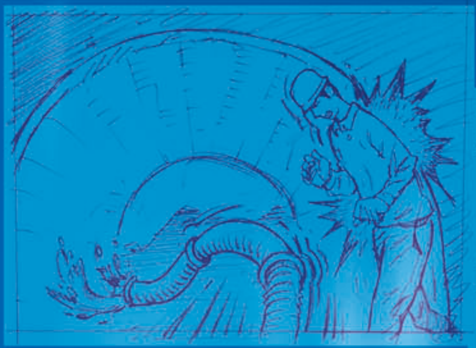
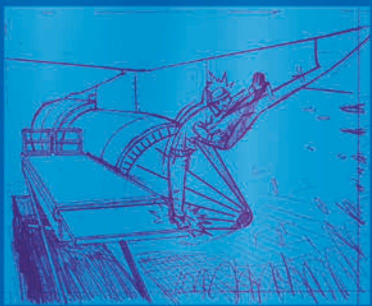
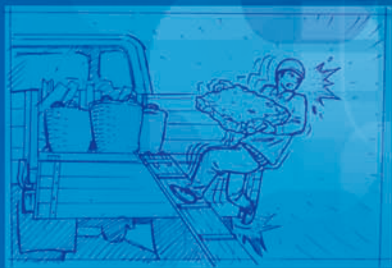
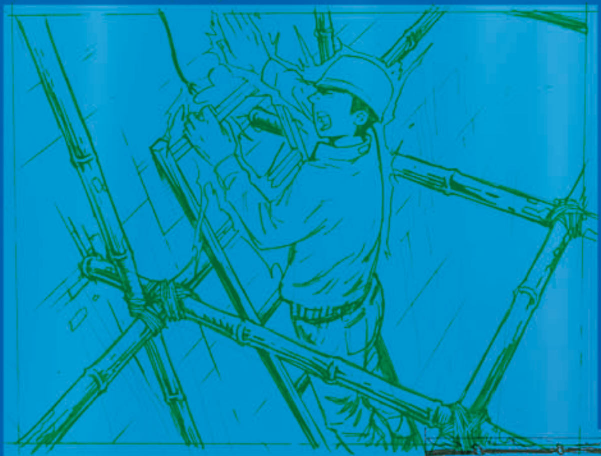
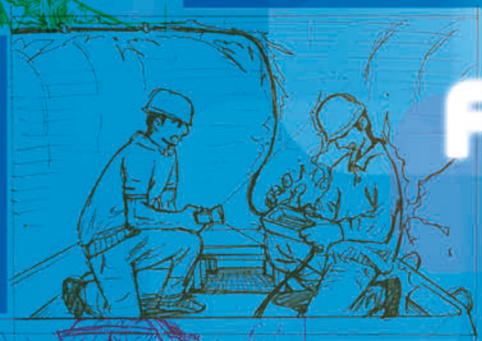
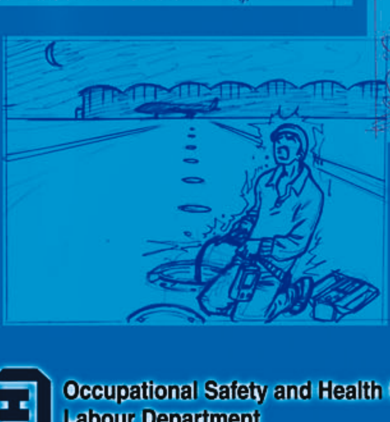












An Analysis on Occupational Fatalities Casebook Volume 1

Occupational Safety and Health Branch
Labour Department

safety at work

Occupational Safety and Health Council

This publication is issued free of charge and can be obtained from offices of the Occupational Safety and Health Branch or downloaded from website of the Labour Department at http://www.labour.gov.hk/eng/public/os/B133.html. Addresses and telephone numbers of the offices can be found in website of the Department at http://www.labour.gov.hk.

An Analysis on Occupational Fatalities – Casebook Volume 1

CONTENTS

FOREWORD

Workplace accidents are not just causing sufferings to the victims and their families. They also incur costs arising from work stoppage, insurance claims, medical and rehabilitation expenses.

It is recognized that most workplace accidents are preventable. Very often, the scenarios and causes have common phenomena. Unless the causes of workplace accidents are properly understood, lessons will not be learned and suitable improvements will not be made to secure the future safety and health protection of those who may be affected by a work activity. The responsible persons of workplaces need to understand why events happened, and act to make sure that they do not happen again.

This casebook gathers a collection of fatal accident at work cases edited in a way for experience sharing on accident prevention. It aims at providing precious lessons to those who are exposed to work activities and the management personnel, as well as case studies for safety training institutes.

Occupational Safety and Health Branch
Labour Department
August 2003

Case 1: A worker fell from an inclined gangway secured onto the end of a lorry parked on a public road

Scenario

A contractor took up a renovation project at a building unit. The deceased (D/P) was a worker of a sub-contractor who took up from the renovation contractor the demolition and removal of tiles and concrete debris. Prior to the accident, the D/P was responsible for carrying the construction debris up a lorry parked on a public road. A wooden gangway inclined at an angle of about 24° was secured to the lorry platform at one end, with the other end resting on the road surface. The D/P carried the load manually and walked up to the lorry platform along this gangway.

Prior to the accident, he grabbed a concrete block with both hands. While he was walking on the gangway to the lorry platform, he slipped and fell to the road surface. During his fall, the concrete block struck on his chest. He was sent to hospital for treatment and subsequently passed away.

Case Analysis

The plank serving as gangway was 30 mm thick, 2.72 m long and 0.23 m wide. It had two metal hooks at one end for securing to the loading platform. Seven small planks of width 0.23 m and cross-section 18 mm x 20 mm were nailed onto the surface of the gangway as cleats for persons walking on it to secure their foothold.

The loading platform was about 1.1 m from the ground, thus making the plank to incline at an angle of about 24° when resting between the loading platform and the road surface.

The concrete block that the D/P was carrying at the time of accident was of size 0.42m x 0.45m x 0.1m, weighing about 20 kg.

A combination of the following factors could have contributed to the cause of this accident:

(a) The gangway involved in the accident was only 0.23m wide. It might have caused difficulties to persons to keep balance while walking on it. It was not considered to be a safe means of access.

Case Analysis

(b) The D/P was having both hands engaged in carrying the concrete block at his front, and the concrete block might have obstructed his view and thus the judgment to the conditions of the gangway.

(c) The protruding hooks at the anchoring point to the loading platform might have caused the D/P to trip and fall.

(d) Autopsy report indicated that the blood alcohol level of the D/P might have affected the body coordination of the D/P.

Before the work was carried out by the D/P, the management had not carried out a risk assessment on the manual handling operation to address the aforementioned hazards and the necessary safety measures.

