Land Transport Authority

SAFETY NEWS

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16th Annual Safety Award Convention

FEATURED ARTICLES

Highlights of Annual Safety Award Convention (ASAC) 2014

INTRODUCTION

LTA hosted its 16th Annual Safety Award Convention (ASAC) at the Singapore Polytechnic Convention Centre on 7th October 2014. The Convention was graced by LTA Chairman, Mr. Michael Lim and was attended by about 1000 guests comprising LTA staff, QP teams, contractors, sub-contractors and professionals from the construction industry. This annual convention was first launched in 1999 to give due recognition to deserving contractors for their relentless effort in raising the safety and health standards at their worksites. At the same time, it recognises their contribution to protecting the environment and the public.

Figure 1: Guest of Honour, Mr. Michael Lim, Chairman of Land Transport Authority, delivering the opening address

THEME OF ASAC 2014

The theme for this year's Convention was "***Reduce Hazards through Innovation and Technology***".

This theme was chosen to give a timely reminder to all involved on our projects to find ways to mechanise, automate and streamline work processes. By injecting new ideas into our construction methods and incorporating the use of construction technologies to eliminate or reduce workers' exposure to hazards on our worksites.

NEW AWARD

A new award was introduced this year - the ***Most Improved Contractor Award***.

The Most Improved Contractor Award aims to recognise contractors who have made significant improvements in their WSH standards, and encourage more to strive for safety excellence.

THE ASAC COMPETITION AND CHALLENGE SHIELD

The ASAC competition is divided into four categories:

Minor – Civil contracts with value below $20m
E&M – E&M contracts with value above $20m
Major – Civil contracts with value between $20m to $50m
Mega – Civil contracts with value above $50m

A total of 49 contractors participated in this year's competition. The contractors were scored based on their monthly Environmental, Safety and Security (ESS) assessments, safety performance statistics and a round of internal audit conducted by LTA's project management teams. Four finalists were subsequently short-listed from the Mega Category to compete for the Contractors' Challenge Shield. They were then audited by an independent panel of judges based on their site conditions, WSH practices and overall WSH management system. They also had to deliver a theme-related presentation at the convention. The scoring criteria were 80% based on the results of the site audit and 20% on the presentation at the convention.

The past winners of the Challenge Shield include Contract 909 Gammon Construction Ltd (2010), Contract 916 McConnell Dowell South East Asia Pte Ltd (2011), Contract 920 Shanghai Tunnel Engineering Co., Ltd (2012) and Contract 921 Ssangyong Engineering & Construction Co., Ltd (2013).

PANEL OF JUDGES

The Panel of Judges comprised of senior representatives from the Ministry of Manpower (MOM), Building and Construction Authority (BCA), Petrochemical Corporation of Singapore (Private) Limited (PCS) and National University of Singapore (NUS).

Figure 2: Panel of Judges (from left): Associate Professor Florence Ling (NUS), Mr. Chan Yew Kwong (MOM), Mr. Bernard Leong (PCS), Mr. Tan Chee Kiat (BCA)

The Panel of Judges were impressed with the 4 finalists for their exemplary WSH management and site practices. During the convention, Mr. Chan Yew Kwong commended "My fellow judges and I were really amazed at the high standards of the four finalists. When we visited the worksites, we saw many examples of good WSH practices put into effect, and implemented".

FINALISTS' PRESENTATIONS

This year's finalists were from DTL2 Contract 911 GS Engineering & Construction – Hock Liang Seng Joint Venture; DTL3 Contract 923 Samsung C&T Corporation, DTL3 Contract 925A KTC Civil Engineering & Construction Pte Ltd and DTL3 Contract 930 SK Engineering & Construction Co. Ltd (Singapore Branch).

Each finalist was given 15 minutes to showcase their good practices based on the theme of the Convention with a presentation and a theme-related skit. At the end of the finalists' presentations, the audience also had the opportunity to vote for their preferred presentation through Short Message Service (SMS).

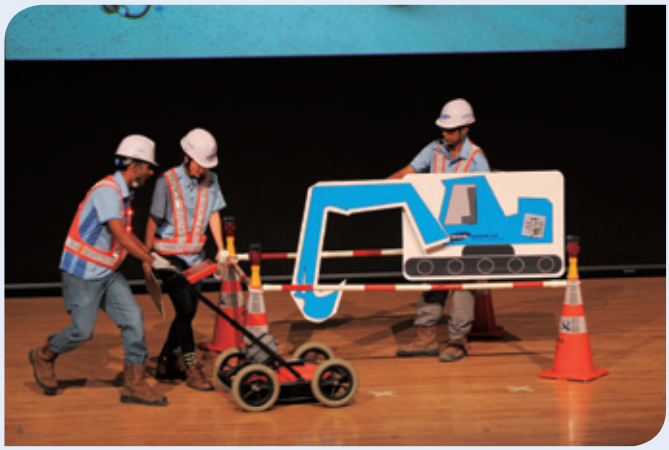

Figure 3: Skit presentation by DTL3 Contract 923 Samsung C&T Corporation

The skits were thoroughly enjoyed by the audience. Contract 923 Samsung C&T Corporation won over the audiences with their skit and went away with the Best Theme Presentation Award. Contract 923 was also the winner of the Contractors Challenge Shield.

