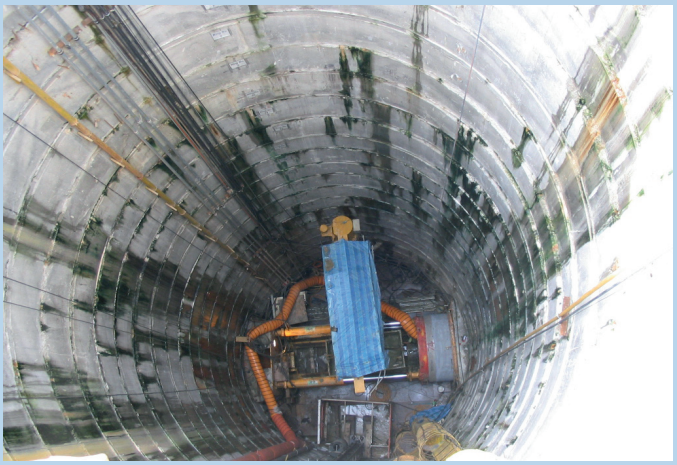
SAFETYNEWS

Land Transport Authority

Issue 10 | ISSN 1793-1665 | March 2008

Confined Space

Articles featured in this issue



• A confined shaft

Introduction

Confined spaces cover a wide variety of workplaces which have limited access and insufficient ventilation, thereby developing into a potentially dangerous workplace due to oxygen deficiency or presence of toxic or flammable gases.

Daily operations on a construction site often involve work in excavations that have the potential to develop into a confined space but often not recognise as one. Very often, the danger develops as a result of the operation within the confined space – for instance hotworks, painting and use of chemicals which include adhesives or solvents.

This article serves to inform the reader how to identify the various sources of risk and how working in a confined space can be carried out safely.

Definition of Confined Space

In 2000, CP 84: Code of Practice for Entry into and Safe Working in Confined Spaces was published by SPRING Singapore (formerly known as PSB Singapore). It is also currently an approved Code of Practice (CP) under the Workplace Safety & Health Act (WSHA) Section 39.

Confined Space as defined in the CP 84 is:

Any chamber, tank, vat, pit, pipe, flue including any other similar space in which:

(a) dangerous airborne substances are liable to be present to such an extent as to involve risk of fire or explosion occurring; or

(b) dangerous airborne substances are liable to be present to such an extent as to involve risk of persons being overcome by such substances; or

(c) there is a risk of persons being asphyxiated due to inadequate supply of air.

Sources of risk

(a) Toxic and flammable atmospheres

High concentrations of toxic and flammable gases in an unventilated space can become unsafe for human occupancy. The First Schedule of the Workplace Safety and Health (General Provisions) Regulations 2006 specifies the Permissible Exposure Limits of Toxic Substances for short-term exposure (15 minutes duration) as well as long-term exposure (8 hour duration). Therefore, site practices and conditions should not exceed these stipulated concentrations. These are some situations whereby contaminants can arise:

- the space itself (eg. leaded petrol tanks).
- earlier process (eg. degreasing, in which case a residue of trichlorethylene solvent in the tank could emit fumes when the sludge is cleaned off).
- previous contents (eg. empty solvent containers which emit flammable and toxic vapour into the atmosphere).
- adjoining plant (eg. entry of toxic gas such as carbon monoxide from adjoining plant or machinery).
- nearby undertakings (eg. deep excavations near sewage works, gas works or chemical refineries).

(b) Oxygen deficiency

CP 84 states that the oxygen content should not be less than 19.5% volume and not more than 23.5% volume. Persons working in oxygen-deficient atmospheres may not know about it until symptoms such as breathlessness, faintness, lack of physical co-ordination occurs. Immediate evacuation is a must since unconsciousness can follow rapidly and unexpectedly. Some situations leading to oxygen-deficiency:

- decay of organic matter (biochemical depletion of available oxygen by organic matter due to the decaying process).
- rusting process (rusting of steel containers/steel storage areas closed for long periods, especially with presence of moisture, causing oxygen to be absorbed by the surfaces).
- contaminated soil (slow oxidation of buried coal waste or microbiological decay of organic matter takes up oxygen from the surrounding soil, leaving a nitrogen gas mixture deficient in oxygen and rich in carbon dioxide. Falling atmospheric pressure would allow this gaseous mixture to seep into tunnels or deep excavations).

(c) Oxygen enrichment

An oxygen-enriched atmosphere is equally dangerous. With excess oxygen, some substances containing organic matter become liable to spontaneous combustion (eg. grease, oil). In addition, the flammability of all other materials greatly increases and a fire in an oxygen-enriched atmosphere develops with great speed.

Note that oxygen should never be used to provide ventilation in a confined space; contaminant-free natural air taken from outside should always be used.

Implementing Safe Work Practices (SWP)

Listed below are the major items that should be implemented when working within a confined space.