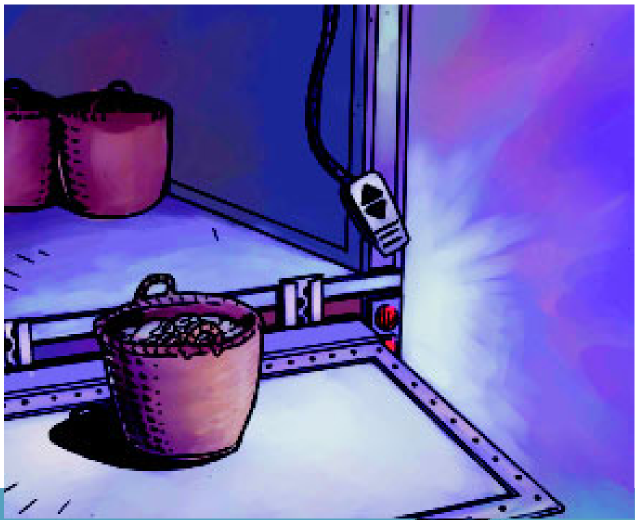
Lessons to Learn

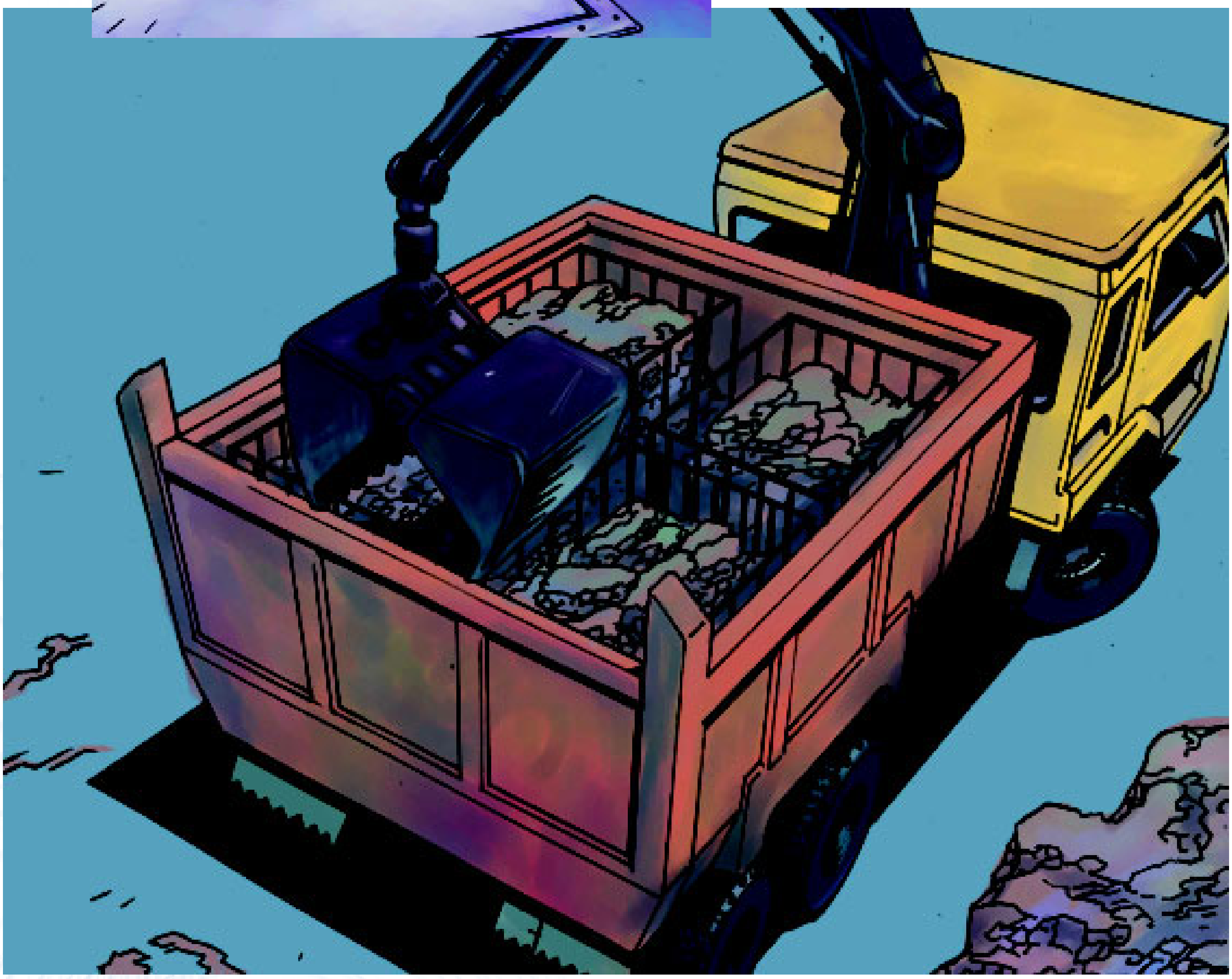
A safe system of work should be provided and maintained for transporting and handling of the load. The system should cover areas such as:

(a) a preliminary risk assessment before carrying out manual handling operations, which should identify the risks associated with the procedure of the work and formulate safety measures to be taken;

(b) suitable mechanical means for the lifting and transportation of a load from one level to another;

(c) when manual lifting of a load could not be avoided, large heavy objects should be broken up into smaller pieces for easy handling.





Case 2: A worker fell from a landing platform down the hoistway to the ground

Scenario

The deceased (D/P) was employed by a sub-contractor in a housing project. The building construction work was near completion. The sub-contractor undertook the kitchen cabinet and steel basin fitting work of the residential flats. On the day of the accident, D/P and other workers arrived at the site and transported cabinets and basins to upper floors with a material hoist. After lunch, D/P worked with a co-worker to transport the basins from the 3/F to upper floors by the material hoist. Another team was responsible for receiving the loads and distributing them to the flats between the 30/F and the 38/F. In the course of work, D/P's co-worker left the 3/F, leaving the D/P to work alone.

In the hoist operations, the hoist operator at the G/F could see the D/P standing on a landing platform at the 3/F level at a height of 12 metres above the ground. Signals were given by the D/P to the hoist operator through an electric bell. Sometimes, the D/P would communicate with the operator by direct shouting. In an operation right before the time of the accident, the hoist operator, after hearing a shouting instruction from the D/P, raised the hoist platform from the G/F to the 3/F. The hoist operator was told by the D/P that adjustment to the stopping level of the hoist platform was not required. Therefore, he waited on the G/F for further signal. After waiting for some time, the hoist operator suddenly heard a loud noise coming from the hoistway. He immediately ran to the hoistway and found the D/P lying in a pool of blood at the bottom of the hoistway. He also noticed the hoist platform was still moving. So, he rushed to stop the hoist. D/P was sent to the hospital and he passed away later.