CONTRACTORS CHALLENGE SHIELD (ASAC CHAMPION)

Figure 4: DTL3 Contract 923 Samsung C&T Corporation proudly receiving the LTA Contractors Challenge Shield

AWARDS CONFERRED DURING ASAC 2014

The following awards were presented during the Convention:

- ***Certificate of Excellence*** to 4 finalists from the Mega category.
- ***Certificate of Merit*** to 7 contractors from the Mega category, one from Major category and four from E&M category for consistent good WSH performance over the assessment period.
- ***Project Safety Commendation Award*** to the LTA Project Safety Committee with the best effort and WSH performance in ensuring and promoting excellent WSH standards at its worksites.
- ***Best ASAC Theme Presentation*** to the finalist of the Mega category for delivering the best theme presentation as voted by the audience.
- ***Construction Environmental Merit Award*** to 8 contractors who have shown consistent environmental management at their worksites.
- ***Innovative Noise Management Merit Award*** to 2 main contractors who have displayed innovativeness in the reduction of noise from construction works.
- ***Accident-Free Million Man-hours Recognition Award*** to 16 main contractors with a considerable accident-free man-hour milestone without reportable accidents or major incidents.
- ***Most Improved Contractor Award*** to 4 main contractors with significant improvement in their WSH standards.
- ***QPS Safety Award*** to 7 QPS teams with proactive contribution towards addressing Workplace Safety and Health (WSH) issues.
- ***Sub-contractors' Safety Recognition Award*** to 15 sub-contractors with significant contribution to good WSH performance.

Kenneth Cheong
Deputy Safety & Health Manager
Safety Division

The Winners of ASAC 2014

Best ASAC Theme Presentation Award

Figure 5: Mega Category (Finalist) – DTL3 Contract 923, Samsung C&T Corporation

Project Safety Commendation Award

Figure 6: Project Safety Commendation Award – Mr. Chang Kin Boon, Director (DTL3 CT2)

Certificate of Excellence

Figure 7: Mega Category (Finalist) – DTL2 Contract 911 – GS Engineering & Construction – Hock Liang Seng Joint Venture

Certificate of Merit

Figure 8: Mega Category (Finalist) – DTL3 Contract 925A – KTC Civil Engineering & Construction Pte Ltd

Figure 9: Mega Category (Finalist) – DTL3 Contract 930 – SK Engineering & Construction Co. Ltd (Singapore Branch)

Figure 10: Mega Category – TWE Contract 1686 – China Railway 11 Bureau Group Corporation (Singapore Branch)

Figure 11: Mega Category – TWE Contract 1688 – Shanghai Tunnel Engineering Co., Limited

Figure 12: Mega Category – DTL2 Contract 913 – GS Engineering & Construction – Tiong Seng Construction Joint Venture

Figure 13: Mega Category – DTL2 Contract 921 – Ssangyong Engineering & Construction Co., Ltd

Figure 14: Mega Category – DTL3 Contract 922 – Samsung C&T Corporation

Figure 15: Mega Category – DTL3 Contract 935 – Leighton Offshore – John Holland (Singapore Branch) Joint Venture

Figure 16: Mega Category – DTL3 Contract 937 – GS Engineering & Construction Corp.

Figure 17: Major Category – RC Contract ER295 – Sato Kogyo (S) Pte Ltd

Figure 18: E&M Category – DTL1&2 Contract 910 – Alstom Transport (S) Pte Ltd

Figure 19: E&M Category – DTL Contract 952 – Siemens Rail Automation Holdings Limited

Construction Environmental Merit Award

Figure 20: E&M Category – DTL Contract 955 – Singapore Technologies Electronics Limited

Figure 21: E&M Category – DTL Contract 960 – Singapore Technologies Electronics Limited

Figure 22: Mega Category – TWE Contract 1686 – China Railway 11 Bureau Group Corporation (Singapore Branch)

Figure 23: Mega Category – DTL2 Contract 919 – Sembawang Engineers & Constructors Pte Ltd

Figure 24: Mega Category – DTL3 Contract 922 – Samsung C&T Corporation

Figure 25: Mega Category – DTL3 Contract 923 – Samsung C&T Corporation

Figure 26: Mega Category – DTL3 Contract 923A – Shanghai Tunnel Engineering Co. Ltd (Singapore Branch)

Figure 27: Mega Category – DTL3 Contract 925A – KTC Civil Engineering & Construction Pte Ltd

Figure 28: Major Category – CRFP Contract ER337 – McConnell Dowell South East Asia Pte Ltd

Innovative Noise Management Merit Award

Figure 29: Major Category – RC Contract ER392 – KTC Civil Engineering & Construction Pte Ltd

Figure 30: Merit Award – DTL3 Contract 929 – China State Construction Engineering Corporation Limited (Singapore Branch)

Figure 31: Merit Award – DTL3 Contract 935 – Leighton Offshore – John Holland (Singapore Branch) Joint Venture

Accident Free Million Man-hours' Award

Figure 32: Category 1 (Contracts $120 million and above and achieved above 2 million accident free man-hours) – TWE Contract 1685 – Jurong Primewide Pte Ltd

Figure 33: Category 1 (Contracts $120 million and above and achieved above 2 million accident free man-hours) – DTL2 Contract 913 – GS Engineering & Construction – Tiong Seng Construction Joint Venture

Figure 34: Category 1 (Contracts $120 million and above and achieved above 2 million accident free man-hours) – DTL2 Contract 920 – Shanghai Tunnel Engineering Co., Ltd

The Winners of ASAC 2014

Figure 35: Category 1 (Contracts $120 million and above and achieved above 2 million accident free man-hours) – DTL2 Contract 921 – Ssangyong Engineering & Construction Co., Ltd