Testing of Atmosphere – Based on the established in-

house procedure, periodic testing shall be conducted by a competent person (someone who has passed the Confined Space Safety Assessor course) to test the atmosphere of a confined space prior to entry by any person. Subsequent periodic testing intervals should not exceed 8 hours. (However, our safety requirement under the LTA General Specification Appendix A, it stipulates that gas monitoring shall be repeated at four hourly intervals when there are persons working therein).

Results of the tests shall be recorded on the gas monitoring chart/sheet. Among the types of gases tested include:

a. oxygen content;
b. flammable gas or vapour; and
c. toxic airborne substances.

In addition, at least one worker in the confined space shall be equipped with a suitable continuous gas monitoring device where applicable. Whenever necessary and practicable, a retrieval system consisting of a retrieval line, body harness and a lifting device, or other similar means should be used by a person who is authorised to enter a confined space.

• Signage

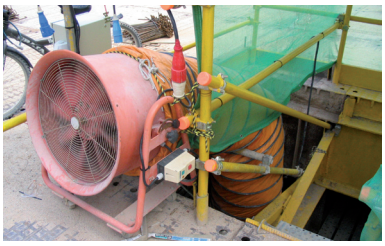
Signage - Warning signs in compliance to SS 217 to be posted at or near every access point to warn persons who intend to enter into the confined space.

Training - All persons working in a confined space shall be trained in the following:

a. general hazards associated with confined spaces;
b. safety and health precautions with respect to entry into confined space;
d. entry permit system and other procedural requirements for conducting a confined space entry; and
e. how to respond to emergencies.

Confined Space Entry Permit – An authorised person shall be appointed by the owner or occupier of the premises to approve the entry permit before any person is allowed to enter a confined space. The permit shall contain the purpose of entry, date and time of entry, location of confined space, results of gas testing and validity of the entry permit. The authorised person shall review and assess the need to continue with the entry into a confined space on a daily basis and may revoke the entry permit if deemed necessary.

A copy of the entry permit after approval by the authorised person shall be displayed conspicuously at the entrance of the confined space together with the names or tags of persons permitted to enter the confined space.



• Forced ventilation

Ventilation – Suitable and adequate ventilation should be provided at all times during occupancy with air supply not less than 1.4 cubic metres per minute for every person inside the confined space.

The forced ventilation shall remain in operation whenever persons are present in the confined space.

Where exhaust ventilation is used, the exhaust air from the ventilation system shall be exhausted to a location outside the confined space where they present no hazard. When internal combustion engines are used in conjunction with an exhaust ventilation system, it needs to be sited away from the confined space such that their emissions cannot enter the confined space or contaminate the air being supplied to the confined space. Should ventilation prove ineffective in the removal of airborne contaminants, other effective means need to be provided to protect persons against inhaling such contaminants in the confined space.

Emergency Rescue - The emergency rescue operation plan shall be established. This includes names of appointed rescue personnel, methods of rescue, provision of rescue equipment and respirators to be written. All designated rescue personnel shall be trained in rescue operation including first aid, the proper use of the personal protective equipment and equipment necessary for carrying out rescue operation in confined spaces and be fully aware of the potential hazards associated with confined spaces. Table-top exercises and evacuation drills must be conducted regularly and records to be kept.

Lighting – The lighting level should not be less than 50 lux for accessways and passageways. Portable hand-held lights are operated at a voltage not exceeding 55 volts between the conductor and earth, or by means of a step-down transformer having a secondary voltage not exceeding 110 volts centre point earthed.

Attendant – The attendant shall remain outside the confined space to monitor persons entering and remaining in the confined space while maintaining contact. Alert rescue team and assist in the evacuation in the event of emergency.

Conclusion

Of foremost importance is to recognise a confined space when you see one. Only upon recognition of the hazard can the necessary precautions be implemented, thereby preventing undue accidents.

Tan Hock Seng Andrew
Safety & Health (Info/Promo) Manager
Safety Division

Hazardous Substances & their Effects on Health

Introduction

Hazardous substances are used in many workplaces and take many different forms. They can exist in solids, liquids gases or vapour. Most people are aware of the safety aspects associated with the use of hazardous substances such as fire and explosion as well as suffocation. Very often the health aspects of exposure to the hazardous substances which can result in long term effect on health are often neglected.

This article serves to remind readers about the harmful effects of chemicals and preventive measures to be taken when chemicals are used at the workplaces. As it is not possible to address and discuss the full range of hazardous substances used in the industry, this article will emphasis on a few chemicals that are commonly used at the LTA construction sites.

Toxic effects of chemicals

Most chemicals used at our workplace by nature are toxic, corrosive or flammable. Generally, the health risk of a chemical depends on the toxicity and the actual exposure. No matter how toxic the material may be, there is little risk involved unless it enters the body.