The hoist

The hoistway had a cross-section of 1.53m (W) x 1.64m (L). Inside the hoistway, there was a hoist platform of 1.32m (W) x 1.33m (L), which was controlled by a winch system. Operation of the hoist could be controlled from the control panel in the G/F control room, or through a pendant control linked to the control panel.

Landing Gate

By design, the hoist platform could stop at any floor. At each landing place, the entrance to the hoistway was provided with a two-flap gate. A spring-loaded micro-switch was fitted in the middle of left flap while a horizontal metal push bar on the other. Before the hoist could be activated, the gate should be in closed position to enable the metal push bar to press down the spring button of the micro-switch.

It was also observed that the spring-loaded micro-switch at the hoistway gate on the 3/F, where the D/P was working, was not protected against tampering. It could be jammed, fastened or simply pressed down manually to render the hoist in operative mode even when the gate was opened. A site safety personnel disclosed that the hoistway gate at 3/F was in the open position when he reached there right after the accident. However, he did not notice any tampering of the micro-switch.

The signalling system

On the site, there was a circuit system for the signalling system of hoist operations. The circuit system provided sockets at each landing place of the hoist on the upper floors. Several means of the devices could be employed in the signalling system. By plugging a control cable of the signalling device into the sockets at designated floors, the workers could give signals to the hoist operator on the G/F through one of the following means:

(a) visual signal of light bulb;
(b) audible signal from electric bell;
(c) communication by inter-communication device.

On the day of the accident, the workers on the upper floors used electric bell to give signal to the hoist operator. In addition, they also used their own mobile phones.

No one had eye-witnessed the accident. Apparently, the circumstances suggested that the D/P had fallen from the upper level, possibly from the edge of the landing platform of the hoistway at the 3/F level, but how and why he fell from there could not be ascertained. Nevertheless, the following could have contributed to the accident:

(a) The micro-switch fitted to the hoistway gate could be easily tampered for the purpose of activating the hoist operations even when the gate was opened. Thus, the intent to keep the hoistway gate closed before moving of the hoist platform was defeated.
(b) As the hoist could be operated with the hoistway gate opened, a worker would face the hazards of falling down the hoistway or being struck by the moving hoist platform.

Case 2

Lessons to Learn

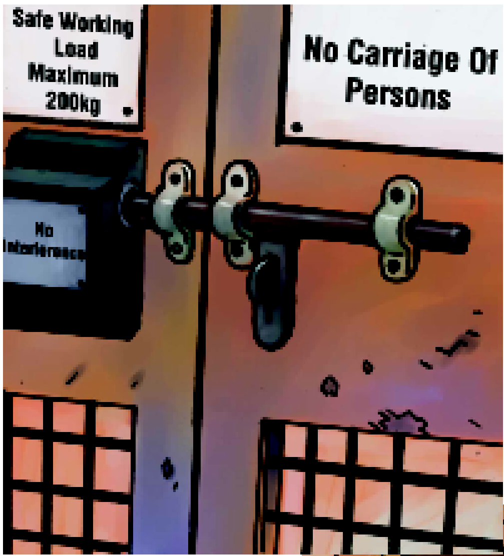
(a) An effective interlocking device should be installed on each landing gate of the material hoist to prevent the hoist from being operated before the gates are closed. The device should be designed and constructed to prevent any tampering to defeat its purpose.

(b) A maintenance programme for all switches, controls and safety devices of the material hoist should be established and implemented.

(c) During the work, there should be an appropriate inspection system conducted by a supervisor who is competent in material hoist operations to check for unsafe situations and to effect rectification immediately, and to stop work if appropriate.

(d) Every worker engaged in material hoist operations should be fully instructed on the correct methods and procedures to perform the job, to use the interlocking gate at the access to a hoistway properly, and to adopt the signalling system appropriate to safe hoist operations.

(e) Every worker engaged in material hoist operations should be given all necessary and sufficient information of the possible dangers, such as the hazards of falling into the hoistway, the trapping by the moving hoist parts, etc., and the associated precautionary measures.


Safe Working Load Maximum 200kg
No Carriage Of Persons
No Interference


Technician
Hoist Operations Control System

Case 3: An electrician was electrocuted when mistakenly cutting a live electric cable

Scenario

On the day of the accident, maintenance of an airfield ground lighting (AGL) system in the airport was carried out after mid-night. The work consisted of replacing high voltage cable plugs, and cable cutting was one of the steps. The deceased (D/P) and four other electricians on night shift were assigned with the task, and they performed the work at three different locations. The D/P and a co-worker (appointed as competent person) worked as a team.

After successfully replacing the plugs of two lighting heads, the D/P's team intended to replace that of numbering AGL-4650. At this juncture, the co-worker left the D/P to drive their service van closer to the scene. Upon returning, the co-worker noticed the D/P lying on the ground near another set of AGL system numbering AGL-4651. The cable leading to AGL-4651 was found having been cut, and a burn mark was observed at the cut end. The D/P was then taken to the hospital where he was certified dead.

Case Analysis

The two different sets of AGL system at the accident scene were energized by two separate circuits. Each circuit was linked up by cables in underground ducting, with the lighting heads embedded in underground casings and sealed up by cover plates. The two circuits were running side by side in the same direction, with the lighting heads installed alternately at spacing about 7m. The cable joining each lighting head was provided with identification.

Case Analysis

Case 3

Electrical output between 1,000 volts to 2,000 volts was supplied through different sources to each circuit. A constant supply of current ranging from 3 amperes to 6.5 amperes throughout the circuit, depending on the level of light intensity required, was maintained by the constant current regulator in the system.

Before the commencement of work, the AGL system within the scope of work was rendered electrically dead with power source switched off and padlocked, and a warning notice was posted up there as well. However, the other AGL system was still energized.

Autopsy report on the D/P revealed that electric burn marks believed to have been caused by contact with electric current were found on his hands and left leg. Apparently, the electrocution occurred while the D/P was cutting an energized cable mistakenly during the work.

The investigation disclosed the following that might have contributed to this mishap:

(a) Details of the job were verbally given by the in-charge to the workmen with the aid of cable routing layout plan and job sheet. However, the information shown on the cable routing layout plan was confusing with the one being cut in the accident AGL No.4651 shown connecting to the circuit of the intended work. In fact, it was linked to another circuit which was live.

Case Analysis

(b) The job was carried out in the dark. Error might have occurred when checking the small identification markings on the cables against those on the job sheet/layout plan.

(c) Although clamp-on ammeters had been provided on the site for the workers for testing, there was no instruction requiring a worker to use them.

(d) A worker was appointed as the competent person in the team, and the D/P should have carried out electrical work under his supervision. However, he left the D/P shortly before the accident happened.

Lessons to Learn

(a) As far as practicable, all circuits of AGLs in the vicinity of the replacement work area should be opened and de-energized.

(b) Cable routing layout plan and job sheet for showing the AGLs to be worked on should be properly designed to provide clear and accurate information so as to enable the job be carried out safely.

