20 experts over 88 days of hearings.

Opened last August, the inquiry finally submitted its report, all two volumes and 1,000 pages of it, to Manpower Minister Ng Eng Hen on Wednesday.

There is even a 14-minute DVD, with information on events leading up to the collapse, that comes with the report.

Filled with technical jargon, the inquiry report lays out its findings in complex engineering and legal terms.

Volume one of the inquiry report on the Nicoll Highway case deals with the main issues of the collapse: the conditions in which the accident occurred, the events leading up to it, the collapse itself, the causes of the tragedy, criminal liability and safety.

A whole chapter is also devoted to the inquiry's recommendations and observations on the tragic accident.

At the front of the report, in sobering contrast to the complexity inside, there is a simple message of condolence to the families of the four men killed in the collapse. They

were Land Transport Authority site inspector John Tan Lock Yong, 56; crane operator Vadivil Nadeson, 44; construction worker Liu Rong Quan, 36; and foreman Heng Yeow Phoeow, 40.

Numerous photographs in the report also serve as a reminder of the magnitude of the collapse.

There are aerial views of the disaster site, pictures of the rescue operations and even shots of the support structures buckling under the weight of soil.

Accompanying the inquiry report are also every graph, diagram and chart used to establish the chain of events that led to the tragedy.

An entire second volume of appendices is devoted to supporting documents, including lists and accounts of experts, witnesses and exhibits submitted for the inquiry.

There are even pages given over to recommendations solicited from groups in the construction industry, professional bodies and the media.

The inquiry report into the Nicoll Highway case is available on the Manpower Ministry's website at <http://www.mom.gov.sg>



PHOTO: ALBERT SIM

A MASSIVE BODY OF WORK: The two-volume 1,000-page report of the inquiry probing the Nicoll Highway case was submitted to Dr Ng on Wednesday.

## The FINAL report

When Nicoll Highway collapsed on April 20 last year, the Government appointed a three-man panel to examine the causes of the accident, recommend ways to prevent another such disaster, and determine if there was negligence, including criminal liability.

### The report: An excerpt

#### The cause and contributory causes

"THE April 20, 2004, Nicoll Highway collapse... was rooted in history.

It began with two critical design errors. These were the under-design of the diaphragm wall... and the under-design of the water connection in the strutting system.

These design errors resulted... in the failure of the sixth-level cross-water connections together with the inability of the overall temporary retaining wall system to resist the redistributed loads as the sixth-level strutting failed.

The catastrophic collapse then ensued.

The collapse did not develop suddenly. A chain of events preceded it.

Several technical and administrative factors contributed to the collapse. From the early stages... through to the final collapse, there were failures to demonstrate the necessary level of care.

Serious human errors were made. Warnings of the approaching collapse were present from an early stage but these were not taken seriously. The builder did not adequately deal with insidious warning signs.

A multiplicity of events led to the position where design, construction, instrumentation, management and organisational systems used by the builder and their sub-builders failed.

There were failures in the defensive systems. There were no proper and appropriate design reviews. There were inadequate contingency and remedial measures.

Two significant contributory factors are the abuse of the back analyses... where the collapse took place and the failure to institute a regular, close and effective monitoring regime.

The two critical back analyses... were geotechnically flawed. There were repeated breaches of the instrumentation review levels.

All the experts agreed that on the basis of the second back analysis... work should not have been allowed to proceed in that area.

The catastrophic collapse was the final nail in mounting incidences and warnings... over six hours on April 20, 2004, from the heart of the strutting system.

Time took its toll. At 3.30pm... Nicoll Highway collapsed.

The blame for the collapse falls squarely on the builder, Nohmatsu-Lum Chang Joint Venture.

The Nicoll Highway collapse could have been prevented."

The adequacy of emergency evacuation procedures was another issue raised in the Interim Report. With this concern in mind, MOM conducted its own inspections into LTA's deep excavation sites.

The results revealed ample room for improvement. Although safety evacuation procedures were already established at these sites, there was an absence of clear guidelines. Many were still uncertain about the types of situations that require an evacuation.