The toxic effects of a chemical may be local or systemic. Local injuries involve the area of the body in contact with the chemical. For example, if you spill an acid on your arm, the effect will be on your arm. Systemic injuries involve tissues or organs other than the contact site where toxins have been transported through the bloodstream. For example, lead fumes primarily affect the brain, kidney and red blood cells and some solvents may harm the liver and kidneys.

Prolonged exposure to hazardous chemical has an adverse effect on health and this may either be acute or chronic effect. Inhaling chemicals such as toxic solvents can cause drowsiness, dizziness, and unconsciousness. Conversely, long-term exposure to benzene is likely to have effects on the bone marrow and can cause anaemia and leukaemia. (Note: Benzene is carcinogenic and is used as an additive in gasoline, but it is an important industrial solvent and precursor in the production of lubricants, rubbers, dyes, detergents, drugs and pesticides).

Hazardous substances

In the construction sites, chemicals are often used in some processes like degreasing, painting, waterproofing and handling of solvent and wet cement.

Chemicals are categorized generally as follows:

Characteristic of Chemicals	Examples	Effects
Irritant	concrete/ mortar admixtures, paints, solvents, adhesive.	can cause **reversible inflammable effect** in living tissue (eg. skin, eye and respiratory system) due to chemical action at the area of contact.
Sensitizer	solvents, paints, epoxy, hardeners.	can cause **allergic reaction** in living tissue.
Corrosive	hydrochloric acid, sulphuric acid.	can cause destruction or **irreversible alterations** in living tissue.
Oxidizer	oxygen.	an oxidizer is not necessarily a combustible substance but may readily liberate oxygen and therefore **increase the violence of fire**.
Axphyxiant	carbon monoxide, hydrogen sulphide.	can **deprive the living organism of oxygen** leading to loss of consciousness and even death.
Flammable	diesel, solvents, thinner, acetylene, sealant.	can **easily ignited and capable of burning rapidly**.

The following section will highlight the common processes where hazardous substances are used at our sites.

Example 1 - Painting

Painting is one of the common work processes in the construction sites. Besides the risk of fire, explosion and asphyxiation, there are health hazards associated with painting. The hazards depend on the:

- toxicity level and the amount of paint used;
- method of painting carried out;
- duration of painting; and
- environmental conditions.

The use of solvent-based paint for spraying carried out inside confined spaces can be hazardous. The first step in identifying the hazards of a particular paint is to know the contents and its characteristics through the review of the Material Safety Data Sheet (MSDS).

Paints consist of binder, pigment or colouring, solvent and special additives. Many constituents of paints are irritating to the skin eg. solvents, resin binders and additives. Some additives such as tributyl tin oxide and organo-mercurial compounds may cause severe skin burns. Others may result in skin allergy eg. epoxy resins, chromate and cobalt. Painters are at risk of industrial dermatitis as a result of direct skin contact.

Paint in the form of mist or vapour may contaminate the air we breathe. This is particularly hazardous when spraying painting is carried out in confined spaces as the concentration of the hazardous contaminants would be very high.

Solvent poisoning

Workers carrying painting in confined spaces have been

known to suffer from the acute effects of solvent vapour intoxication. They feel weak and may feel like vomiting. Sometimes, they may even lose their consciousness and die subsequently. This has occurred even among workers using respirators while painting in confined space provided with force ventilation. The ventilation provided may not be sufficient and the respirators provided may not be effective to protect against high concentration of solvent vapour. Acute solvent poisoning can be fatal in itself or can lead to a fatal accident due to from falling from heights.

Metal poisoning

Although chronic metal poisoning is not common as lead containing paint is rarely used nowadays, one should not overlooked. Besides painters, welders and metal cutters who weld or cut metals coated with lead paint may be at risk of lead poisoning if they inhale excessive amount of lead fumes over a period of time.

Example 2 - Handling cement

Cement is used as a binder in concrete and mortars that is widely used in construction industry. They are made from materials such as calcium sulfate, chromates, calcium oxide, crystalline silica and other trace compounds.

• Cement burn through skin contact
Source: (OSH Journal)

Industrial dermatitis or inflammation of the skin is probably the most common type of occupational disease among those who work in the construction industry. The most common cause of skin rashes is through direct contact with wet cement which can irritate and damage the skin because it is abrasive and alkaline. Some workers develop an allergy to the chromates present in the cement. The itchy rashes usually occur on the exposed parts of the body like the hands, forearms and legs. Workers who handled wet cement and habitually disregarded the use of appropriate hand gloves may suffer serious skin burn.

Irritation to respiratory tract

Breathing cement dust at low concentration level and short duration may cause irritation to the nose, throat or lung. Prolonged inhalation of dust can cause silicosis and fatal lung disease. Studies have shown that silicosis increases the risk of tuberculosis and may result in renal disease.