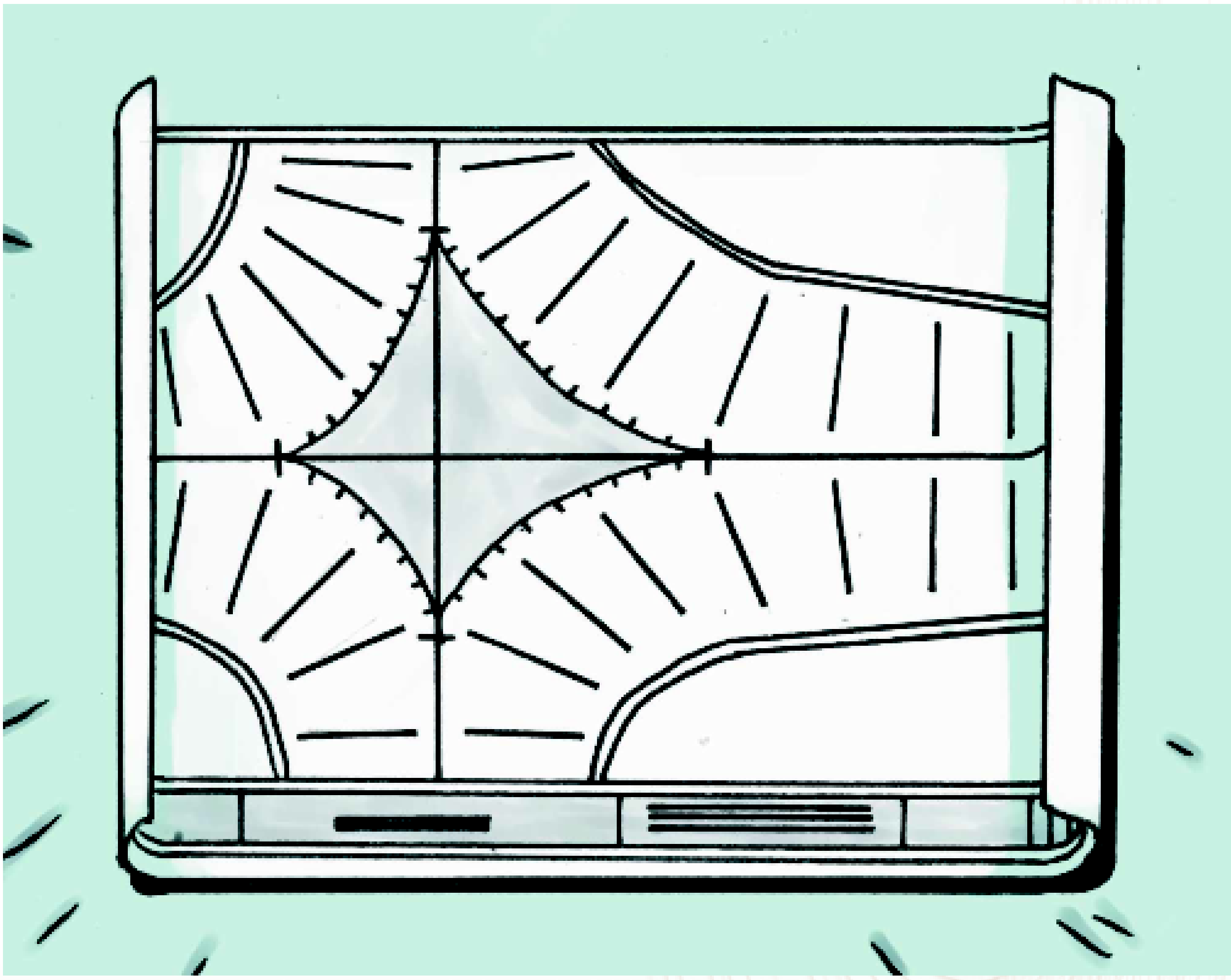
(c) All AGLs circuits should be proved "dead" before working. The procedure for identifying the status of the circuit should be documented.

(d) A specific and easy-to-follow permit-to-work procedure should be provided and maintained to ensure that the safe system is properly followed. It should give clear guidance and indication to the workers on which AGL is "dead" and properly isolated from live sources, and is safe to be worked on.

(e) Persons engaged in AGL plug replacement work should be competent persons or work under appropriate supervision. No workers should be allowed to engage in the replacement work without the required competency or supervision.

(f) A safe system of work should be established to ensure the safety of the AGL maintenance work. That system should include suitable steps to ensure that proper training, information, supervision and instruction are provided to workers, and that safe working practice and procedure are developed and adopted by the workers.

Cable routing layout plan




Competent Person
Engineering Supervisor
Permit-to-Work

Case 4: A site sub-agent was struck by an object falling from height on the construction site of a building project after typhoon

Scenario

Before the day of the accident, typhoon signal no. 8 was hoisted. Construction activities on a building construction site were suspended. After the typhoon, a sub-agent (D/P) returned to the construction site. Before the site activities were fully resumed on the site, the D/P and the foreman of the scaffolding sub-contractor carried out an inspection to the damage caused to temporary structures such as bamboo scaffold, fans and nets erected at the external wall of the building. They stayed on the open podium beside Block 5 and discussed the remedial work . In the course of their discussion, a piece of concrete slab fell from height and struck the D/P. The concrete slab badly damaged his helmet and knocked it off his head. The D/P suffered head injury and fell to the ground with his head bleeding seriously. He passed away on the same day.

Case 4

Case Analysis

The construction of Block 5 had reached the 50/F level. Bamboo scaffold had been erected at the external wall of the building and covered by fans and double-layer safety nets. In addition to the provision of double-layer safety nets, the hoistway and the refuse chute at the external wall were also covered with plastic sheets. Catch fans had been erected at the external walls of the 27/F, 38/F and 48/F of Block 5. However, the typhoon had damaged some fans and nets. At the side facing the accident scene, voids and openings of width 0.3 m to 0.45 m were found on the nets from the 45/F down to the 27/F. Debris and lumps of mortar were found scattered on the nets and fans, considerable accumulation of debris at the 48/F level and concrete slabs at the 38/F level.

After the accident, the D/P was found lying on the ground at a distance of about 7m from Block 5. Two pieces of concrete slabs were seized by the police in the vicinity of the accident scene. Forensic examination indicated that one of the concrete slabs of dimension 250 mm x 150 mm x 50 mm had struck the D/P as plastic residue of the safety helmet worn by the D/P had been left on the surface of the concrete slab. This concrete slab also resembled those found on the catch fan at the 38/F.

