

THE CONTRACTOR

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COVER STORY

SECURING WORKPLACE SAFETY & HEALTH IN A POST-PANDEMIC, RECOVERING CONSTRUCTION SECTOR

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MR NG YEK MENG
PRESIDENT,
THE SINGAPORE CONTRACTORS ASSOCIATION LTD

MESSAGE FROM THE PRESIDENT //



**...COLLABORATION
BUILT STRONGER
TRUST BETWEEN
THE STAKEHOLDERS,
CREATING AN
EVEN STRONGER
FOUNDATION TO
WORK TOGETHER ON
FUTURE PROJECTS.**



Dear members,

The first half of 2022 has passed, and the local built environment industry is gradually recovering from the worst of the COVID-19 pandemic. We are not totally out of the woods yet as the industry continues to face stiff challenges including high inflation for materials, fuels, equipment and also labour costs. We do not expect the recovery to be a smooth one but we believe we will be able to tide over this too.

During the most difficult times of the pandemic, the swift supporting schemes provided by our government helped to greatly soften the impact on the construction industry. However, for the many companies who are hard hit by the pandemic, it will take years for complete recovery.

But on the positive side, the pandemic exposed several vulnerabilities and inadequacies of our construction ecosystem which gave us great opportunities to reset our industry and to build more resilience and innovation into the ecosystem. This resulted in improved efficiency in the following areas:

1. INDUSTRY COLLABORATION

The need to overcome the issues brought on by the pandemic spurred higher levels of collaboration between the various stakeholders in the construction industry value chain.

The pandemic has taught us the importance of every single stakeholder in the value chain. The failure of just one stakeholder can affect the entire value chain. During this period, the stronger parties, from the client to the main contractors, had to play a proactive role to engage the other contractors, sub-contractors, and even workers to provide them the support required - including financial assistance - to ensure completion of project.



COLLABORATION

DIGITALISATION

“ MANY HAVE REALIZED THE BENEFITS OF TECHNOLOGY AND EMBRACED THE MORE EFFICIENT AND LESS LABOUR-INTENSIVE WAYS OF ENSURING PROJECT DELIVERY AND SUCCESS ”

This team collaboration built stronger trust between the stakeholders, creating an even stronger foundation to work together on future projects.

2. DIGITALISATION

The COVID-19 pandemic exacerbated the need for digitalisation. In the present acute labour shortage situation when international borders are closed, digital technologies and communication are extensively deployed so that work can continue as usual. Many have realized the benefits of technology and embraced the more efficient and less labour-intensive ways of ensuring project delivery and success. In this issue, look out for the interesting article on what this technological shift really means for some contractors.

3. SAFETY

Finally, I would like to talk about one of the most important subjects of our industry—SAFETY. With construction progress gaining pace in 2022, there have been some unfortunate fatal accidents across construction work

sites. SCAL is very concerned about the loss of lives due to such accidents. MOM, in an effort to remind the industry to stay vigilant, has called for a few “Safety Time Outs”. In order to prevent the loss of precious lives, and to avoid the delays in projects due to accidents, SCAL will continue to work with the industry with the objective of ensuring that our workplaces remain safe, risk-controlled, and disease-free for all workers. SCAL’s upcoming Safety Campaign in June will feature SCAL’s WSH Awards recipients to recognise their success in maintaining accident-free sites. These members will also share their WSH experiences so that other members can learn from them to achieve accident-free sites.

Moving forward, the construction industry needs to put in concerted efforts to focus on improving the key areas highlighted above. With this, I believe we can bring our industry standard to a higher level. //

SECURING WORKPLACE SAFETY & HEALTH IN A POST-PANDEMIC, RECOVERING CONSTRUCTION SECTOR

Singapore possesses one of the safest work environments among developed economies, with a 2021 fatality rate of only 1.1 workers per 100,000. The construction industry, being a significant source of physical workplace risk (alongside marine and processing industries) in large part has contributed to this safer state of affairs through the comprehensive and collaborative efforts of the Workplace Safety & Health Council (WSH Council) and industry associations such as the Singapore Contractors Association Limited (SCAL).

Working in Singapore—and especially outdoors work that involves materials and heavy equipment—comes with a unique set of challenges: Singapore’s tropical weather leads to work environments being very warm, humid, and often wet and slippery due to frequent rainfall; and space constraints in the little red dot often leads to tight and compact sites for personnel and equipment to navigate. This creates conditions for accidents that affect all industries with an outdoors component and not simply construction alone.

However, these issues have not been new to Singapore or the construction industry, although some have been more pressing than others. Mr. Yong Jian Rong, Chairman of the Workplace Safety & Health Subcommittee of

SCAL, mentioned that all work must have an element of workplace safety to be considered within it. All work is equal, in this WSH sense, but some work, backed by statistics, does pose more serious threats. A balance needs to be struck between high frequency of occurrence and high frequency of fatality or serious injury.

“Working at Height (WAH) will always be one of the top safety concerns as this has a much higher probability of serious injury or fatality in the worst case scenario. Injuries resulting from Slips, Trips & Falls (STFs) may be generally less serious, normally resulting in minor lacerations or contusions. However, these types of minor injuries probably constitute the majority of the incidents seen on the work site,” Mr. Yong said.



“

WORKING AT HEIGHT (WAH) WILL ALWAYS BE ONE OF THE TOP SAFETY CONCERNS AS THIS HAS A MUCH HIGHER PROBABILITY OF SERIOUS INJURY OR FATALITY.

”

MR YONG JIAN RONG

CHAIRMAN
SCAL WORKPLACE SAFETY AND
HEALTH SUB-COMMITTEE



Featuring some of member companies conducting Safety Time-out (STO).

As the construction sector (and other outdoor industries) receded in the wake of the COVID-19 pandemic, the drop in activity tracked a drop in fatalities and serious injuries (a contraction of 18% between 2019 and 2020).

However, as the industry and broader economy reopens and recovers, new challenges have led to new WSH risks. On May 8 2022, after noting a spat of accidents across multiple industries that raised the tally for 2022 to 20 workplace fatalities, the Ministry of Manpower (MOM) alongside the WSH Council and associations such as SCAL announced a two-week Safety Time-Out (STO) to realign industries—including construction—around WSH principles and reinforce measures and systems that can save lives.

Recovery is a matter of optimism for the construction sector—as with all sectors—but remaining cognisant of and vigilant for the WSH risks that recovery poses will allow contractors to navigate a smooth recovery where all industry participants benefit.