Although asbestos was banned in Singapore, some workers may be exposed to asbestos fibres during demolition or renovation of old buildings. Inhalation of high levels of asbestos fibres over many years could lead to their accumulation in lungs, leading to a condition called asbestosis. Therefore, asbestos should be removed, handled and disposed of properly so as not to pose a hazard to the workers or to the public. Proper respiratory protection and clothing should be worn by the workers.

Obligations of stakeholders

Section 40 of the WSH (General Provisions) Regulations stipulate that the employer is responsible to take all reasonably practicable measures to ensure that no person at work is exposed to the toxic substances specified in the First Schedule in excess of the permissible exposure levels as specified in that Schedule.

Preventive measures

Below highlights some of the preventive measures to be implemented when working with chemicals that are known to be hazardous.

1. Reviewing MSDS
Every hazardous substance should come with a MSDS. The information contains in the MSDS are reviewed to determined whether the substance used has any health effect, fire and explosion hazards and preventive measures required. The MSDS also provides the estimated amount of ventilation that is required to reduce the toxic contaminant concentrations to levels which are not harmful (permissible exposure limit) and which do not pose a fire and explosion risk.

2. Engineering control
Engineering control can be implemented to minimise the hazards of solvents in the workplace. These include automation or enclosing the processes using harmful substances as far as possible. In addition, work place should be properly ventilated.

3. Substitution
Take the case of spray painting carried out in a confined space where a solvent-based paint known to be highly flammable and toxic can be substituted safely with a paint which contain less toxic constituents or a water-based paint.

4. Dissemination of information
Persons at the workplace who are liable to be exposed to the hazardous substances shall be explained of the hazards involved and the precautionary measures to be taken. Proper dissemination of information would enhance workers' level of safety.

5. Safe handling, storage & disposal
Procedure should be established to guide the handling, storage and use of hazardous substances in a safe, environmentally responsible manner (eg. use of metal trays to prevent spillage and soil contamination).

Conclusion

Lack of knowledge and improper control of the chemical used can sometimes result in serious accidents at the workplaces. In addition, spills, leaks and unsafe discharges of hazardous substances can also harm the environment.

Therefore, appropriate control measures must be implemented to prevent or minimize accidents and any ill health to workers who are exposed or working with hazardous substances.

Lee Cheng Chuen Patrick
Editor LTA Safety News
Safety Division

Managing Fire Incidents at MRT Stations and Tunnels - Safety Features

Introduction

When the Singapore Rapid Transit Systems (RTS) first started in the 1980s, the fire safety provisions were based on NFPA 130 – Standard for Fixed Guideway Transit and Passenger Rail Systems. There were no local codes or standards for designers to make reference to then. During the early stages for North East Line and Changi Airport Line, relevant requirements from NFPA 130 and the Singapore Fire Code as well as other relevant codes of practice were collated and documented in Fire Safety Outline Reports. The reports were then submitted to the local fire authority, the Singapore Civil Defence Force (SCDF), for consideration.

Subsequently in 2000, the Standard for Fire Safety in Rapid Transit Systems (SFSRTS), which is an amalgamation of relevant requirements from NFPA 130 and the local fire codes including lessons learnt from previous transit lines, was jointly formulated by the Development and Building Control Division of the Land Transport Authority (LTA) and SCDF. The latest edition of SFSRTS was launched in 2005 and is available in the SCDF website.

This article highlights the salient fire safety features for the stations and trainways.

Fire safety features in stations

The types of fire safety features in stations can be broadly categorised into passive as well as active provisions.

Passive provisions encompass appropriate siting and sizing of the means of escape / exit facilities such as open stairs / escalators, exit staircases, doors and signages to enable passengers to vacate the platform and station expeditiously.

Other passive provisions include protection to structural elements, fire compartmentation to hazardous areas / plantrooms, access for fire fighting and rescue operations, and the external fire engine access roads and accessways.

There are 3 major active provisions in stations, namely fire protection systems, smoke purging system as well as emergency lighting and power supply.

Fire protection systems such as hose reels and portable fire extinguishers are considered first-aid fire fighting provisions, while automatic detection / suppression systems such as fire alarm, fire sprinkler and clean gas fire suppression systems provide early warning and control the fire before the arrival of the fire fighters.

Fire protection systems

• Fire extinguisher

• Hose reel

Automatic detection/suppression systems

• Fire alarm panel

• Fire pumps for sprinklers

Fire hydrants, dry mains and fire lifts are used by fire fighters in their fire fighting and rescue operations.

• Dry mains & standby fire hose

The smoke purging system is activated automatically to extract the smoke produced by a fire in order to facilitate evacuation.