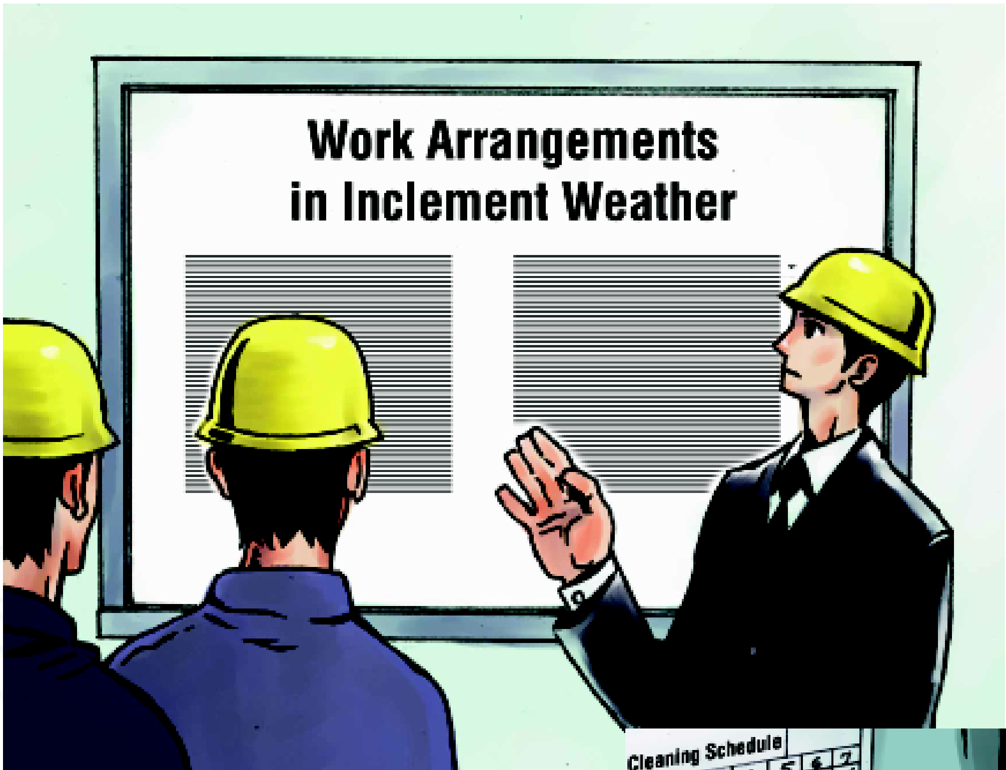
The investigation carried out immediately after the accident also revealed that the weather was still windy with occasional strong gusts on the site.

Hence, the accident might have been caused when one of the concrete slabs on the catch fan at the 38/F level fell through the voids and openings of the safety nets and struck the D/P.

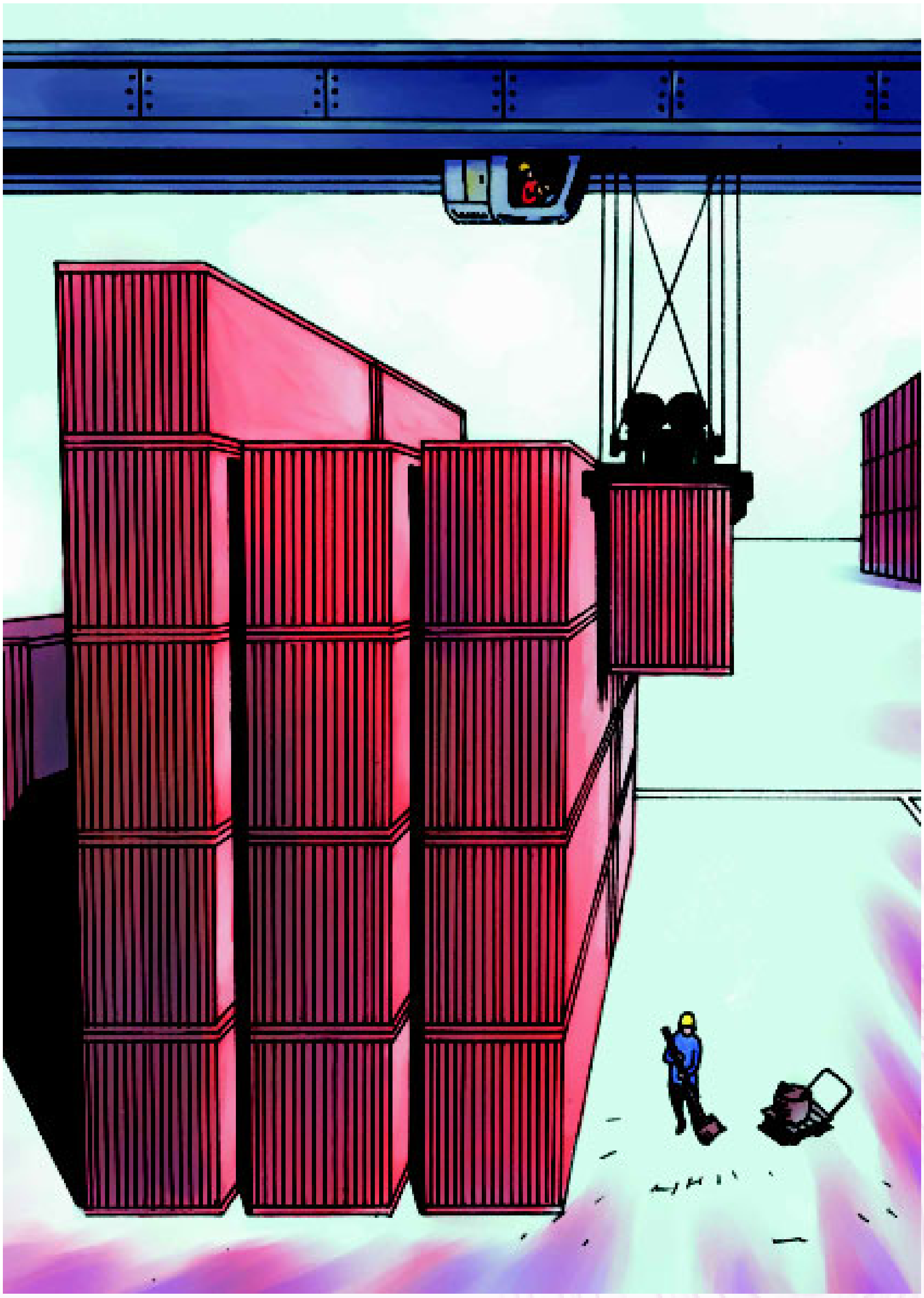
Lessons to Learn

(a) Construction waste and materials accumulated on the fans and nets should be removed from time to time.

(b) Employees should avoid carrying out any work on the open ground of a construction site shortly after the typhoon. Work should only be resumed after assessing the effects of inclement weather on the site conditions.



Case 5: A cleaning worker was crushed to death by a container while being lowered by a rubber-tyre gantry crane



Scenario

In a container terminal, a contractor employed four cleaning workers including the deceased (D/P) to clean the terminal yard. Each worker worked separately in the area designated by the contractor, collecting rubbish on the ground with the aid of broom and spade, and conveying it on a trolley to a rubbish collection area for disposal.