Figure 36: Category 2 (Contracts below $120 million and achieved above 250,000 accident free man-hours) – DTL3 Contract 925A – KTC Civil Engineering & Construction Pte Ltd

Figure 37: Category 2 (Contracts below $120 million and achieved above 250,000 accident free man-hours) – TEL Contract T2115 – KTC Civil Engineering & Construction Pte Ltd

Figure 38: Category 2 (Contracts below $120 million and achieved above 250,000 accident free man-hours) – CRFP Contract ER337 – McConnell Dowell South East Asia Pte Ltd

Figure 39: Category 2 (Contracts below $120 million and achieved above 250,000 accident free man-hours) – RC Contract ER343 – Hwa Seng Builder Pte Ltd

Figure 40: Category 2 (Contracts below $120 million and achieved above 250,000 accident free man-hours) – RC Contract ER368 – Or Kim Peow Contractors (Pte) Ltd

Figure 41: Category 2 (Contracts below $120 million and achieved above 250,000 accident free man-hours) – RC Contract ER371 – Hwa Seng Builder Pte Ltd

Figure 42: Category 2 (Contracts below $120 million and achieved above 250,000 accident free man-hours) – RC Contract ER391 – Or Kim Peow Contractors (Pte) Ltd

Figure 43: Category 2 (Contracts below $120 million and achieved above 250,000 accident free man-hours) – RC Contract ER392 – KTC Civil Engineering & Construction Pte Ltd

Figure 44: Category 2 (Contracts below $120 million and achieved above 250,000 accident free man-hours) – RC Contract ER403 – Sato Kogyo (S) Pte Ltd

Figure 45: Category 2 (Contracts below $120 million and achieved above 250,000 accident free man-hours) – RC Contract ER412 – Hwa Seng Builder Pte Ltd

Figure 46: Category 3 (For E&M Projects and achieved above 250,000 accident free man-hours) – DTL Contract 952 – Siemens Rail Automation Holdings Limited

Most Improved Contractor Award

Figure 47: Category 3 (For E&M Projects and achieved above 250,000 accident free man-hours) – DTL Contract 960 – Singapore Technologies Electronics Limited

Figure 48: TWE Contract 1686 – China Railway 11 Bureau Group Corporation (Singapore Branch)

Figure 49: DTL2 Contract 911 – GS Engineering & Construction – Hock Liang Seng Joint Venture

Figure 50: DTL3 Contract 923 – Samsung C&T Corporation

QPS Safety Award

Figure 51: DTL3 Contract 937 – GS Engineering & Construction Corp

Figure 52: TWE Contract 1686 – Tritech Consultants Pte Ltd

Figure 53: DTL2 Contract 915 – WorleyParsons Pte Limited

Figure 54: DTL2 Contract 920 – Fong Consult Pte. Ltd.

Figure 55: DTL3 Contract 928 – Ecas-Ej Consultants Pte Ltd

Figure 56: DTL3 Contract 930 – Tritech Consultants Pte Ltd

Figure 57: DTL3 Contract 932A – AECOM Singapore Pte Ltd

Figure 58: DTL3 Contract 935/936 – GWC Consulting Pte Ltd

Sub-contractors' Safety Recognition Award

Figure 59: 68 Systems & Project Engineering Pte Ltd

Figure 60: Asia Tunnelling & Construction Pte Ltd

Figure 61: Chan & Chan Engineering Pte Ltd

Figure 62: Civil Tech Pte Ltd

Figure 63: Eng Hoe Engineering Works

Figure 64: Kiso-Jiban Consultants Co Ltd

Figure 65: Koh Kock Leong Enterprise Pte Ltd

Figure 66: Kori Construction (S) Pte Ltd

Figure 67: L&M Foundation Specialist Pte Ltd

Figure 68: Qinda Engineering Pte Ltd

Figure 69: Sambo E&C Company Limited (Singapore Branch)

Figure 70: Soon Li Heng Civil Engineering Pte Ltd

Figure 71: Wai Fong Construction Pte Ltd

Figure 72: Yew Ann Construction Pte Ltd

Figure 73: Yongnam Engineering & Construction (Pte) Ltd

08 Reduce Hazards through Innovation & Technology – Samsung C&T Way

INTRODUCTION

"Make the change….. Use the TECH to make it safe". These were part of the lyrics sung by Senior Site Engineer Mr. Lee Tae Ho in his song to encourage the audience at the 16th Annual Safety Awards Convention (ASAC) held at the Singapore Polytechnic Convention Centre on 7th October 2014.

Figure 1: Mr. Lee Tae Ho, SCT Senior Site Engineer, performed "MAKE THE CHANGE"

At Samsung C&T C923, safety is paramount. Every individual is instilled with a culture where safety takes precedence in every decision made. Where safety is concerned, Samsung C&T C923 is open minded and readily welcomes any comment, good practices, innovation and technology, and ideas that could contribute to a safer working environment for the workers. With this proactive attitude, Samsung C&T C923 is able to raise its safety standards, and has been recognised being awarded the "Most Improved Contractor Award", "Environmental Excellence Award" and Winner of the prestigious LTA Contractors Challenge Shield at the 16th Annual Safety Awards Convention.

Figure 2: ASAC 2014 Champions

MANAGEMENT COMMITMENT

Samsung C&T believes that safety and health requires strong management commitment and good employee involvement. Spearheading the management team is C923 Project Manager Mr. Brian Park Ho Yoon, and together with the strong support from the LTA project team, QPS team and Samsung HQ, Samsung has set high safety standards in their project planning and designing phase, as well as establishing a sustainable QSHE management system.