“Most of the workers have restarted work and more are returning from overseas with the opening of borders,” Mr. Ng Yek Meng, President of SCAL, said, “The labour market is still tight and the site progress is lagging behind even though the labour supply situation is better than before.”

Consequently, the tightness of timelines and pressures of exacting projects can pose risks to the safety of workers even as activity resumes at a greater pace.

This is not helped by the fact that the industry has lost some of its more experienced workers owing to the pandemic exodus that took place over the last two years. Mr. Yong listed shortage of skilled labour and difficulties in the retention of experienced workers as among the key post-pandemic WSH issues in the industry. Skills and experience necessarily mean better WSH outcomes: a more experienced or skilled worker is more intimately familiar with safety regulations or is talented enough to mitigate risks of accidents altogether.

Mr. Yong listed the rise in material costs as another key post-pandemic WSH issue. As material costs rise, budgets for projects and firms across the industry tremble under the weight of unexpected and volatile costs and the prospect of losses, especially on lump sum contracts that aren't re-negotiable to a cost plus basis. If firms are not holistic in their resource use, this could mean smaller budgets for WSH. Making WSH expendable, even in these trying times, could yield short-term benefit but long-term loss—either in the form of stop work orders or, worse, demerit points stemming from WSH violations.

How can a much-awaited recovery in the industry be balanced with the critical need for WSH standards to be upheld? The solution could reside at the intersection of better technology and better processes. Both need one another.

“Given the struggles that the industry is facing with regards to skilled labour, technology will no doubt play a deciding role in how efficiently companies will be able to run jobs in the future,” Mr. Yong said, “There is no substitute, however, for having a strong practicable process in place, this forms the back bone of any type of work that has to be carried out. ‘Technology’ should therefore work to strengthen our processes and enable us to be more efficient.”

SCAL has long believed in the promise of technological progress to transcend the present limitations of the industry. The recent partnership between the WSH Institute of the Ministry of Manpower (MOM) and the Innovation Technology Work Group (ITWG) of SCAL aims to offer a testbed for new technologies to improve WSH compliance in the industry. The resulting Open Innovation Platform (OIP) is currently working with nine companies as industry partners supported by two on-field problem solvers. WSH technological solutions are as wide-ranging as WSH challenges—they can include remote supervision of sites, virtual fences, and even drones for both monitoring and incident response.

There can also be unexpected WSH benefits from more general post-pandemic technological adoption in the construction industry, as opposed to adopting WSH-specific technologies.

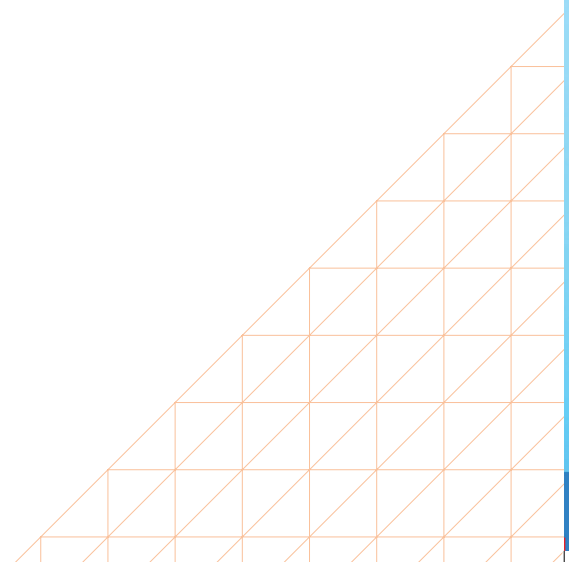
“With newer construction methodology such as Prefabricated Prefinished Volumetric Construction (PPVC) and Design for Manufacture & Assembly (DfMA), fewer workers are needed on site,” said Mr. Ng, “and this can be beneficial for lowering the incidence of accidents on-site.”

With modular construction comes repetition and standardisation, which can also have surprising WSH benefits compared to non-modular construction: highly bespoke or customised installation bears highly bespoke risks to workers due to unfamiliarity with unique elements.

Past technology, there's still the human element of moving towards better WSH adoption. SCAL recognises the industry's achievements in ensuring safety for its workers with the annual SCAL Workplace Safety & Health Awards. Members submitted applications in late April and results for this year's awards are expected to be released in July. Celebrating the best of the industry on one hand, SCAL also ensures that it has a grasp over the industry as a whole: the SCAL WSH Annual Survey 2022 has also been successfully compiled with results released covering respondents' feedback on WSH topics from vector control to traffic.

SCAL members interested in implementing a Total WSH system for their own operations can avail the Total WSH Programme—a free initiative by the WSH Council and supported by SCAL—by learning more here and registering here.

As the tides change, safety remains a fixed concern for the construction industry. And through SCAL's various initiatives and the unifying, collaborative safety courses offered by SCAL Academy, safety continues to be a collective effort—one for all with every worker adhering to safety rules, and all for one with the industry coming together with SCAL to ensure that no worker is left behind. Learn more about SCAL's WSH initiatives by reaching out to the WSH subcommittee and its working groups today!





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BUDGET 2022 SOUNDS THE HORN ON STRUCTURAL EVOLUTIONS IN SINGAPOREAN CONSTRUCTION

2020 saw the lowest level of Singaporean construction demand in more than ten years as the industry was roiled by the closures, trade disruptions, and labour restrictions of the worst of the COVID-19 pandemic. While recovery has been tenuous and gathering steam ever since 2020, the two-year shock to the industry has allowed many contractors to take pause, introspect, and consider what they had within their control and what they did not.

While a pandemic and related global trade and migration patterns aren't controllable by an individual contractor, cultivating resilience and contingency plans is. Over the past two years, innovation and investment in technological progression has empowered many firms in the built environment sector to control what they can: better efficiency has meant lower wastage of now-expensive materials, more automation has meant lower dependence on now-scarce labour. Firms have

developed resilience by investing in themselves; they have developed reliance by investing in relationships with counterparties in the construction process.

The result was a 2021 which saw a rebound from a low base (20.1% expansion compared to 2020) and a permanently changed Singaporean built environment sector—less shy to technology, more flexible, and better at putting out fires.

“But the construction industry is not out of the woods yet,” Mr. Ng Yek Meng, President of the Singapore Contractors Association Limited (SCAL) warned.