Four hours later, only three of them returned to their rest room after the cleaning work. Therefore, a worker went to find the D/P. At the junction of two main streets in the container stacking area where 12-metre-long containers were stacked, the worker found two legs exposed from the base of a 16-tonne container placed on the ground. There were a broken plastic broom and a spade next to the legs while a trolley was several metres away. It was reported immediately to the management of the terminal. When the 16-tonne container was lifted up, the D/P's body was found. Her safety helmet, with a straw hat over, was also found underneath the container. The D/P was certified dead later.

Case Analysis

On the accident scene, stacks of containers each of dimension 12 metres (L) x 2.6 metres (W) x 2.9 metres (H) were arranged in rows. Facing a section of the main street, there were spaces reserved for the storage of containers in six stacks. Right before the accident, containers in the 1st Stack were of 3 high, in the 2nd Stack were of 5 high, in the 3rd and 4th Stacks were both of 4 high, but no container was on the ground reserved for the 5th or 6th Stack.

Case Analysis

Through operation of the spreader of a rubber-tyre gantry crane, a container on a truck would be picked up, brought to a position right on the designated stack, or to the ground reserved for it. The process would be reversed for transporting a container from stack to truck.

The driver's cabin of the rubber-tyre gantry crane involved in the accident was about 18 metres above the ground. The spreader together with its hoisting mechanism was installed in front of the cabin. On the cabin floor, there was a wide window for the operator to watch the movement of the container below. When the cabin was stationed above the 4th Stack, the visible area on the ground of the 5th Row through the floor window was restricted if a container was under suspension of the spreader. While the container was being lowered down gradually, the visible area would be further reduced.

Although a camera of a closed circuit television (CCTV) system was installed at the front of the cabin for the operator to monitor the situation of container yard below, it could not give a detailed condition of the ground. There were blind spots when the yard was viewed from the cabin.

The cleaning workers normally would not enter the space between two containers. They would enter the stacking area and did the work only when there was no container in the area or any container handling activity nearby. As a general rule, the terminal prohibited persons to enter the container stacking area or get near to a machine under operation. This requirement was monitored by a patrol team on vehicles and by CCTV cameras installed on high lamp-posts.

Case Analysis

Before entering the container stacking area, the D/P should probably have knowledge that a rubber-tyre gantry crane was operating nearby because it was a piece of heavy mechanical equipment that would emit noises. She still remained in the area probably because she wanted to do some work there and had not expected that a container was to be lowered onto her position.

The operator of the rubber-tyre gantry crane held a valid certificate for operating the crane. He had 15 months of working experience. There was no signaller to assist him in the transport of the container. Nonetheless, he had the practice to actuate the horn once before lowering a container onto the ground. Right before the accident, the horn had lasted for about one second. It was believed that the D/P was not aware of such short warning signal.

In short, the investigation revealed that the mishap could have been attributed to the following factors:

(a) The terminal management did not lay down specific safety procedures on the cleaning work for the contractor to follow.

(b) The contractor had not given any guideline to the workers on what condition they could enter the container stacking yard to do the cleaning work. There was only verbal instruction given by the foreman of the sub-contractor to the workers that no cleaning work to the container stacking yard should be performed while container handling was in progress.

(c) There was no coordination between the terminal management responsible for handling operations and the contractor undertaking the cleaning work.

Lessons to Learn

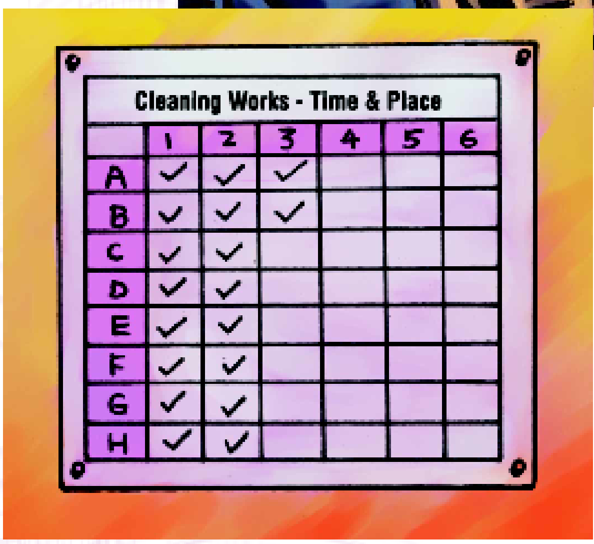
(a) The contractor should, so far as is reasonably practicable, coordinate with the terminal management on the provision and maintenance of a safe system of work to ensure the safety and health of all cleaning workers in the container stacking yard.

(b) Safety measures including, but not limited to, the following should be taken:

- Appointment of a cleaning supervisor to oversee the overall cleaning operations;
- Co-ordination between the cleaning supervisor and the terminal management on arrangement of the cleaning area and the work schedule;
- Isolation of the zone for cleaning work from any container handling activities and crane operations;
- Placing of appropriate signage and traffic cones at the area where cleaning is in progress;
- Effective communication amongst the cleaning workers, the cleaning supervisor and the control tower of the terminal; and
- Monitoring system to ensure the proper implementation of safety rules and procedures.

(c) Training and information on associated hazards and safety measures should be provided to all cleaning workers.


Supervisor


Cleaning Works - Time & Place
1 2 3 4 5 6
A B C D E F G H


Area Permitted for Cleaning Works

Case 6: An engineer was electrocuted while repairing a telecommunication system inside an effluent tunnel

Scenario

An effluent tunnel of length 7.5 km and diameter 2.7 m had two portal ends located at Diamond Hill and Shatin respectively. A telecommunication system had been previously installed at the ceiling of the tunnel to enable workmen engaged in maintenance work inside the tunnel to communicate with those staying outside by radio. The system consisted of a long feeder cable and signal amplifiers at regular intervals to enhance power transmission of signals. During the maintenance, effluent was stopped from discharging into the tunnel to facilitate the work.

On the day of the accident, the deceased (D/P) who was an engineer and a worker were responsible for fine-tuning and testing the telecommunication system. By using a tunnel inspection vehicle, they reached a signal amplifier of the telecommunication system at 4.8 km from the Shatin Portal. The vehicle had rubber tyres and its chassis had a steel chain touching the ground. They went to the top of the vehicle to carry out the work.

The D/P removed the signal amplifier from a plastic enclosure and lowered it onto a wooden table. He then opened the amplifier plastic cover and tuned the electric module card inside. Throughout the tuning process, the amplifier remained connected to the feeder cable. As the working area was dark, the co-worker held a torch to provide lighting to the D/P. While the D/P was kneeling on the top of the vehicle to carry out the job, he received an electrical shock and fell down. The co-worker immediately carried the D/P out of the tunnel. Unfortunately, he was certified dead upon arrival at hospital.