Strong commitment from the management is essential in developing a strong safety culture as it ensures that safety is taken seriously by everyone within the company. In a speech by Samsung C&T CEO, Mr. Chi Hun Choi, he highlighted that "safety should be led by the management with enthusiasm". As part of the management ongoing efforts to raise safety and health awareness of workers at sites, Samsung C&T C923 management has organised events on a regular basis which educate, motivate and influence the use of best equipment and technology.

Figure 3: Regular joint site inspection with LTA

BUILDING THE BRIDGE

With workers being the largest asset of Samsung C&T C923, it is of utmost priority to ensure their safety. All new workers arriving at site will undergo the NEW WORKER SCHEME, where they need to put on a "NEW WORKER" helmet label and will be assigned to an experienced worker for On-The-Job Training (OJT). This lasts for 1 month before they are given actual individual tasks by their foreman or supervisor. This helps new workers to adapt and better cope with the site conditions as they commence work.

Figure 4: Technology explained to workers at site

Figure 5: WSHO Mr. Din advising staff on site about safety

Samsung C&T C923 chooses the soft approach over enforcement to engage and win the hearts and minds of every workers, thus they are willing to accept the advice enthusiastically. Samsung C&T C923 believes that a motivated worker performs better in terms of productivity, quality and safety. Samsung C&T C923 has organised employee engagement activities such as Barbeque parties with the management, dining sessions with the Project Manager, as well as rewarding workers that demonstrate desirable safety behaviours as part of its motivation program.

INNOVATION & TECHNOLOGY

Samsung C&T has made various studies, both locally and abroad on ways to improve safety in construction sites. With that, Samsung C&T C923 has taken an innovative approach and harnessed the use of new technologies to enhance work productivity and to achieve better safety performance. The Pre-call system, LED illuminated vest and the RD 1000 are some of the new technologies that are currently used on sites.

The Pre-call system is a safety device consisting of a sensor, transmitter, and alarm. It provides alerts when heavy construction equipment and workers are within close proximity to each other. The transmitter can be operated manually via remote control or by motion sensor which is capable of detecting up to 3 metres range. Equipment operators will be alerted by an audible alarm through the device mounted inside the equipment's cabin. One useful application is having it installed in excavators during the bulk excavation stage, where multiple excavators are operating at the same time within a limited space.

By having LED on safety vests, it provides illumination which enhances the safety of traffic controllers when they perform night duties. These LED illuminated safety vests powered by 9-Volt battery help to increase the visibility of the traffic controllers and also attract the attention of motorists, hence reducing the risk of collision between vehicles and traffic controllers.

Figure 6: Pre-call system composing of receiver and transmitters

Figure 7: Traffic controller directing traffic at the construction site

Another technology adopted by Samsung C&T C923 is the RD 1000. It is a high precision underground utility detection tool that uses Ground Penetrating Radar (GPR) technology. It is best used during the early stages of construction. It has the same principle as a radar system by directing pulses to image the sub-surface. Its ability to detect conductive and non-conductive materials makes it more superior than other underground cable detection equipment.

Figure 8: RD 1000 – High precession utility detector

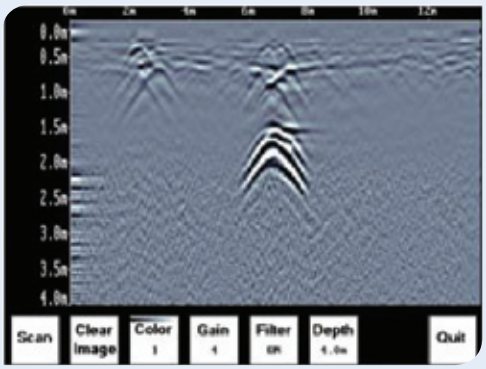

Figure 9: Image formation on RD 1000 LCD screen - series of waves formed signified the location of object

CONCLUSION

Samsung C&T believes in embracing the use of innovative ideas and new technologies to enhance safety on site. By introducing latest technologies and equipment, Samsung C&T is able to overcome the various challenges posed at different construction stages. Samsung C&T also recognises that going the extra mile for safety through innovation and technology is not only good for its employees, it also enhance project speed, quality, and cost efficiency.

Muhammad B Juahir
SHE Manager
Samsung C&T C923

Good Design Practices for Roads Near Completed MRT Stations

INTRODUCTION

In LTA's continual effort to develop the transportation infrastructure, most of the rail lines will generally run along the corridor of commercial and residential buildings to provide close connection of the MRT stations for commuters' convenience of transport options.

Within the limited reserved corridor, designers and builders often face challenges in positioning the above-ground structures of the MRT station such as the station entrance, ventilation shaft and escape staircase at ideal locations adjacent to the carriageway. This article highlights good design practices and learning points identified in the audit of the road safety submission for the design of the permanent road affected by the rail project development.

A) For Station Structures Located near Junctions

Good Alignment across Junction

The stretch of road affected by the provision of the MRT station is often realigned and tied back to the existing road, resulting in misalignment at the junctions. This misalignment of lanes across the junction could result in lane encroachment and sideswipe collision.