Just as the industry seems to have developed an immunity to the worst of the pandemic, new challenges have arrived on the horizon: global trade and supply chain disruptions continue, the war in Eastern Europe has let loose cascading price rises in petroleum-related products, and material costs remain volatile as inflation takes root globally.

The industry is caught between a rock and a hard place: higher material costs, intense labour competition and scarcity, and higher overheads from technological adoption all mean higher tendering costs for imminent projects. As the industry manages recovery with new risks, consumers must brace themselves for higher costs in home-buying.

The 2022 Budget of the Singapore Government has sought to therefore provide a booster shot, as it were, to the construction industry in light of these new challenges despite some existing immunity. With a wide range of support measures to cushion the industry—including an extended bridging loan facility—as well as systemic reforms such as the dismantling of the Man Year Entitlement framework, the Budget heralds a strong pivot for the years ahead.



Change is not easy, least of all when so much is in flux.

“We are beginning to look ahead. There’s never a good time to invest in the future,” said Minister of State Tan Kiat How (Ministry of National Development) at a post-budget dialogue session hosted by SCAL on March 18 2022, “If we always say, ‘let’s wait for a good time before we invest in the industry or invest in the future’, there will never be a good time. There’ll be one crisis or another.”

One of the strongest levers of change in the years ahead will be policy aimed at lowering Singaporean contractors’ dependence on foreign workers, and especially low-income, low-productivity foreign workers. In 2022 and beyond, the Singapore Government will adjust its levies on foreign workers engaged in productive off-site labour to bring down the Design for Manufacture & Assembly (DfMA) premium; the goal being to encourage greater worker allocation to this sector and, with a lowered premium, encourage more contractors to embrace modular construction and associated digital technologies. **“In order to increase productivity, we have to train workers to be more skilled,” Mr. Ng said, “This will allow the industry to use prefabrication and better technology and methods for our buildings.”**

At the SCAL post-budget dialogue, Ms. Penny Han (Divisional Director for Work Passes, Ministry of Manpower) also noted that S Pass salary requirements would rise in step with rising local salaries. This can offer local firms better predictability for their hiring needs as well. By 2024, the Man Year Entitlement framework for allocating foreign workers to local firms will also be phased out. “This is a response to SCAL’s feedback that the MYE mechanism has resulted in a lot of allocation inefficiencies,” Ms. Han added.

While the labour shortage continues to weigh the industry down, still greater issues are found in cash flow disruptions and the limitations of inefficient technology.

The Government has extended the Temporary Bridging Loan Program and the Enhanced Enterprise Financing Scheme (Trade Loan) to the industry to help stave off the worst of continuing cash flow difficulties. **“The lower interest trade and bridging loans guaranteed by the government have definitely been beneficial to the industry,” Mr. Ng said, “Many companies have made use of it as a lifeline to tide through difficult financial situations.”** According to SCAL Council Member Mr. Yong Jian Rong, this support has been favourable and welcome but still requires fundamentals to improve. **“A loan is a means of allowing accounts to flow. But if business volumes don’t pick up, it could just be a band-aid.”**

Few contractors wish to have loans on their books at this financially precarious time, and many firms that

have availed of the loan facility are yet to draw down from it. And inherently labour-intensive firms, such as those engaged in plastering and tile setting (where labour-saving technology is either non-existent or inaccessible) may suffer the most from structural shifts within the industry which require greater foreign labour independence. The gradual lowering of the Dependency Ratio Ceiling (DRC) from 1:7 to 1:5 in particular may lead to wasteful overheads for firms that, by nature, employ more on-field foreign workers than local Singaporeans as office staff.

The Government, through the Productivity Solutions Grant and a plethora of innovation grants and testbeds, continues to stand by the industry in becoming smarter as a way of becoming more independent. But technology cannot be a silver bullet for the years ahead.

“Technology is just a tool to make our work more efficient,” Mr. Ng mentioned, “But it must be cost effective. If these tools don’t reduce costs or increase business volumes, no matter the theoretical value and government support, firms will not be as interested in them.”

A clear alleviator of some of the issues with labour and technology is greater involvement of local, and especially younger, Singaporeans in the construction industry. But this long-sought goal remains just out of the industry’s grasp despite recent progress.

“Speaking purely as a contractor, as a born and bred Singaporean, I want to see a sustainable local industry. Drawing locals to the industry is one thing, but retaining them is another,” Mr. Yong said.

Mr. Ng added that there is a perception problem in construction that repels many Singaporeans, who see it as dangerous and demanding work for relatively lower pay.

“It’s very difficult or almost impossible to convince local Singaporeans to work on-site. But if DfMA and technological adoption leads to more work being off-site and in factories, where the conditions are better, then we have a better chance of attracting Singaporeans.”

If 2020 was the dark night of the Singaporean built environment sector’s recent history, and 2021 was a fragile early dawn, 2022 with all its uncertainties and challenges is shaping up to finally be a brilliant sunrise—with new technologies, new methods, new initiatives. But on the new horizon are unfamiliar figures and outlines that the industry, through partners like SCAL, must navigate together and cohesively. //



KNOCKING AT LU BAN'S DOOR: CONTRACTORS AND THE NEXT WAVE OF CONSTRUCTION TECHNOLOGY

A conversation with **Gammon's James Yuen**

Lǚ Bān (魯班) is a beloved and revered fixture in the Chinese tradition of humanistic peasant scholars: individuals who committed their formidable creativity, inventiveness, or insight to the improvement of ordinary people's lives. Lǚ Bān is associated, almost to a level of deityhood, with the material arts—the art of construction, and the science required to elevate it into a truly gratifying art more than simple a backbreaking one.

Stories resound across the ages of how his inventions were spurred less by a personal drive for profit or cash flow optimisation but a genuine wish to make the labour involved in building—homes, temples, palaces, schools—as constructive and efficient for workers as it was for the users of those buildings. And so, per tradition, Lǚ Bān invented the frame saw whose teeth could bring comfort to the hunched, sunburnt backs of woodcutters using hand-axes. He is said to have invented the stone mill after his heart was clenched by the sight of a frail old woman struggling to grind flour with a pestle and mortar in her spindly hands.

And this was despite Lǚ Bān not being especially academically gifted; legend notes him to be a mediocre student when younger. What was conspicuous was his wish to be and do things that were useful to ordinary people. This absorbing desire to improve the dignity and nature of construction labour—when condensed into a sort of unpretentious (that is, without being cheem) wisdom—led to a common sense from which a great array of solutions sprung forth. If Lǚ Bān's technological contributions to construction were like a rainbow spectrum of light (from the chisel (鑿) to the shovel (鏟)) dispersing out of a very finely polished prism, his care for humane efficiency was that very prism.