Case Analysis

The telecommunication system that the D/P was working had two direct current boosters, each connected to the feeder cable end at the portal of the tunnel. Through this feeder cable, the booster supplied direct current to the system at a voltage of 42V. The tunnel inspection vehicle was battery-driven at a voltage of 38V. There were no other electrical services, nor lighting, on the accident scene.

By design, the earth of the system was arranged in the following manner:

(a) At each portal end, the earth of the communication equipment and that of the boosters were connected to a common earth busbar, then to the earthing system.

(b) The outer sheath of the feeder cable was made of copper wires and was always connected to the earth at the cable ends.

(c) Inside the plastic casing of each signal amplifier, there was a layer of aluminium foil bonded by earth cables to the electronic module card and the outer sheath of the feeder cable. The arrangement had provided a common earth screen to shield the electronic module card.

There was a lightning protection system installed at the control kiosk and the inlet chamber at the Shatin Portal. The system would direct high voltage current induced by lightning to protect the telecommunication equipment and the main power supply system.

Autopsy report on the D/P disclosed that burn marks were found on his left chest and left leg near the knee joint respectively. They were likely to be the path of electric current passing through the body.

The record of the Hong Kong Observatory indicated that thunderstorm warning was issued before the accident. Thunderstorm and several strong lightning were prevailing at Shatin Portal at the time of the accident. The environment inside the tunnel was wet.

Thus, the electrocution might have been caused in the following manner:

(a) When the accident happened, the D/P was kneeling on the top of the tunnel inspection vehicle, which was electrically connected with the tunnel floor. At the same time, there was thunderstorm, with lightning, prevailing at the Shatin Portal. It might be possible that a lightning flash struck on the lightning protection system at Shatin Portal, or on the earth direct in its vicinity. The lightning strike would produce a large current flow in the earth in that general area and caused an instantaneous rise in the earth potential which could be in thousands of volts.

(b) As the outer sheath of the feeder cable was always connected to the earth at the two cable ends, the potential of the cable's copper sheath at Shatin Portal would therefore rise to a high voltage which would be transferred from the cable end at Shatin Portal, along the feeder cable into the effluent tunnel, towards the cable end at Diamond Hill Portal. Thus, a high voltage surge was experienced by the signal amplifiers, including the one involved in the accident.

Case Analysis

(c) As the accident scene was at a distance of 4.8 km from Shatin Portal, the tunnel floor and the surrounding would be at earth potential at or close to zero volt, and so was the vehicle on which the D/P was staying owing to the indirect linking of the vehicle chassis to the tunnel floor.

(d) On the other hand, the D/P had already removed the plastic cover of the signal amplifier, with the electronic module card exposed. He might have touched direct, or might have been very close to, the electronic module card at the particular moment. He would therefore experience a high voltage difference between his upper body/hands and his legs. A side flashing occurred and a leakage current thus flew from the amplifier, through the D/P's body, the tunnel inspection vehicle, the tunnel floor, and finally entered the earth at local. As a result, the D/P received the electric shock.

6 Case

Lessons to Learn

(a) A competent person should be appointed to carry out risk assessment of the working environment inside the effluent tunnel before the commencement of the work. The risk assessment should identify the hazards likely to be present, recommend the safety measures to be taken, and state the work method, materials and plant to be used when the work is carried out.

(b) No worker should enter or remain in the effluent tunnel unless the recommendations in the risk assessment report have been implemented and a permit for safe entry has been issued.

(c) In adverse weather condition, such as thunderstorm or lightning, working inside the tunnel on conductors or conductive parts of any communication system, lightning protection system, or other electrical services should be strictly prohibited.

(d) When carrying out work on any electrical system inside the effluent tunnel, all workers should stay on an equipotential zone that is bonded to an effective local earth. All equipment, plant and conductive parts at the working place should also be bonded together electrically to an effective local earth to ensure that no hazardous potential difference exists between different parts of a worker's body that would cause a leakage current flow.

(e) The risk assessment report and the permit for safe entry into the effluent tunnel should be displayed at a conspicuous place at its entrance.

Case 7: An aircraft mechanic fell over the edge of an unfenced elevated platform to the ground when carrying out routine check to an aircraft

7 Case

Scenario

The deceased (D/P) was a mechanic responsible for checking of an aircraft on the day of the accident. Shortly before the accident, the D/P and two co-workers carried out visual inspection on the structural part of an aircraft. They had to open the batwing door at the pylon to inspect the inner parts, and to fasten the door afterwards. Working at the end of an extensible ramp of an elevated platform, the D/P reached out beyond the edge of the extended ramp to fasten the batwing door, but fell to the ground 3.5 m below. He was sent to hospital and passed away subsequently.

Case Analysis

The platform involved was a scissors type elevated platform mounted on a truck. It had an area of 2.43 m x 6.09 m. The built-in extensible ramp underneath the platform was 2.28m in width and could be extended beyond the front-end of the platform to enable workmen to reach different parts of the aircraft for maintenance work.

At the edge of the extensible ramp, there were slots for inserting sections of removable guard-rail. This construction facilitated the removal of guard-rails to cope with the contour of an aircraft when the raised platform was stationed under it. However, no guard-rail or fencing arrangement was provided at the lateral sides of the ramp. With the extensible ramp in extended position, the team considered that some guard-rails, if installed, would cause obstruction to the movement of the batwing door, and would crash the wing of the aircraft. Hence, guard-rails at the extensible ramp were not installed.

Investigation revealed that at the time of the accident:

(a) Most of the guard-rails at the platform had not been installed. Guard-rails were provided only at the rear of the platform while the extensible ramp was totally unfenced.

(b) The door latch was at a horizontal distance of 0.26m away from the left side of the ramp, and at a vertical distance of 1.5m above the ramp.

(c) The D/P was not wearing any safety belt or harness at the time of the accident, nor was there any anchorage for the attachment of safety belt or harness. He was not protected from falling to the ground while reaching out to latch the door.

Case Analysis

The accident also reflected the inadequacies in the safety management system of the company:

(a) No risk assessment was conducted to evaluate the possible hazards the workers might encounter and the safety measures to be adopted.
(b) There was no method statement or safe working procedures for the operation.
(c) There was no instruction on how the operative staff could reach the batwing door safely.
(d) No safety harness, belt or fall protection arrangement was provided in the vicinity, or issued to staff for personal use. The employees were only told to get the safety harnesses from the store when needed.

Apparently, there was no system of work in place, and the team was left to exercise their personal knowledge and experience to develop the appropriate safe method. Fall prevention specific to carrying out such inspection work on the elevated platform, or on the extensible ramp, was not properly instituted. All these contributed to the occurrence of the accident.