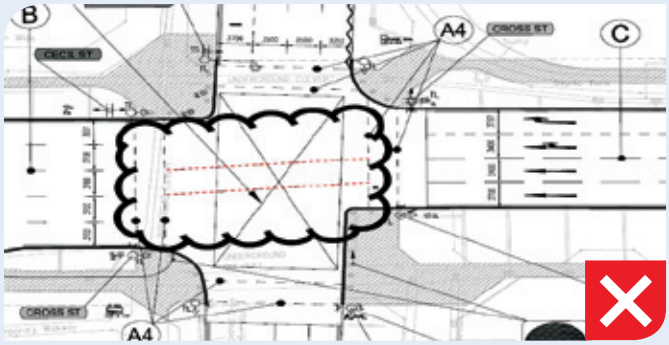

Figure 1: Poor alignment between existing and realigned road may result in lane encroachment

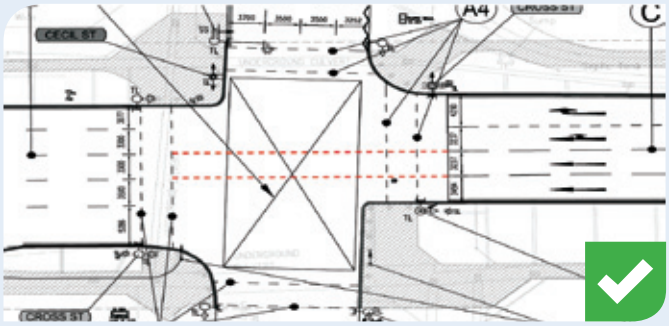

Figure 2: Improved alignment between existing and realigned road after making adjustments to the upstream sidetable kerbline

Appropriate adjustment to the existing road in coordination with the alignment of the affected section should be considered to improve the alignment of the carriageway across the junction.

Adequate Sight Visibility at Junction

Particular attention should be given to ensure the station structures are sufficiently located away from the intersection such that approaching motorists can have a clear sight view of pedestrian movements and traffic from other approaches to avoid conflict.

Figure 3: Vent shaft positioned away from corner of side road access to ensure adequate visibility of oncoming vehicles

Figure 4: Station entrance located away from slip road of junction provides good view of pedestrian at crossing point

Appropriate Location of Commuter Facilities near to Junction

Commuter facilities such as bus stops, taxi stands and passenger pick-up / drop-off bays are generally designed to be close to the designated station entrance to minimise the transfer walking distance of commuters. However, these facilities may need to be relocated at an appropriate distance away from the traffic junction for the following reasons:

- To reduce weaving conflicts between main stream traffic and vehicles using the bus bays, taxi and pick-up / drop-off bays
- To minimise traffic obstruction resulting from queue tailback from the bus and taxi bays

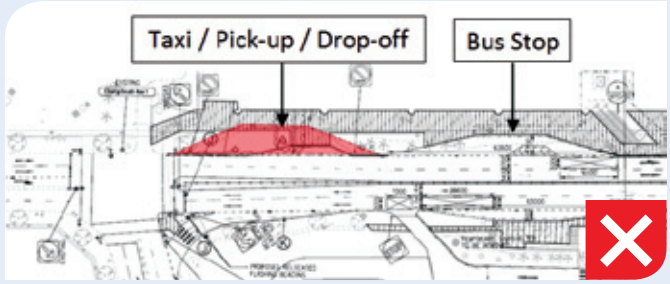

Figure 5: Proposed taxi / pick-up / drop-off bay near the junction

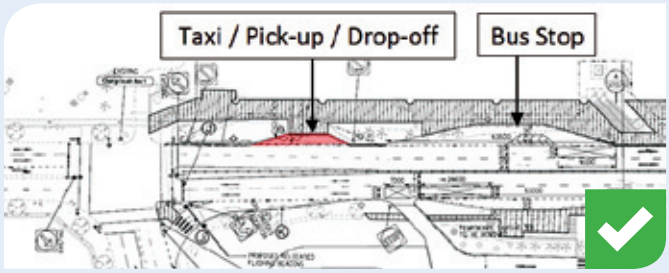

Figure 6: Shifting the proposed taxi / pick-up / drop-off bay away from the junction

Though some taxi and commuter pick-up / drop-off bays are located within a minor road away from the junction to reduce the likely conflict with the main traffic, care must be taken to ensure that the arrangement would not cause disturbance to stakeholders / residents in the vicinity or affect traffic circulation within the estate.

Safe Pedestrian Crossing Facility at Junction

To accommodate the increased pedestrian volume from MRT station using the nearby junction, larger traffic island / refuge area and wider walkways leading to the station may need to be considered to accommodate higher pedestrian / commuter volume. This would prevent spillage of commuters onto the carriageway during peak periods.

Pedestrian crossing timings at junction should be properly designed to accommodate the higher pedestrian volumes, including senior citizens, children, and those with mobility or visual impairments.

B) For Station Structures Located along Mid-Sections of Carriageway

Adequate Lateral Clearance of Station Structure from Carriageway

Above-ground station structures erected along the carriageway could pose a safety concern to users in the station in the event that their vehicle veers off the road and crash into these structures. The minimum lateral clearance from the carriageway in relation to the speed environment shall be provided to minimise the likelihood of a vehicle-object collision.

Figure 7: Adequate offset of station structure from road edge

Where there is site constraint that restricts the structure from being located at the required offset, suitable road safety barriers may be integrated with the station structure to shield vehicles and reduce the severity of the vehicular impact.

Safe Pedestrian Crossing Facility along Carriageway

Well-connected and accessible routes for commuters are essential. The provision of lift integrated crossing facilities, underpass and sheltered walkways linking from the MRT stations to nearby residential developments and public amenities will discourage jaywalking at unsafe locations along the carriageway.