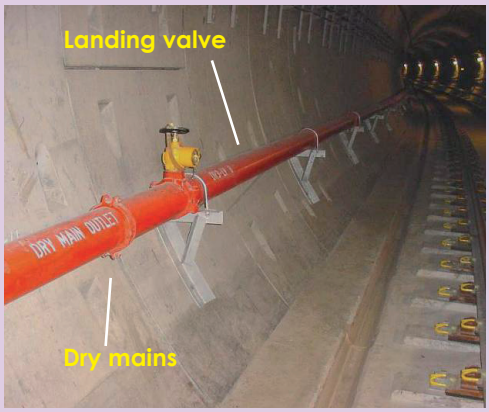
• Smoke extraction fans

The emergency lighting and power supply ensure that occupant evacuation and fire safety equipment operation will not be interrupted even when there is a power outage during fire.

Fire safety features in enclosed trainways

In the underground tunnels, both passive and active fire safety provisions are critical due to its enclosed nature.

The major passive provisions in the tunnels are the mid-tunnel exit staircases, cross-passageways between adjacent tunnels, the Illuminated Tunnel Evacuation Signage System (ITESS) and the Cross Passage Evacuation Signage System (XPESS) to facilitate the orderly and speedy evacuation of passengers after detrainment.



• Tunnel dry mains

• Motorised trolley

The active provisions include the emergency tunnel ventilation system, tunnel dry mains, motorised trolleys, emergency lighting and power supply.

The tunnel ventilation prevents backlayering of smoke and hence affords a tenable evacuation path for passengers away from the smoke.

The tunnel dry mains used in conjunction with the motorised trolleys allow the fire fighters to mobilise / deploy heavy fire fighting equipment and evacuate casualties speedily.

The emergency lighting and power supply are necessary to maintain the minimum illumination level in the tunnel for evacuation should there be a disruption to the normal electrical power supply during a fire incident in the tunnel.

Conclusion

Despite the establishment of the comprehensive provisions and stringent fire prevention measures (e.g. among others include the use of non-combustible building materials, prohibition of hazardous materials in the stations / trains, enforcement of good house-keeping), LTA and SCDF would continue to review the fire safety requirements and ensure that the level of fire and life safety in the RTS will not be compromised. This is best reflected by the words of Mr Goh Kok Hwa, DD(DTL1) and former chairman of the SFSRTS review committee:

"The Standard of Fire Safety in RTS developed jointly between LTA and SCDF has set a high standard for fire safety in RTS. I am happy to see that the Standard is in place for Circle Line and is also applicable to Downtown Line. It is always LTA's interest to take care of life safety of commuters using our current RTS."

Melvyn Thong,
Deputy Director, Mechanical & Electrical Services
Lim Kwee Chew,
Manager, Mechanical Services
Sng Chun Hui,
Assistant Manager, Mechanical Services
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Enhancing Elderly Pedestrian Safety along Work Zones

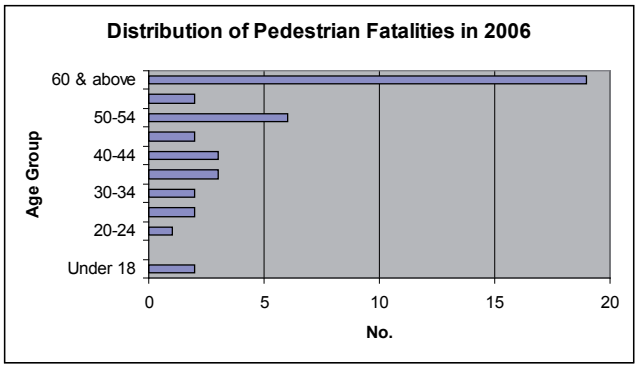
Introduction

Walking is a major mode of transport and a component of most trips. Pedestrians fall under the vulnerable road user group, largely due to their lack of protection and limited biomechanical tolerance to the external forces when impacted by vehicles. Older pedestrians are especially vulnerable to injuries because of their physical frailty which include visual impairment.

Crash and injury risks

In 2006, pedestrian fatalities account for about 22% of the overall road fatalities and they are the 2nd most vulnerable group of road users after motorcyclists/pillion riders.

Of these pedestrian fatalities, 45% involved the elderly in the age group of 60 years and above.



Demographic realities

In a report published by the Singapore Committee on Ageing Issues in 2006, it was revealed that "the elderly population fueled by the "baby boomers" group is expected to rise significantly in 2030. Presently, 1 in 12 people is above 65 years of age. By 2030, it is expected that 1 in 5 will be above 65 years".

The report also highlighted that the majority of the elderly are expected to be healthier, better educated and richer. They would be engaged in social, economic initiatives with a greater demand for individual mobility.

The ageing process

In numerous reports on the effects of ageing, it is well documented that there is reduced abilities in anatomical and physiological processes. These include declines in visual acuity, sensitivity and visual fields, substantial hearing losses, reduction in depth and motion perception and significant declines in physical and cognitive capacity. Health status also declines with increased age where there is a greater tendency for older people to have ongoing medical conditions. These conditions and the taking of prescription medications could also affect pedestrian performance.