Through such a prism, the seething white inflow of problems can be transformed into a spectrum of colourful opportunities to improve lives—the lives of workers, builders, tenants, and (importantly) future generations. But such a prism must be built first.

James Yuen, Director at Gammon Pte Ltd and Assistant Treasurer of the Singapore Contractors Association Limited (SCAL) believes that building such a prism of technological opportunity for modern contractors goes beyond simply investing in the technology. In his time at

Gammon, and even prior, James has sought to marshal technology to improve construction project outcomes for workers, clients, and end-users. But fundamental issues remain within the built environment industry that make the application of technology more challenging than it should be.

One challenge is that the industry hasn't really pushed itself to think much farther beyond Lǚ Bān. **“Over the past hundred years or so, construction really hasn't changed that much,” James explained. “Almost every product today has been touched by modular assembly and global supply chains operating in multiple jurisdictions. Look at the manufacturing of cars, computers, or aircrafts, or even submarines. This disruption or infusion of technology into processes has somehow been problematic for construction.”**

This is not entirely inexplicable: James acknowledged that, unlike cars and computers, every building is unique. Repetition is an excellent base to develop standardisation, but no two buildings are replicas of one another. One could have two buildings with identical designs, materials, subsystems, and even tenants but they will not be replicas of one another in the actual act of building and maintenance. But a much more serious challenge looms large.

“Maybe it's because of how the industry is set up—there is inertia to change from the industry's participants themselves.” Inertia, or confronting new headwinds but not positioning sails to make them tailwinds, ends the journey to technological innovation before it can even begin. James believes that Singaporean construction suffers from an inertia borne by three key factors: fragmentation, risk aversion, and leadership culture. All are related.

“In Singapore, the construction industry is quite fragmented, and this isn’t good for adapting to change. While the government supports the industry and there have been new developments like Design for Manufacture & Assembly (DfMA) that are being pushed by ambitious programs, the point that is being missed is the profitability level of the industry.”

With higher fragmentation, the industry is suspended in a state of hyper-competitiveness where everyone is busy, but nobody is making money. “It’s almost perfect competition, and evaluators don’t have the resources to objectively assess twenty or more bids.” The result is a race to the bottom of the price range, and an incentive for companies to invest less in innovation and in fact invest less, period. Low overheads mean lower price quotes. **“There needs to be a better method to pre-qualify bids,” recommended James, “The pre-qualified bidders should not only offer competitive bids but possess the organisational backing and resources to embrace innovation for project delivery.”**

This will naturally mean moving away from rubrics that give enough weight to price alone that other factors (especially, quality and innovation) essentially become irrelevant—reduced to smokey paragraphs so that tender managers can tick a box.

The Singaporean Government, a key driver of demand in the built environment sector (accounting for 60%+ of industry demand in 2022 as part of recovery from the COVID-19 pandemic), emphasises price as a key indicator of competitiveness: the so-called PQM (Price, Quality, Method) framework routinely places Price’s weight at 70-80% of the consideration pie, with Quality and Method making up the rest. Gradually Price is retreating to 60% (especially for design and build projects) and James says some projects have already breached the important floor of 50%, with Quality and Method assuming more importance.

“An open tendering system is not always efficient because tendering is not a costless process. It uses resources, both for those who issue the tenders and those who respond to it,” said James.

With better technology- and method-centric pre-qualification, Singaporean construction can study and emulate the successes of the telecom and banking sectors. This doesn’t mean competition ought to be squashed, but that competition must be “credible” and contribute a net positive to the technological maturity and sophistication of Singapore’s construction industry.

But beyond structural and incentive issues, there is still the question of mindsets. “Profitability leads to

progress; it shouldn’t be treated like a sin,” James claims. And his assertion is not untrue: progress requires surplus capital, which requires profitability. And profit, as any businessperson knows, is a reward for bearing risks. In other words, taking risks to earn profit (a reward for efficiency) is not a sin if it leads to progress.

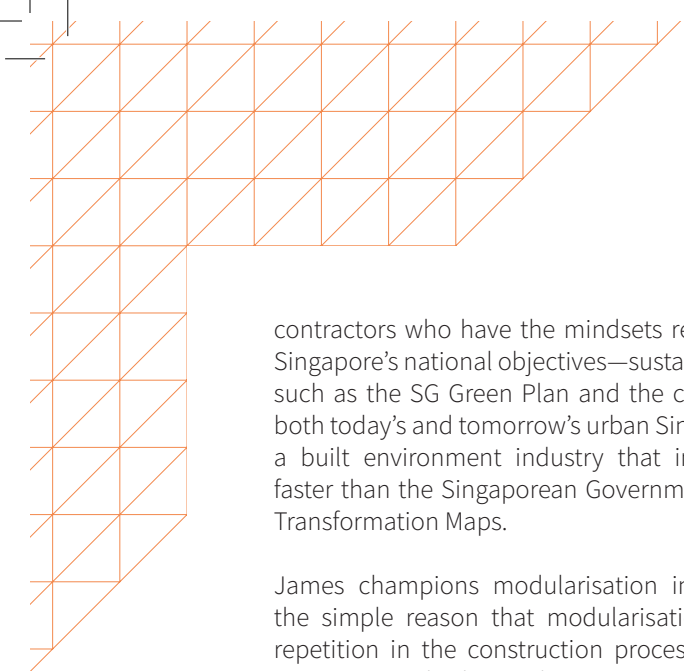
“Leadership needs to make a clear decision and stick to it. In business, whatever you do has risk. That doesn’t mean I don’t invest and so it’s less risky. Then I am forgetting long-term risk from not upgrading my technology to settle short-term risk of investing. It will eventually come back to bite me.”

According to James, clarity of market positioning must be sought and stated by the management team so that the organisation is aligned, and technological investments are made with this positioning in mind beyond simply investing in tech for its own sake. But this is often easier said than done due to problems of scale and conservatism for many firms. To go around this, there must be an active scouting for and elevation of promising and innovative



**MASTER BUILDER
LU BAN**
(魯班先師)

IF LU BĀN’S TECHNOLOGICAL CONTRIBUTIONS TO CONSTRUCTION WERE LIKE A RAINBOW SPECTRUM OF LIGHT (FROM THE CHISEL (鑿) TO THE SHOVEL (鏟)) DISPERSING OUT OF A VERY FINELY POLISHED PRISM, HIS CARE FOR HUMANE EFFICIENCY WAS THAT VERY PRISM.



contractors who have the mindsets required to achieve Singapore's national objectives—sustainability ambitions such as the SG Green Plan and the cascading needs of both today's and tomorrow's urban Singaporeans require a built environment industry that imagines and acts faster than the Singaporean Government drafts Industry Transformation Maps.