Figure 8: Well-connected and accessible routes from MRT station to nearby residential developments deter jaywalking

Adequate Provision of Commuter Facilities along Carriageway

The provision of adequate bus stop, taxi and pick-up / drop-off bays along the carriageway to serve the commuters help to minimise the likelihood of queues spilling onto the carriageway and eliminate obstruction to passing traffic. However, site constraints at the station location sometimes lead to the provision of inadequate taxi and pick-up / drop-off facilities, e.g. Facilities only along one bound of the carriageway and limited number of lots within the bay.

It is also undesirable to locate pick-up / drop-off bays and bus facilities at the following locations:

- Pick-up / drop-off facilities behind bus bay where line of sight for drivers exiting the taxi and commuter pick-up / drop-off bays is compromised (Figure 9)
- At the exit to the slip road leading from a high speed carriageway

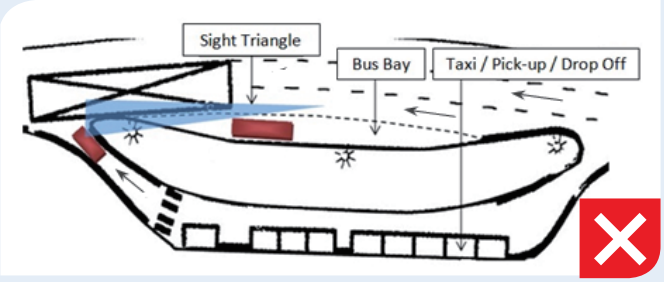

Figure 9: View of drivers exiting the taxi stand obstructed by buses at the bus bay

CONCLUSION

It is important to provide a safe road environment with good connectivity for commuters and motorists near all MRT stations. This objective could be achieved if the affected road network is given due safety considerations at the early stage of the rail project development so that the potential hazards in the road design stage can be properly mitigated.

The internal LTA Project Safety Review process helps to assure that adequate safety considerations are considered in the road design process. Strict adherence timelines for safety submission at the early design stage would minimise unsafe provision and prevent abortive work at the later stages of work.

Jelphine Goh Jie Yun
Deputy Road System Safety Manager
Safety Division

The Journey Towards Corporate ISO14001 Integration

INTRODUCTION

LTA was first certified to ISO14001 standards for engineering and project management in 2008. Since then, the environmental management system in LTA has expanded to cover corporate level with a central and integrated assessment of environmental impacts. As of 13th June 2014, LTA had been officially re-certified by Certification International Singapore (CIS) to ISO14001 standards covering the scope of: "Planning, Design, Technical Support, Corporate Services and Project Management for the Development and Delivery of Road Projects, Rail Transit System Projects and Road Operations."

Not only project management of environmental impacts such as noise, earth control, vector, air and water are systematically managed; the environmental impacts arising from the planning of transport systems, design of our transport infrastructures, operation of road facilities and office energy usage are all reviewed, assessed and managed holistically.

Through this holistic approach to manage the environmental impacts, we are able to sieve out impacts that are significant, focus our efforts and resources to those which require attention and identify any gaps within our environmental management more effectively. New significant aspects can also be promptly recognised and mitigation measures introduced to minimise all environmental impacts.

CERTIFICATION INTERNATIONAL

Certificate of Registration

This is to certify that

Land Transport Authority

1 Hampshire Road Singapore 219428

operates an Environmental Management System which has been assessed as conforming to

ISO 14001:2004

for the scope of activities

Planning, Design, Technical Support, Corporate Services and Project Management for the Development and Delivery of Road Projects, Rail Transit System Projects and Road Operations.

Certificate No: CIS/100318IE-1 Issue Date: 13 June 2014

Valid until 12 June 2017 subject to adherence to the agreed ongoing audit programme, successful endorsement of certification following each audit and compliance with CI Regulations

Signed for and on behalf of

Authorised Signatory

A company of SGS

Figure 1: LTA Corporate ISO14001 certification 2014

CHALLENGES

The preparation work leading to certification process was challenging due to the reorganisation in June 2013. New groups were formed to manage LTA's new work scope, while others were reorganised to provide a better structure for accountability. The challenge was to identify significant environmental aspects within groups with newly acquired portfolios and work processes.

Due to the diverse nature of LTA's corporate work scope, an ISO14001 working committee was set up to align the environmental objective and working manuals of all groups within LTA. The Working Committee was responsible to liaise with the respective group representatives to have a better understanding of the work nature and projects undertaken by each group.

With strong support from all groups and the respective representatives, the Working Committee was able to share good environmental practices and ensure the successful re-certification at corporate level.

INTEGRATED ISO14001 MANAGEMENT SYSTEM

Under the integrated environmental management system, a Corporate Environmental Aspects and Impacts Register was established by the ISO14001 Working Committee and managed centrally by the Quality Assurance Committee. The register is similar to a risk matrix and all Groups will adopt the same system for assessing the significance of the environmental impacts resulting from their works. This allows for a coherent assessment and ensures that the right amount of resources is used on important matters.

After establishing the significant environmental impacts of their works, the individual groups are to manage these with a proper system stipulated under the ISO14001 standards.

For project teams, we have expanded the significant environmental impacts to cover wastewater discharge from tunnelling processes this year. This assures that chemical-laden discharges are properly treated and does not affect local catchment areas.