Complex road and traffic conditions

Studies on crash-involved pedestrian accidents from other countries revealed that older people generally face the following challenges:

- Difficulty in coping with busy and complex road environments.
- Difficulty in processing multiple information about the road environments.

Inclusive design for older people

Road designers and traffic engineers therefore have to take into consideration these special needs of older pedestrians and provide an inclusive design for temporary traffic control schemes. The next few sections describe measures that can be adopted to improve safety at these areas.

Simplify traffic arrangements

Intersections, wide and multi-lane roads, with busy, fast moving traffic presented challenges for the elderly pedestrians. The older pedestrians are faced with undue demands as they have to process multiple sources of information, in trying to get across these roads. As a result, they may focus on simple inappropriate cues when crossing the roads, thereby placing themselves at greater risk.

Pedestrian crossings

• Central median refuge - for resting after crossing first half of the road

- Simplify the crossing task by providing a central median refuge where older pedestrians are able to cross mid-blocks of roads in 2 phases. The arrangement provides a refuge to rest after crossing the first half of the road before commencing the second half.

- Locate appropriate place for the pedestrians to cross so that they do not walk very far from their intended path.

- At signalized crossing, provide a longer and slower walking speed of 1m/s for the steady crossing phase especially at wide and multi-lane roads.

Signalised junctions

- Provide good sight distance that motorists while making turning can slow down and stop before crossing points.

- Use a leading green whereby pedestrians are able to commence crossing before vehicle enter the intersection. This would also help to increase visibility.

- Turning pockets for vehicle could be set back farther from the crossing to create a buffer zone between vehicles and pedestrians.

Clear delineation and signs

- Locate clear and large sign at suitable locations to clearly delineate the desired pathway for pedestrians.

Separation of vehicular and pedestrian traffic

- Where it is not possible to provide a lower speed environment, it is desirable to install barriers to create a physical segregation between vehicular traffic and pedestrians.

• Pedestrian guardrails

- Pedestrian railings or sometimes guardrails can be installed on road edges to limit crossing at hazardous mid-block locations, and channel pedestrian to safe crossing points.

Safe and level footpath

• Bright yellow & black markings

Footpaths are integral part of the pedestrian transport network and it is important to:

- Ensure that foot paths are well maintained to minimize tripping hazard and injuries. If this is not possible, mark these locations with bright yellow and black markings to alert pedestrians to their presence.
- Provide footpaths with even levels.
- Use lower kerbs together with ramps at crossing points to ease the efforts in getting up and down from the roadway.

• Well lighted footpaths along covered linkways

- Provide well lighted footpaths along covered linkways.

Commuter facilities

- Locate pedestrian crossing points closer to the bus stops to minimize jaywalking behaviour where feasible.
- Provide adequate width along the footpath to enable older pedestrians to walk comfortably together with younger people who walk at a faster speed.

Access arrangements

• Provide a good view of traffic entering/ leaving the worksite

- Minimise pedestrian conflicts by relocating work access away from intersection as they present not only risk to vehicular traffic, and increase the workload for older pedestrians as they have to constantly shift focus on traffic from multiple directions.
- Provide older pedestrians with good view of traffic entering/ leaving the worksite. Station workers to control and guide traffic if necessary.

Maintenance

- Footpath built using materials such as wooden boards or waste mills should be regularly inspected so that they do not pose hazards such as tripping or water ponding etc.

Conclusion

With a growing number of people living well into their 60s and maintaining active life style, it is our duty as professionals to continue to implement innovative and effective solutions to ensure that the mobility and accessibility needs of older pedestrians are met.

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Safety Division

Rotary Head Noise Shield for Bored Piling Rig

Introduction

In his key note address at the 2007 PS21 ExCEL Convention, Head Civil Service, Mr Peter Ho stressed that "Exploration, experimentation and discovery are vital to the Public Service. We must learn to anticipate demands, influence developments and meet needs in ways which are innovative and provide Singapore with competitive edge." This is especially relevant in describing the basis of Safety Division's project from conceptualisation to the eventual realisation of a noise shield for use on construction sites.

Four-pronged approach

Safety Division seeks to reduce noise pollution arising from our sites through four main approaches:

- Education - by means of conducting environmental awareness courses for our project staff.
- Management - by incorporating the need for a noise management plan and identification of Noise Sensitive Receivers in our revised General Specifications for Contractors.
- Improvement - through modification of work and operational processes on site.
- Review - through site inspections and monitoring of infringements.

This article aims to share with readers the knowledge in building their own noise shield.

(a) Principle in noise reduction

The noise shield was built with the aim of reducing noise generated by the rotary head of a bored piling rig during dislodging of soil. The project made use of sound principles in reducing noise. They are:

- Noise is best mitigated at source.
- Break the line of sight from the noise source to the recipients.
- Use enclosures wherever feasible.
- Porous material absorbs high frequency noise better than solid material.