James champions modularisation in construction for the simple reason that modularisation leads to more repetition in the construction process, which makes it easier to standardise and so automate using technology. All this leads invariably to a rise in productivity and concomitant drop in costs. Presently, modularisation in Singapore is primarily driven by Government and industry efforts to propagate prefabrication, BIM, and DfMA. But industry perception and scale continue to make widespread use of modularisation elusive.

“There is a perception problem with modularisation,” said James, “where a modular project is not unique enough for a firm’s portfolio. Everyone wants to come up with unique geometries and complex projects.”

But the result, in land-strapped Singapore, is the use of factories for fabricating bespoke architectural elements since these don't require much room, and a dependence on larger foreign factories for manufacture of basic elements at scale.

However, COVID-19 has taught Singaporean contractors the difficult caveats of foreign dependence, and convulsions in global trade has revived the spectre of inflation in material costs. Any technological movement towards better productivity and higher efficiency will demand Singaporean contractors to be more self-sufficient. This is what James seeks to do at Gammon—a microcosm of what the rest of the industry could one day hopefully be.

“Gammon has a commitment, beyond safety and integrity, in every one of our projects to have a conscious effort on the part of key decision makers to look at innovation and making sure to see how the project can be executed digitally. We won't do it just because it's trendy.”

“When Gammon gets a new project, we see how it can be done in a modular way, whether architecture or E&M. We see how to make things repetitive and break down the project as much as possible. If not standardised, chance of catching error is lower. If every part is highly bespoke, it may not fit on site. We try to get our construction engineers, architects, and clients to see how things can be made more repetitive.”

Gammon with James approaches innovation at both a macro and micro level. Gammon is trying to push Virtual Reality collaborations as far as possible with the design

side and on-site execution as well. There is a conviction that digital tools in the market can be used in many better ways and Gammon experiments to uncover these ways. Currently on one of their projects, Gammon is also employing remote supervision. But that's at the macro level. Change inches up just as it trickles down. James, for example, made it a rule to only send PDFs electronically to minimise paper wastage. **“Once, 4 or 5 reams of paper were used to print a project progress report,” James recalls, “After that, I made a rule to consolidate reports into PDF.”**

But these are still baby steps. **“A lot more is possible than what exists now,” James believes. “To start in that direction, standardisation needs to take root.”**

This has been the emphasis of SCAL and the Building & Construction Authority (BCA), which have both worked to engage the industry in discussions and dialogues to achieve a standardisation of discourse and effort before true standardisation can be achieved. Additionally, SCAL, through SCAL Academy, strives to bring together practitioners from the various corners of the industry—professionally but also personally—to meld together through common training and standards. While the ideals of standardisation and modularisation continue to remain ideals, the practical steps being taken today by the various stakeholders of the industry—from SCAL and the Singaporean Government's various statutory boards to prescient firms like Gammon—are giving practical form to how a practical industry can aspire to those ideals.

There is a Chinese idiom that at once celebrates achievement and cuts braggards down to size: 班門弄斧 (bān mén nòng fǔ), which translates to “holding an axe at Lǚ Bān's door”. It implies that one mustn't have the conceit to celebrate themselves when their technology or invention is barely anything in front of the towering works of Lǚ Bān: to hold an axe at the door of the man who made axes obsolete. Attitudes to technology in the construction industry must take the positive and negative lesson from this idiom.

The negative lesson, naturally, is that simply investing in technology without the processes, structures, and mindsets that can match the ingenuity of genuine, human-focused efficiency (such as of Lǚ Bān) is an act of self-aggrandisement at worst and a lost opportunity for true innovation at best. It is incompatible with the striving and rugged spirit of construction.

The positive lesson is altogether more inspiring: it is time to knock at Lǚ Bān's door, seek his spirit of curiosity and innovation for the sake of improving lives, and build our own door. A new door—a new benchmark of industry-level excellence in technology—that will go beyond the inheritances of the past and bequeath new inheritances to the future. //

2021 BCA AWARD WINNER SPOTLIGHT: ANG MO KIO 23 NURSING HOME



MR. THAN LWIN HAS BEEN WITH VIGCON FOR 16 YEARS, AND PRESENTLY MANAGES OR IS INVOLVED IN 19 OF ITS PROJECTS. ONE OF THESE, THE NEWLY COMPLETED NURSING HOME FACILITY AT ANG MO KIO 23, WAS AWARDED A GOLD INTEGRATED DIGITAL DELIVERY (IDD) AWARD AT THE 2021 BCA AWARDS.

The first time Mr. Than Lwin, Assistant Project Director at Vigcon Construction Pte Ltd, used Google Meet was to speak to SCAL for this article.

Mr. Than Lwin is not unfamiliar with video conferencing (in fact, the opposite) but had simply not used Google Meet before. This didn't bother him. "Never used GMeet before. I should be able to figure out. I will log in early," he emailed. When we spoke, long after the working day had ended for most Singaporeans, Mr. Than Lwin was still on site, having set himself up with a pair of wired headphones in a temporary cabin, white safety helmet barely off-screen—clearly ready to respond to any happening on site in a moment's notice.

"Quieter now, so we can talk."

Mr. Than Lwin has been with Vigcon for 16 years, and presently manages or is involved in 19 of its projects. One of these, the newly completed nursing home facility at Ang Mo Kio 23, was awarded a Gold Integrated Digital Delivery (IDD) Award at the 2021 BCA Awards.

As the main contractor and first-class Building Information Modelling (BIM) implementer, Vigcon's BIM efforts in this project were the hub onto which the various spokes of other stakeholders were attached. With his open-mindedness to novel solutions (whether GMeet or BIM) and attention to detail, it's not surprising—in hindsight—that with Mr. Than Lwin as project manager, this project went on to set a high benchmark for all contractors in the industry.

The AMK Nursing Home project satisfied all rungs of the three-tier BIM/VDC (Building Information Modelling/Virtual Design & Construction) initiatives industry standard: first class at the top rung, second upper (2U) in the middle, and second lower (2L) at the bottom.