To address this, MOM and LTA's safety department summoned all the Registered Safety Officers (RSOs) who were working for the contractors involved in deep excavation projects. During the meeting, all RSOs in attendance were instructed to work with LTA to establish clear criteria on when to activate emergency evacuations.

In addition to the various individual initiatives in place, the Committee stressed the need to think about the bigger picture. To prevent future accidents, a "band aid" approach was not enough. This was a wake-up call that could not be ignored.

One pioneering MOM engineer and Director of Policy, Information & Corporate Services of OSHD, Er. Mohd Ismadi, who was Secretary to the Committee at the time, recalls the incident with much sadness. "The scale of it is quite daunting; the number of witnesses, parties involved, world-class

LEFT:

A news article recounting the Nicoll Highway incident and the inquiry into its causes.

geotechnical experts, documents, drawings, the technical complexity was simply unprecedented in all past inquiries," he shared. Er. Ismadi remembers getting wind of how the victims' families and co-workers were coping. The recollections resonated deeply with him. "To this day, that footage of [the family and children] attending that wake of one of the deceased foreman is always permanently etched on my mind whenever the subject of Nicoll Highway incident is mentioned."

The tragedy cast a sobering shadow on the nation, but it came with a silver lining. Following the incident, a new WSH reform began to take shape. In 2005, the new WSH Framework was put into place to advocate greater ownership of WSH outcomes. While the gears of change were turning at the Ministry, the industry also took note of the changes that were being rolled out. The following decade became a period of significant progress, as the Ministry worked hand in hand with partners and the industry to take WSH to the next era of excellence.

“

*I saw a couple of witnesses broke down and cried on the stand,” (referring to the court proceedings). “These are colleagues of the deceased [...] so you can see the bosses and supervisors sitting there on the stand. They felt very sorry for their fallen colleagues. So we have seen grown men just crumbled and broke down and this is something that I will remember forever.*

”

Er. Mohd Ismadi, Director of Policy, Information and Corporate Services of the Occupational Safety and Health Division, Ministry of Manpower and Secretary to the Committee of Inquiry for the Nicoll Highway Collapse

## CASE STUDY

# THUMBS-UP FOR EPSON INDUSTRIAL

Singapore Epson Industrial was one of the first companies to benefit from the new Tax Incentive Scheme for Noise Control. The scheme was introduced by the Ministry of Manpower and Ministry of Finance in 1998. Under the scheme, companies with effective measures to reduce noise levels to 83 dBA were entitled to attractive tax incentives from the Year of Assessment

1999. Singapore Epson Industrial invested about S\$120,000 to enclose its 11 stamping machines with special acoustic materials, successfully reducing levels from 90 dBA to below 80 dBA. Through these control measures, the company had created a safer and quieter working environment for some 25 employees.

**BOTTOM:**  
Ear protection  
safeguards workers  
from high levels  
of noise in the  
workplace.



## Tapping Into New Technologies to Stay Ahead



The turn of the new millennium brought along an exciting wave of technologies. Ever adaptive to change, OSHD was quick to embrace these new solutions.

Aptly named the Integrated Occupational Safety and Health System (iOSH), the platform serves as a primary processing and transactional system in all matters relating to OSHD. Under iOSH, processes that took longer times in the past, such as incident reporting, could be better streamlined. One example could be found in the introduction of iOSH's one-stop incident reporting system – iReport.

The introduction of iReport in March 2006 accompanied new regulations that expanded the scope of requirement for reporting WSH accidents to include all workplaces. It is also now mandatory to report work-related accidents in which workers are given more than three days of medical certificates, whether consecutive or spread apart.

To overcome the obstacle of mobility, OSHD has also extended the iOSH system for mobile usage. With Mobile iOSH, OSHD inspectors can reduce turnaround time and various costs involved with inspection duties.

Enhanced mobile capabilities also provide OSHD with an opportunity to engage with the public. Snap@MOM, the first mobile application developed by MOM at a national level, allows any witnesses of WSH issues or best practices to report their findings instantly. The issue of occupational health is addressed via ergo@WSH, another app developed by MOM.

The safety and practicality of inspection work is another area OSHD has sought to address. To carry out

enforcement operations, OSHD personnel often have to face various risks and hazards. To mitigate this issue, OSHD is exploring the use of a new technology that has just begun to see wider adoption.