(b) Dimensions of the noise shield

Size:

- Height- 1.5m which is generously in excess of the height of the rotary head.
- Circumference- about 3m which is sufficient to "wrap" round the rotary head.

Shape:
Our noise shield was designed in the shape of a "U". The top and bottom of the noise shield were angled inwards to better reflect/absorb noise travelling over the top of the shield as well as to deflect the angle of noise travel further away from the residences.

(c) Materials

There are many acoustics materials which could be used for building the noise shield and one must consider the performance of the acoustic materials used and cost of constructing the noise shield.

There are two key materials used in the construction of the noise shield. The foam used for absorbing the noise level is either made of polyester or polyurethane material and the rear piece of material can either made from polycarbonate or polypropylene for reducing noise transmission.

Additionally, an aluminium alloy frame was used as the main bracket for holding the above two materials together because of its light weight and resistance to rust.

The above set-up would cost about $4000 and is able to achieve a reduction of 4dBA.

(d) Mounting of noise shield

• Mounting of aluminium frame on rotary head

The noise shield is mounted firmly by means of screws and bolts at the base of the rotary head. This gives the noise shield a "3-points" grip to ensure that it is held firmly during operation.

(e) Operational & safety considerations

It is important that the final product does not in any ways, impede or slow down site operations. Our project is therefore designed with the following considerations:

- It should be light weight and does not need a crane or excessive manpower to install or relocate.
- It does not change the way work processes are carried out nor does it need additional training for men using it as it is designed to be attached onto the machinery itself.
- It should not hinder the movement of the Kelly bar in operation.
- It should not dislodge from the rotary head due to vibration where the mounting screws might get loosen due to vibration.

(f) Good blend of team members

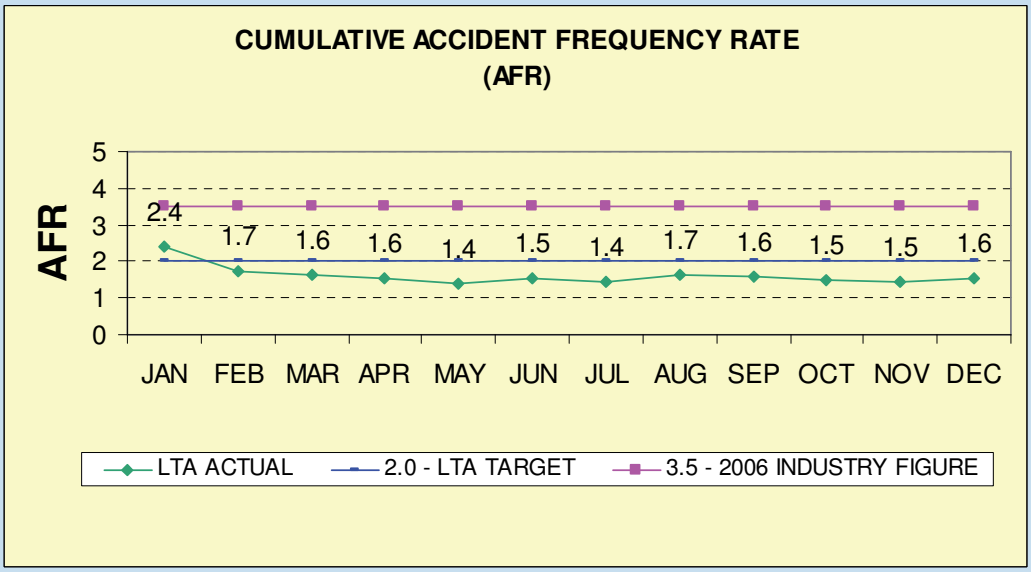
Finally, it is important to form a team with a good blend of skill sets. Safety Division used a team of engineers with specialisations in environmental, safety and mechanical engineering in the successful completion of our project.