2L involves basic BIM implementation: onboarding multi-disciplinary models from various consultants and stakeholders, settling clashes, and building a unified model—first for the sub-structure, then super-structure, and finally the as-built model. 2U involves BIM implementation that has relevance to the operational stage as well: namely 4D BIM with detailed asset/equipment data encoded for facilities management (FM) purposes as needed.



But first-class is the secret sauce: the above-and-beyond BIM implementation which places projects such as AMK Nursing Home in the running for BCA's IDD Award. "For this project, the first-class implementation was logistics monitoring using RFID tagging," Mr. Than Lwin shared,

"We had four states—manufacture, transit, delivery, installation—to track elements. Using RFID tagging for this, anyone with a smartphone was able to check element status and we were able to fix any delays with the supplier or on-site staff."

Vigcon's first-class implementation in the AMK Nursing Home project allowed it to streamline modular logistics with real-time Design for Manufacture & Assembly (DfMA) monitoring as well. This was critical for keeping an eye on the prefabricated ACMV ducts used in the project.

Vigcon's IDD/VDC/BIM suite for this project was at once broad and comprehensive: state-of-the-art digital tools and solutions were used to better organise and integrate functions such as modelling, clash detection, resource and workforce management, construction and safety documentation, quantity surveying and cost management, and precast fabrication and logistics management. These tools involved multiple stakeholders and data that competed for the attention of the project team and often contradicted one another.

So perhaps the most important role that Mr. Than Lwin's team played was in serving as the BIM integrator for the entire project. A clear BIM management plan was set out, placing Vigcon's BIM coordinators at the heart of matters. In all stages of the project, base models from multiple parties—consultants, architects, subcontractors, MEP specialists and so on—were consolidated by Vigcon's BIM team.

Design teams and high-level consultants possess a bird's eye view of a project on paper, and individual

subcontractors and specialists possess a grassroots view of a project in practice. The contractor, sitting on the fence between the two, possesses a unique vantage point—combining both the possibilities of design and the practicalities of building. This means that contractors must occupy a centrally important role in BIM implementation—they are the glue between multiple BIM models because they are the glue between multiple stakeholders.



"INTEGRATED CONCURRENT ENGINEERING (ICE) MEETINGS ALLOWED US TO RESOLVE CLASHES IN THE VARIOUS BASE MODELS FROM DIFFERENT STAKEHOLDERS," MR. THAN LWIN SAID, "EVERYONE IS OFTEN SILOED AND THIS MEANS THEY SOMETIMES MAKE MODELS THAT REPRESENT THEIR VIEWPOINT OR THAT ARE CONVENIENT TO THEIR MANDATE. AT ICE MEETINGS, WE RESOLVED CLASHES WITH EVERYONE PRESENT AND DID THIS FLOOR-BY-FLOOR. WE DECIDE WHO GIVES WAY AND WHAT WILL BE CLEARED. THIS IS HOW WE ENDED UP WITH THE AS-BUILT MODEL."





As such, Vigcon served as the compiler and clash resolver for the AMK Nursing Home project. “Integrated Concurrent Engineering (ICE) meetings allowed us to resolve clashes in the various base models from different stakeholders,” Mr. Than Lwin said, **“Everyone is often siloed and this means they sometimes make models that represent their viewpoint or that are convenient to their mandate. At ICE meetings, we resolved clashes with everyone present and did this floor-by-floor. We decide who gives way and what will be cleared. This is how we ended up with the as-built model.”**

The consolidation function of the contractor in the AMK Nursing Home project highlights another challenge of such value-added BIM implementations: common standards and coordination. The project adhered to multiple key standards and methodologies for revision, modelling (following the Singapore BIM Guide V2), and model division. Mr. Than Lwin noted that while it was easier to coordinate and enforce these standards with subcontractors and Vigcon staff, it could be more challenging to do so with consultants, who are nominally higher in the project hierarchy in relation to the buyer. **“To be frank, and I’m frank for the industry’s benefit, some upstream players expect that the contractor will handle everything for BIM coordination,”** Mr. Than Lwin said.

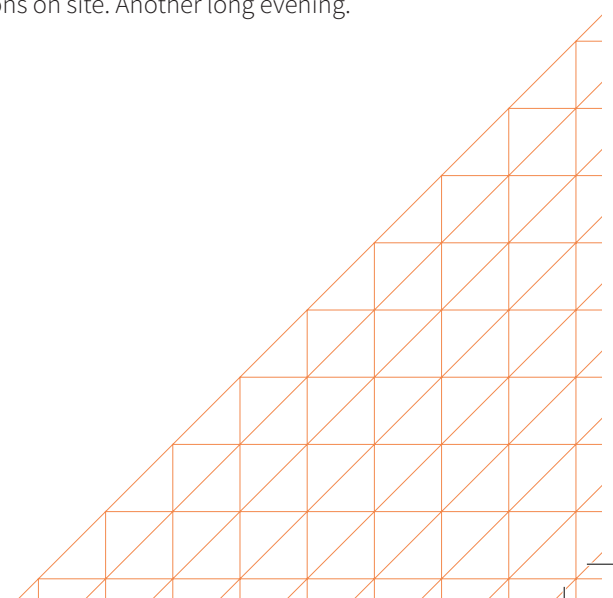
Ultimately with the use of a Common Data Environment (CDE) (including a physical server on-site) in tandem with common standards and ICE meetings, Vigcon was able to promptly update models after clearing clashes and other issues amongst various models. The team was also able to rely on CDEs and data from previous projects (namely an identical but lower-level BIM implementation for a nursing home project) to measure and quantify the team’s BIM performance for the AMK Nursing Home project. Without measurement, there cannot be management.

Beyond setting an excellent benchmark for the continuing rise of IDD and VDC in the Singaporean built environment sector, Vigcon’s first-class BIM implementation with the AMK Nursing Home translates to benefits beyond the technical; it has tangible impacts for the end-user: Singapore’s elderly. With one in four Singaporeans expected to be aged above 65 by 2030, the need for elderly care infrastructure is vital. By contributing to the construction of such facilities in a smart way—with cost- and time-efficient technologies as well as 4D BIM which allows for FM activities to be precise and non-disruptive for elderly residents—contractors such as Vigcon make important contributions to the sector’s commitment to build Singapore for Singaporeans, one brick (and one data set) at a time.