Management of office environmental impacts is a common but differentiated responsibility. With Corporate Services Group managing the technical aspects of improving the performance of systems such as air conditioning and lighting, everyone in LTA can contribute positively by reducing the amount of energy consumed. LTA staff can now access an intranet link to find tips and suggestions on energy conservation.

CONCLUSION

There were many challenges during the re-certification process due to our corporate reorganisation. Despite working with the tight timeline, the team was well supported by all representatives to assist and advise on the alignment of respective group's manual to the corporate manual. This allows ISO14001 corporate integration for re-certification to be a great success.

Low Shi Mei
Assistant Environmental Manager
Safety Division

ASAC INNOVATIVE NOISE MANAGEMENT MERIT AWARD 2014

We interviewed the winners of ASAC Innovative Noise Management Merit Award to gain a better understanding of their innovative noise management measures. We also wanted to find out what motivated the projects to go beyond their contract specifications to improve the noise condition on site.

NOISE ENCLOSURE FOR VENTILATION FANS

China State Construction and Engineering Corporation (Singapore Branch) (CSC), DTL 3 Contract 929

Mr. Henry Goh (WSHO) shared with us on C929's innovative use of noise enclosure for ventilation fans (Figure 1) and its benefits since its implementation.

***LTA:** What was the motivation behind this winning innovation?*
CSC: The project was faced with the issue of noise due to the close proximity to residence. Hence, by coming up with this innovation, not only we have achieved an improvement in noise reduction; we have also received less feedback from residents.

***LTA:** How did this winning innovation help in the progress of the project?*
CSC: Progress of work was no longer disrupted unlike previously where we practiced intermittent works (e.g. 5 minutes work followed by 3 minutes rest), to reduce noise level in order to meet NEA permissible noise limits. Workers are able to work comfortably by wearing ear plugs instead of ear muffs over their helmet.

Figure 1: Noise Enclosure for Ventilation Fan

During the interview, Mr. Henry Goh further shared with us the working principle behind the innovative noise enclosure to reduce the noise from 88.6dBA to 67.5dBA (an impressive reduction of 21.1dBA when measured 1 metre away from the noise enclosure!). The enclosure comprises of celcon block walls with built-in rock wool, similar to a concept of a soundproof room. CSC also took into consideration the entrance of the enclosure to create an L-shaped access route to reduce the direct impact of noise during the opening of the access door (Figure 2). The details of the design were commendable.

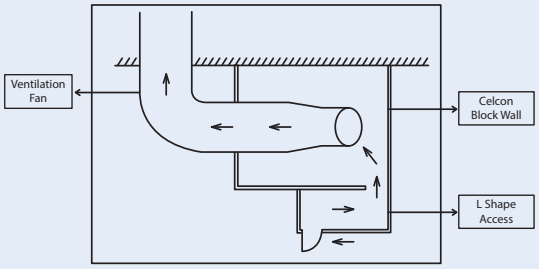

Figure 2: Plan view of Noise Enclosure for Ventilation Fan

LAUNCH SHAFT NOISE ENCLOSURE

Leighton- John Holland JV (LJHJV), DTL 3 Contract 935

Mr. Muthu Veeran (ECO) shared with us the support they have received from their management to innovate and develop a fully enclosed launch shaft. He also encouraged other contractors to use noise reduced machineries on site during the interview.

***LTA:** How did your management play a role in this winning innovation?*
LJHJV: Our management is always receptive to innovative and sustainable technological solutions. They also encourage us to minimise noise pollution while we work.

***LTA:** How did this winning innovation help in your project?*
LJHJV: After the launch shaft noise enclosure was up, the noise level measured during noisy work activities have not exceeded the limits. The stakeholders were happy with our noise management system, even when we worked round the clock. We have received minimal feedback relating to noise from the public and the authorities. It has certainly helped our works as we are able to proceed without delay.

***LTA:** Lastly, what advice do you have for other fellow contractors?*
LJHJV: For contracts that require heavy crane movements, we suggest the use of overhead gantry crane instead of the use of mobile cranes with tracks. The overhead gantry crane reduces noise level produced by track and wheel traction.

Mr. Muthu also shared with us the benefits of having a fully enclosed launch shaft (Figure 3). With that in-place, it has allowed their tunnel activities to go 24 hours, thus saving time and increasing productivity.

Figure 3: Launch Shaft Noise Enclosure

The fully enclosed launch shaft was further enhanced by the use of rolling shutters, which can be retracted in the event of noisy works or during night works. This fully enclosed launch shaft is enveloped on all 5 sides, making it the one and only of its kind in Singapore!

Low Shi Mei
Assistant Environmental Manager
Safety Division

Carrying out Engineering Works within Road Structure Safety Zone (RSSZ)

INTRODUCTION

Road Structure Safety Zone (RSSZ) refers to the land or area which is 20 metres from the outermost edge of any part of a road structure.

As Engineering Works carried out within the RSSZ may likely affect the structural integrity of road structures and the safety of road users, an application for approval to commence engineering works within the RSSZ has to be made in accordance to Street Works Act 8A to ensure the safety / integrity of these structures are taken into account during the construction works.

Types of Road Structures

The various types of Road Structures include:

- Road viaducts, bridges and flyovers
- Road tunnels
- Vehicular and pedestrian underpasses
- Pedestrian overhead bridges
- Retaining walls
- Ancillary structures such as ventilation buildings for tunnels and pump rooms for underpass.

ENGINEERING WORKS

Engineering Works refers to any kind of construction work which includes:

- Excavations for basement and other building structures under land
- Tunnelling works
- Installation of diaphragm walls, foundation piles, sheet piles, bored piles, wells, ground anchors and tie backs
- Operation of crane hoist or heavy equipment.