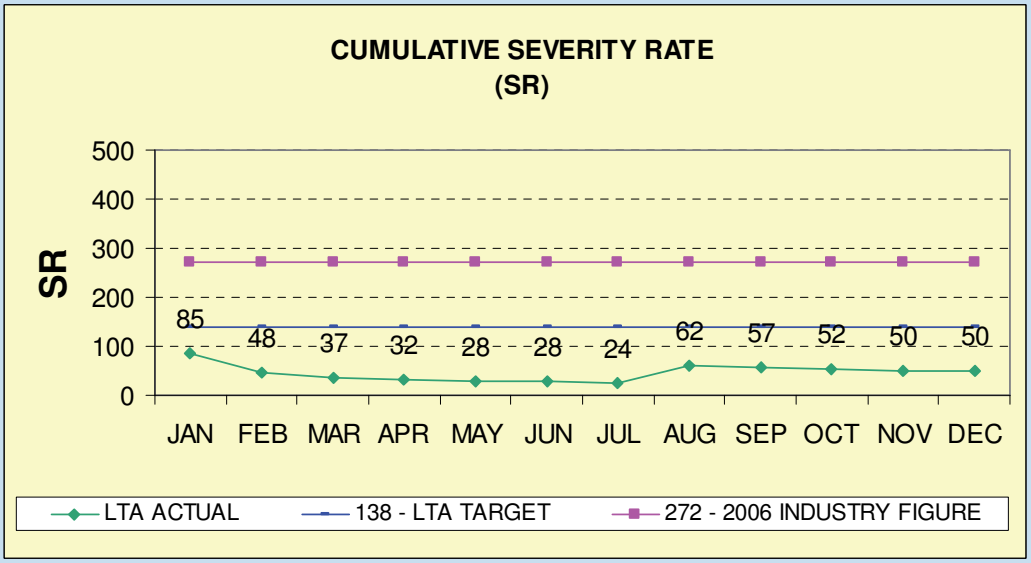
Conclusion

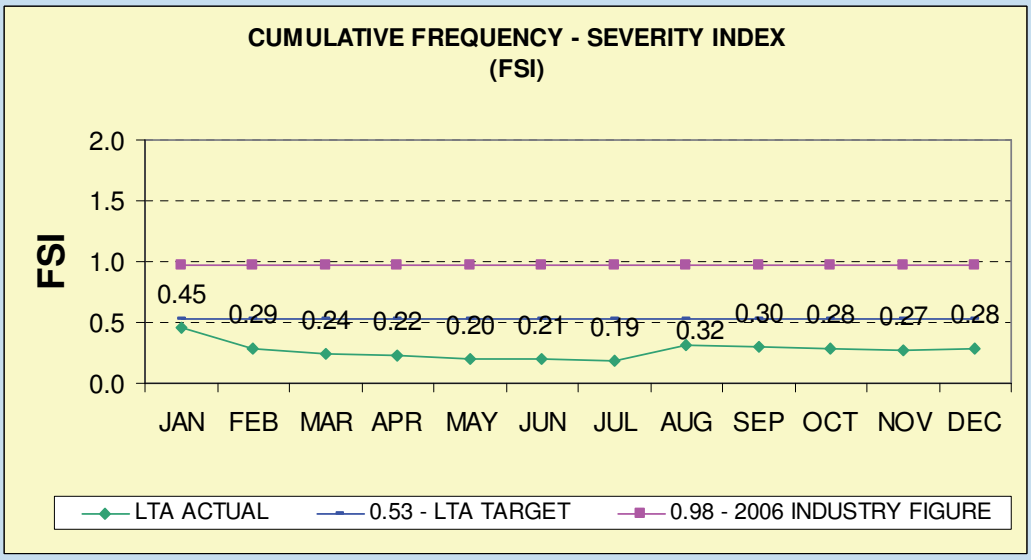
This project is an example of continual improvement at the workplace. It is only through experimentation and improvements that we can continue to exceed expectations. Through this project, Safety Division hopes to inspire others to adopt similar approaches in creating a better and more conducive working environment.

Chew Boon Bwan Matt
Environmental Engineer
Safety Division

Accident Statistics*
from January 2007 to December 2007







*Based on Workplace Safety and Health Act Requirements

2007 Industrial Figures are not available at the time of print

Workplace Safety and Health (Construction) Regulations 2007

The Ministry of Manpower has gazetted the Workplace Safety and Health (Construction) Regulations 2007 which came into effect on 1 January 2008. The Regulations will replace the Factories (Building Operations and Works of Engineering Construction) Regulations.

The major policy changes include:

1. Requiring all worksites to implement Safety Management System. However, it is no longer prescribed or limited to the 14 elements currently within the law.

2. Requiring the appointment of WSH Coordinator (with contract sum of less than $10 million).

3. Implementing the recommendations of the MOM-MND joint review committee, which include:
   (i) imposing statutory duties on Professional Engineers undertaking temporary works.
   (ii) requiring safety and health training for all supervisors.
   (iii) instituting regular site coordination meetings.
   (iv) implementing a permit-to-work system for selected hazardous work.

4. Removal of prescriptive provisions from the legislation; provision would be transferred to codes of practices to serve as guidelines for the Industry.

5. For more details, please refer to the Workplace Safety and Health (Construction) Regulations 2007.

Safety Tan says.....

"A competent person shall be appointed to test the atmosphere of a confined space prior to entry by any person into the confined space."

ACCOLADES TO LTA CONTRACTORS

Million Accident Free Man-hours

Congratulations to our Contractors for achieving 1 million accident free man-hours for the period from Aug 07 to Jan 08;

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- Taisei Corporation, C854
- Woh Hup Pte Ltd – Shanghai Tunnel Engineering Co. Ltd - Alpine Mayreder Bau GmbH JV, C855.

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