“I wish that IDD tools were used in every project,” Mr. Than Lwin said, “The problems that IDD resolves exist at the level of smaller projects as well. You don’t need to be a very large company to reap the benefits of IDD.”

In Singapore, large projects usually compel contractors with contractual requirements to adopt IDD technologies but Mr. Than Lwin believes that, instead of being a means to a contractual obligation, IDD is a good in itself.

Mr. Than Lwin then logged off his first ever GMeet call and returned to his obligations on site. Another long evening.





SCAL ACADEMY PTE LTD

SCAL ACADEMY CONTINUES TO BROADEN THE INDUSTRY'S HORIZONS

SCAL Academy, at an institutional and personal level, understands the importance of upskilling to maximize performance and keep up with the tides and flows of a complex and ever-innovative construction industry. It is nigh impossible to identify every single challenge or advancement coming the industry's way, but with development-oriented training, SCAL's wide-ranging in-house training works to broaden the horizon and help members of the Singaporean construction industry be more adaptable, resilient, and forward-looking.

Govindavelalar Gunasekaran, Project Director at Woh Hup (Private) Limited recently attended a SCAL Academy course covering on-site Workplace Safety & Health (WSH) practices ("Manage Workplace Safety and Health in Construction Sites") to refresh his knowledge of safety standards and to better apply these standards in the workplace.

"The training provided by SCAL's experienced and knowledgeable trainers has equipped me with an excellent grasp of construction safety and allowed me to enhance worksite safety in Woh Hup,"

Mr. Gunasekaran said after successfully completing the course.

Kenn Tan, Project Manager of SEC(S) Pte Ltd chose SCAL Academy to supercharge his upskilling for personal career development and attended the same course as Mr. Gunasekaran. Apart from being the industry benchmark for project management training, the course Kenn participated in also had the double effect of strengthening his grasp of important ideas and concepts in WSH for the built environment. Kenn said,

"SCAL Academy has a good understanding of how the industry works and the training is much better aligned with practical needs. The trainer also exhibited fantastic content knowledge and this enabled me to apply the concepts to my work."

Daphne Yip, Senior Design Manager at Shanghai Tunnel Engineering Co (Singapore) Pte Ltd attended a course ("Perform Design for Safety Professionals Duties") to fulfil client requirements for a Design for Safety (DfS) professional. Daphne highlighted that the trainer was very engaging in keeping class participation high and provided clarity in their explanation of the course materials.

Daphne added, **"The course content is very relevant to my daily work and I will definitely recommend this course to my colleagues with design background at SCAL Academy."** Kyaw Zaw Aung, Project Engineer at Tristar Engineering Pte Ltd, chose SCAL Academy to obtain his first-aid license ("Occupational First Aid Course") when he wanted to pick up first-aid skills. Zaw Aung was happy to be able to apply his newly attained knowledge and practical skillset at the worksite. This was possible, according to Zaw Aung, since the training equipment at SCAL Academy is effective and hands-on and trainers are great in sharing their knowledge and experience.

Being able to help with the development and training of such a broad cross-section of the industry—from design managers to project engineers—is something SCAL Academy prides itself on. The construction industry is as interconnected in principle as it is fragmented in practice, and through high quality education and training, SCAL Academy aims to bring practitioners, standards, and the industry closer together: one successful course at a time.



FOR UPCOMING COURSES, WEBINARS, AND WORKSHOPS CONDUCT BY SCAL ACADEMY, PLEASE VISIT [HTTPS://SCAL-ACADEMY.COM.SG/](https://scal-academy.com.sg/) OR PAGE 18 FOR MORE INFORMATION.

Design for Safety (DfS)

continues to become more relevant to ensure downstream safety.

HOW CAN ARCHITECTS AND CONTRACTORS WORK TOGETHER TO ENSURE SAFETY IS FACTORED INTO THE EARLIEST STAGES OF A PROJECT?



EUGENE SEAH

**MANAGING DIRECTOR, SURBANA TECHNOLOGIES,
CO SPONSOR, SUSTAINABILITY AND RESILIENCE OFFICE,
SNR DIRECTOR, SPECIAL PROJECTS, GROUP CEO'S OFFICE**

Each day as I go to work, I know I will be going back home since my office space is relatively safe. How does one feel each day when going to work in a dangerous environment, where he may not get back to see his family ever again?

I feel that there is a need for both technology and processes as well as human intervention to ensure that there is complete safety in the construction industry. For that matter there needs to be sufficient time to complete the work so that there would be proper checks and balances to address safety concerns.

Contractors are constantly pressed for time but if projects are managed well, project managers will be able to reap the maximum benefits of using technology. We can train technology to recognize workers who are not wearing Personal Protective Equipment (PPE) with enough cameras and algorithms deployed on site. With sufficient training of the AI, technology can help pinpoint safety concerns and narrow to workers at risk, even predicting minutes or even seconds before something harmful is about to occur. This is where predictive safety management comes into play. But this can only happen when accidents are documented in Common Data Environments (CDEs), and when data is shared with the industry in a way that allows us to learn from the mistakes of others, rather than learning each accident at a time.

But nothing works better where there is a process in place to train and teach workers to firstly be safe and then look out for others as well. If there is something not right, let them be empowered to stop work and raise the issue up

to their reporting supervisor without fear. Working with technology, the toolbox meetings can be complemented with videos and playbacks of previous accidents so that workers can understand the would-be dangers. Sharing on the day's works ahead is also important so that workers and supervisors can plan their work according to safety standards and bring along required PPEs for specific tasks. Briefings can also be not only in the morning, but also in the afternoon. Car Mechanics in Japan have two briefings a day because their mechanics deal with heavy machinery such as trucks and cars, each needing different procedures and awareness.

And this is where human intervention comes in whereby construction workers themselves know how to intervene and are empowered to even issue their own stop work order. I know of some construction companies that empower their workers to stop work themselves in the event that they feel their lives are in danger. They employ an "If not me then who" stance where looking out for dangers means looking out for one another.

So, my opinion is that technology is not the panacea to address safety issues everywhere. It is powerful in combination with processes and people, human intervention and the empowerment of workers to say, "this is not safe for me". While we may design safer practices, it is the combination of technology, digitalisation, processes as well as the human factor that will ensure that everyone comes home safely each night to their families.