Safety Considerations for Engineering Works

a) Deep Excavation / Tunnelling Works

Figure 1: Excavation works beside flyover

Deep excavation can cause considerable ground movement and settlement, and may lead to the lowering of ground water table. Lowering of ground water due to deep excavation can accelerate consolidation settlement. The differential settlement between different supporting systems of the road structures can adversely affect their stability.

Tunnelling works over or under road structures can also cause instability to them. Tunnelling works under road structure can affect the foundation of road structures and crossing over can cause heaving to the road tunnels.

Earth retaining structures must be designed and constructed to minimise ground movement and reduce the risk of damage to the adjacent road structures. These earth retaining structures should be constructed to prevent excessive seepage of water through and around them.

The response of the existing road structures and the ground adjacent must be monitored with a comprehensive instrumentation monitoring system to detect any excessive movement of the road structure that may affect its functionality and structural integrity.

Figure 2: Additional lateral steel bracket installed to the abutments

Protective measures or advance works, either temporary or permanent, may need to be designed and implemented to minimise the damage to existing road structures and to ensure that the operating conditions for the road infrastructures remain safe. These may include temporary props, strengthening or underpinning works, modification or replacement of bridge bearings and shear pins, etc.

b) Diaphragm Wall Installation

The installation of diaphragm walls near road structures can cause instability to the road structures if there is a lack of proper control during installation. All trenches must be stabilised during trenching. Depending on soil conditions, trenches can be stabilised using casing, stabilisation fluid, or both.

For diaphragm walls located less than 6 metres but more than 3 metres horizontally from the outermost edge of road structures, they shall be constructed in panel length not exceeding 3 metres. On the other hand, for diaphragm walls that fall within the zone of influence, they are to be debonded if the load or stress induced to the road structure is above the design capacity of the structure.

Figure 3: Diaphragm wall installation beside flyover

c) Piling Works

Figure 4: Piling works beside flyover

The Installation of foundation piles will likely generate excessive vibrations depending on the construction method adopted. This will cause structural damage and ground settlement resulting in instability to the road structures. Use of non-vibratory method such as silent pilers should be considered.

d) Installation of Ground Anchors

Figure 5: Installation of ground anchors

The installation of ground anchors can cause damage to underground road structures and road structure foundations if it is not carried out properly. As such, these underground structures must be pegged and demarcated clearly on site. By doing so, this will ensure that the proposed locations for the installation of ground anchors are located away from these underground structures, and thus will neither hit or cause damage the road structure foundations nor inadvertently affect the ground supporting the road structures.

e) Operation of Cranes and Heavy Road Equipment

Figure 6: Lifting works beside flyover

Cranes and heavy equipment can cause not only significant damage to the road structure, but also disrupt road operation if it collapses or overturns, possibly resulting in fatality to road users.

Precautionary safety measures must be implemented during the operation of crane and heavy equipment to ensure that all lifting and drilling works are carried out safely:

- All lifting machineries and lifting gears used for lifting operations must be tested by an Authorised Examiner and have valid test certificates
- Professional Engineer (Civil) must design and check on the stability of working platforms and access
- To minimise the risk of hitting the road structures should the lifting machinery collapses, the crane and heavy equipment shall be positioned such that its toppling radius is at least 6 metres away from the outermost edge of the road structure
- All outriggers of mobile crane shall be fully extended
- Physical barriers should be provided to restrict movement of cranes
- For works under the viaduct, excavators and machines (drilling rigs and cranes) with their arm or boom fully extended must have at least 1 metre clearance from the soffit.

CONCLUSION

Carrying out Engineering Works poses hazards not only to the road structures but more importantly to road users. With the collaborative effort between consultants, contractors and LTA, possible hazards can be identified and mitigated. Proper planning and monitoring will ensure that Engineering Works are carried out safely within the Road Structure Safety Zone.

Robert Abello Marcelo
Principle Engineering Officer
Development and Building Control Division

Editorial Page

LTA 32nd Safety Workshop and 20th Construction Staff Award Ceremony

The 32nd Safety Workshop and 20th Construction Staff Awards Ceremony organised by Safety Division was held on 2nd December 2014 at the HSO Auditorium. It was attended by more than 100 officers from Rail, Road Projects and Engineering Groups. The workshop served as an excellent platform for projects teams to share the safety challenges they faced and how they were overcome. Project staffs that have gone the extra mile in ensuring high safety and environmental standards were recognised and presented with awards during the Construction Staff Awards Ceremony.

There were three presentations given by two LTA officers and one guest speaker from Ministry of Manpower (MOM). The topics were:

1. SHE challenges faced in Sleeper Replacement by Senior Project Engineer Mr. Mohamad Ridhwan Bin Abdul Lazim
2. Safety challenges in dismantling and retracting TBM from within tunnel by Senior Project Engineer Mr. Poon Hong Wai
3. Crane Safety in Singapore: Lessons learnt from the past by Mr. Ian Teh Yi Tian, Senior Specialist, Engineering Safety Branch, Ministry of Manpower (MOM).

Figure 1: Senior Project Engineer **Mr. Mohamad Ridhwan Bin Abdul Lazim**

Figure 2: Senior Project Engineer **Mr. Poon Hong Wai**

Figure 3: Guest Speaker **Mr. Ian Teh Yi Tian** from Ministry of Manpower

Figure 4: Winners of the Construction Safety and Environmental Awards

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