The Unmanned Aerial Vehicle (UAV) represents a potential breakthrough in executing WSH monitoring tasks safely, affordably and efficiently. A proof of concept testing held from January to May 2015 illuminated UAV's potential in assisting with accident investigations.

Despite its massive potential, adopting the nascent technology comes with a few challenges, such as Singapore's weather conditions and stringent air regulations. Fortunately, OSHD is not alone in pushing for the use of UAV. Driven by an initiative by the Ministry of Transport, agencies, regulators and various stakeholders have brainstormed and addressed the issue extensively, after which a UAV Steering Committee was set up. Two workgroups have also been launched – one to look into use cases, and another to attend to matters of policies and technology. In a promising development, OSHD, along with Singapore Civil Defence Force and the Maritime and Port Authority of Singapore, have been granted priority for operating a UAV by the Committee.

Moving forward, OSHD will continue to leverage on new technologies and tools to work more effectively and keep its processes apace with changing work landscapes.

## FROM PAPERWORK TO DIGITAL

### iOSH

iOSH is an integrated digital platform that serves as the primary processing and transactional system for all matters relating to OSHD. Now also available on mobile, it allows inspectors to access the platform from the inspection site.

### iReport

Introduced in 2006, iReport is a one-stop workplace incident reporting system for employers, workplace occupiers and doctors. It accompanied the introduction of the Workplace Safety and Health Act and the Workplace Safety and Health (Incident Regulations) Act.

### Snap@MOM

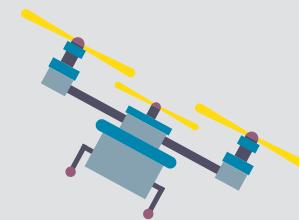
This app helps witnesses of WSH issues report their findings instantly by taking photos of both unsafe and commendable work practices, providing the relevant description and location, and sending the feedback to the workplace occupier to act upon.

### ergo@WSH

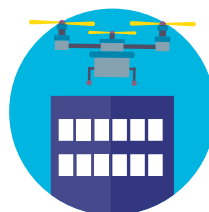
Designed to promote ergonomics in the workplace, this handy app helps the tech-savvy workforce identify ergonomic hazards, improve their postures and maintain musculoskeletal wellness with photo examples, instant posture analysis, and exercise tips.

## A NEW TECHNOLOGY TAKES FLIGHT

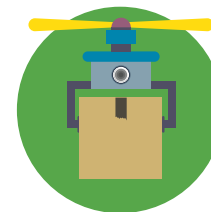
WSH inspectors often have to carry out physically strenuous or risky tasks in the course of their duties. This could mean having to climb up to a great height, or walking along the boom of a tower crane. Fortunately, an innovative technology may be able to provide a solution. As the adoption of UAV gains momentum, OSHD aims to harness this growing technology to make WSH enforcement and monitoring operations safer and more efficient.



### WITH AN UNMANNED AERIAL VEHICLE, OPERATORS CAN:



Access hard-to-reach areas.



Carry customisable payload.



Execute tasks too dangerous for humans.

### TO GET THIS TECHNOLOGY OFF THE GROUND, OSHD HAS:



Partnered with other government agencies, regulators, and various stakeholders to brainstorm the issue.



Conducted a proof-of-concept testing from January to May 2015.

### WHAT'S NEXT?

OSHD, along with the Singapore Civil Defence Force and the Maritime and Port Authority of Singapore, has been granted priority to operate a UAV by the UAV Steering Committee.



# 1998

- The Ministry of Labour became the Ministry of Manpower.
- The Tax Incentive Scheme for Noise and Chemical Hazard Control for factories was introduced.

# 1999

- The first award presentation for the Noise Control Awards scheme was held.

2000

- The Occupational Safety and Health Division was formed.
- The Debarment Scheme and the Demerit Points System was introduced.



# 2003

- The first case of SARS was detected in February.
- SARS was officially eradicated in July.



# 2004

- The Avian Influenza outbreak occurred. The Ministry of Manpower subsequently amended the Second Schedule of the Workmen's Compensation Act to include Avian Influenza as a compensable occupational disease.
- Nicoll Highway collapsed.