UPCOMING EVENTS, WEBINARS AND WORKSHOPS TO ATTEND

SCAL ACADEMY



PERFORM DESIGN FOR SAFETY PROFESSIONALS DUTIES (ONLINE)

14 – 15 Jul, 18 -19 Aug | 9.00am – 6.30pm

This is a mandatory Workplace Safety & Health (WSH) training course for all prospective Design for Safety (DfS) professionals to learn how to facilitate DfS Review Meetings, to be able to identify and mitigate various safety and health risks.



CET FOR MULTI-SKILING (SAFETY) PATHWAY: WORKPLACE SAFETY AND HEALTH-RELATED TRADES (ONLINE)

Weekly | 9.00am – 1.00pm

In this course, candidates will learn the latest regulations, code of practice, and innovations in safety as well as good industry practices related to WSH trained by BCA's Approved Training and Testing Centre (ATTC).



HOW TO NEGOTIATE YOUR CONTRACTS – KEY CLAUSES TO WATCH OUT FOR AND PUTTING YOUR BEST FOOT FORWARD (ONLINE)

1 Jul 2022 | 3.00pm – 5.00pm

This webinar highlights matters which contractors should be aware of when negotiating contracts and the implications of some of the more 'problematic' clauses.



CONCRETE QUALITY CONTROL (EURO CODE) (ONLINE)

18 Jul 2022 | 9.00am – 1.00pm

Singapore is migrating to the Euro code for concrete quality control. Find out what are the quality control requirements of concrete based on the new Euro code requirements (SS EN 206-1/SS 544-1 and 2) to ensure and manage concrete quality control and comply with client requirements and industry benchmarks.



DATA ANALYTICS – DATA MINING FOR INSIGHTS (ONLINE)

22 Jul 2022 | 9.00am – 5.00pm

This workshop aims to provide a broad but practical overview of the entire analytics value chain, with a specific focus on the methods required to glean objective insights from data. Attendees will get a practical introduction to the analytical process, including an overview to statistical concepts and relevant analytical tools with which to apply the concepts.





THE CONSTRUCTION WORKPLACE REIMAGED! (ONLINE)

28 Jul 2022 | 9.30am – 5.30pm

This course explores the current and potential future impacts of new and rapidly evolving technologies relevant to construction-related businesses and operations. Learners will gain insights into these emerging technologies and how organisations may harness these technologies to their advantage.



PROBLEM SOLVING WITH DATA ANALYTICS (ONLINE)

4 – 5 Aug 2022 | 9.00am – 5.00pm

Join this webinar to learn how you can leverage data to create value for your organisation through hands-on practical exercises.



ENGINEERING SAFETY CONCEPTS IN CONSTRUCTION (ONLINE)

24 Aug 2022 | 1.00pm – 5.00pm

This course covers topics in this vein and introduces attendees to key issues, concepts, and novel technologies in engineering safety management.




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 SKYTEC GLAZING PTE LTD
 SOON CHIANG HENG PTE LTD
 SPYDERCAMP PTE LTD
 SRI RAMANA ELECTRICAL ENGINEERING PTE LTD
 SUCCESS SUCCEED SUCCESSFUL MARKETING
 SUPERFIX (SINGAPORE) PTE LTD
 SURFACE SOLUTIONS
 SYH TILING (PTE) LTD
 TAI THONG INTERIOR & TRADING LLP
 TAI WAH AIR-CONDITION & ELECTRICAL COMPANY
 TAKHUI CONSTRUCTION PTE LTD
 TECH ELECTRIC SERVICES PTE LTD
 TEKNIA TESTING SERVICES PTE LTD
 TERRALAB TECHNOLOGIES PTE LTD
 THE INTERIOR PLACE PTE LTD
 THL HQ AIRCON PTE LTD
 TONG MEN TECHNOLOGY PTE LTD
 TOPTRADE GENERAL CONTRACTOR
 TOTAL SOLUTION MAP PTE LTD
 TRIDENT SOLUTIONS PTE LTD
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 UNITED MACHINERY & TRADING PTE LTD
 V. T. CIVIL ENGINEERING PTE LTD
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 YEAK & SONG RENOVATION CONTRACTOR PTE LTD
 YEO & SENG BUILDING CONSTRUCTION PTE LTD
 YEONG SOON FATT STAINLESS STEEL WORKS
 YINDA TECHNOLOGY SINGAPORE PTE LTD
 YONG CHIANG ELECTRICAL ENGINEERING PTE LTD
 YONG DE CONTRACTOR
 YONG HING ENGINEERING PTE LTD
 YONG SHENG BUILDERS
 ZENTERRA ENGINEERING PTE LTD



MITSUBISHI ELECTRIC

Changes for the Better

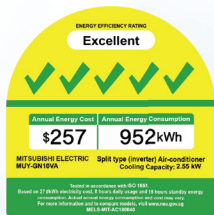


EXCELLENT
Energy Savings

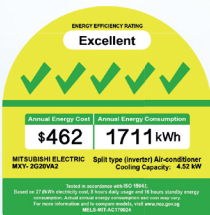
QUIETEST
19dB

EASY
To Clean!
Easily accessible
Inner vent

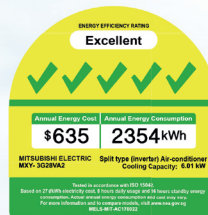
Mitsubishi Electric **star MEX** Air-Conditioner



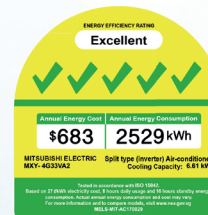
MUY-GN10VA



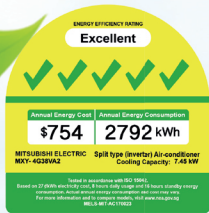
MXY-2G20VA2



MXY-3G28VA2



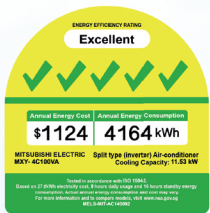
MXY-4G33VA2



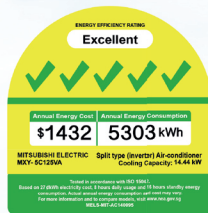
MXY-4G38VA2



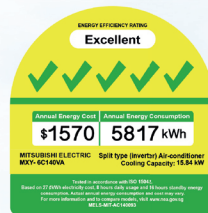
MXY-5G48VA2



MXY-4C100VA



MXY-5C125VA



MXY-6C140VA

WIDE RANGE OF EXCELLENT ENERGY SAVINGS 5-GREEN TICKS AIR-CONDITIONERS IN SINGAPORE



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