Lessons to Learn

(a) A safe system of work should be developed and implemented to ensure the safety of workers carrying out inspection, maintenance and repair of aircraft at height. The system should include the following :

- carrying out a risk assessment to identify the potential hazards associated with the inspection work;
- providing the workers with detailed method statement and clear instructions on the working procedures, associated hazards and safety precautions to be adopted during work; and
- providing the workers with sufficient safety training specific to the inspection work, including the safe operation procedures and the precautionary measures.

(b) Steps should be taken to prevent workers falling from height during work. Such steps should include the provision, use and maintenance of working platforms with suitable guard-rails or fencing. Where it is impracticable to provide guard-rails or fencing, suitable fall arresting system, such as safety net, safety harness and anchorage, should be provided.

Case 8: A worker was struck by a metal pipe swinging under pressure and hit against a tunnel wall

Scenario

On the day of the accident, a sub-contractor assigned the deceased (D/P), who was a foreman, to lead a team of workers to carry out concreting of arch lining inside a tunnel. Concrete was pumped to the arch lining through a metal pipeline. After the concreting work, the workers carried out purging of the pipeline to clear the concrete residue which would be used to form the slab of a sump pit. They disconnected the end of the pipeline from the arch lining and inserted a foam-rubber ball into the pipeline. The pipeline was then connected to an air receiver. The discharge end of the pipeline, composed of bent pipes, was connected to the sump pit. Under the pressure of compressed air, the foam-rubber ball pushed the concrete residue along the pipeline to discharge at the sump pit. When the pumping was almost complete, the pressure caused the bent section to swing fiercely. The D/P standing nearby was struck by a bent section and was thrown up a height of three metres. His head hit against the tunnel wall and sustained fatal injury.

Case Analysis

The tunnel had a diameter of 5 metres. The pipeline involved in the accident was over 100 metres in length and had diameters 150mm externally and 125mm internally. The additional sections of the pipeline to the pit consisted of two 7.5m external arc length bent sections and two straight sections of 3m and 1m respectively. However, these sections were not secured or anchored in position by any means. With a compressed air pressure of about 0.8 MPa, the unsecured pipe end was caused to swing and led to the mishap.

Case Analysis

Purging of the pipeline with compressed air would pose great danger if improperly handled. The site management had not established any safe system of work to identify the hazards associated with the operation and to adopt sufficient safety measures to eliminate the danger. The team members were not trained on the hazards in the job and the safety measures to be adopted, nor were they instructed on the proper steps and procedures and supervised to secure the pipeline before carrying out the purging work.

Lessons to Learn

A safe system of work should be developed and implemented to eliminate the hazards and to control the risks arising from the concrete conveyance through pipeline and the associated pumping operations on the concrete residue. The system of work should include the following elements:

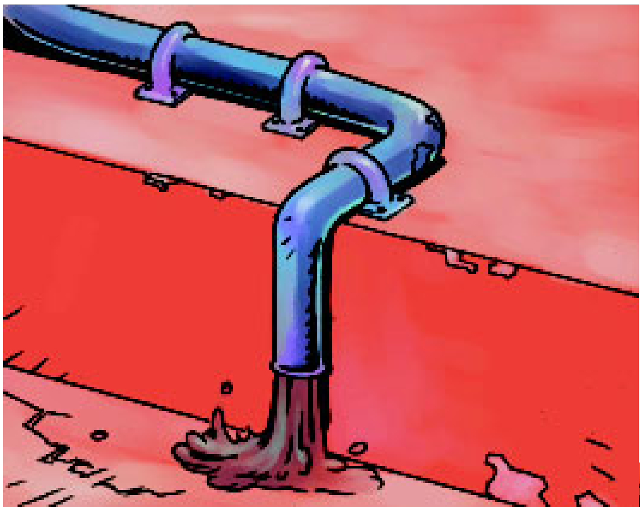
(a) Detailed risk assessment should be carried out to identify the potential hazards associated with the operation of pumping concrete through pipeline and clearing concrete residue from pipeline with compressed air.

(b) Design and construction of the pipeline should be properly planned by engineer with suitable technical knowledge and experience. Relevant method statement, instruction and plan should be provided in details to the workers for assembling the pipeline.

(c) Adequate anchorage with suitable design, construction and spacing should be provided and maintained to secure the pipeline in position, especially at the bends and ends both of which forming an integral part of the pipeline, to avoid danger arising from violent pipeline movement.

(d) Method statement, information and instructions on the working procedures, associated hazards and safety precautions for concrete pumping and purging operation should be provided to workers.

(e) Adequate training in concreting work and the associated concrete pipeline purging operation, including the safe operation procedures and the precautionary measures, should be provided to workers.



Case 9: A worker was electrocuted while working in a building under construction

Scenario

The construction site involved was a building site near completion stage. The deceased person (D/P) was a ventilation duct installation worker employed by the sub-contractor responsible for the installation of ventilation ducts and fans. At the time of accident, such installation work was undertaking at shop units on ground floor by the D/P and his employer.

9 Case

The ceiling of the shop units was 4.6 m high and the ventilation duct was erected at a height of 3.8 m. A bamboo scaffold of 2.9 m high was erected on the ground. Ventilation duct installation work had to be carried out on this bamboo scaffold. A wooden ladder of 3.05 m high was placed leaning against a wall by the side of the scaffold for access and egress. The sub-contractor was required to install the ventilation ducting and to connect a cable from a fused spur mounted at the ceiling to a ventilation fan in each shop unit. The lighting of the shop units was supplied with electricity from a source at 1/F. The fused spur was also supplied from the same source.

After the installation of the ventilation ducting for the shop units, the employer had to connect the cable between the fused spur unit and the ventilation fan. He claimed that he had checked with a tester that the fused spur unit was not energized but he was not so familiar with the testing. In fact, he had only checked one of the terminals on the fused spur. Furthermore, he was not a Registered Electrical Worker under the Electricity Ordinance.

When the employer connected the blue and the yellow/green wires of a 3-wire cable to a fused spur unit, D/P was doing some packing work. Then, he saw D/P climbing up the wooden ladder from the ground. Shortly afterwards, he heard the D/P screamed and found him lying unconscious on the ground with blood stains by the side. D/P was certified dead in the hospital.

Case Analysis

After the accident, it was found that the fused spur was energized, and the lights in the shop units were switched on. While the employer was connecting one end of the cable to the fused spur, the cable was hanging on a sprinkler pipe at the ceiling, with its free end 300 mm above the bamboo scaffold, close to the wooden ladder.

It was believed that the cable was energized at time of wire connection and D/P might have touched the other end while climbing up the ladder. Burn marks were found on D/P's right hand.

The employer claimed that he had been told by the resident electrician that the electrical circuit would be de-energized in that afternoon. He had not got such confirmation before cable connection. However, the resident electrician claimed that he had told the employer to approach him before work. There might have been misunderstanding over their conversation.

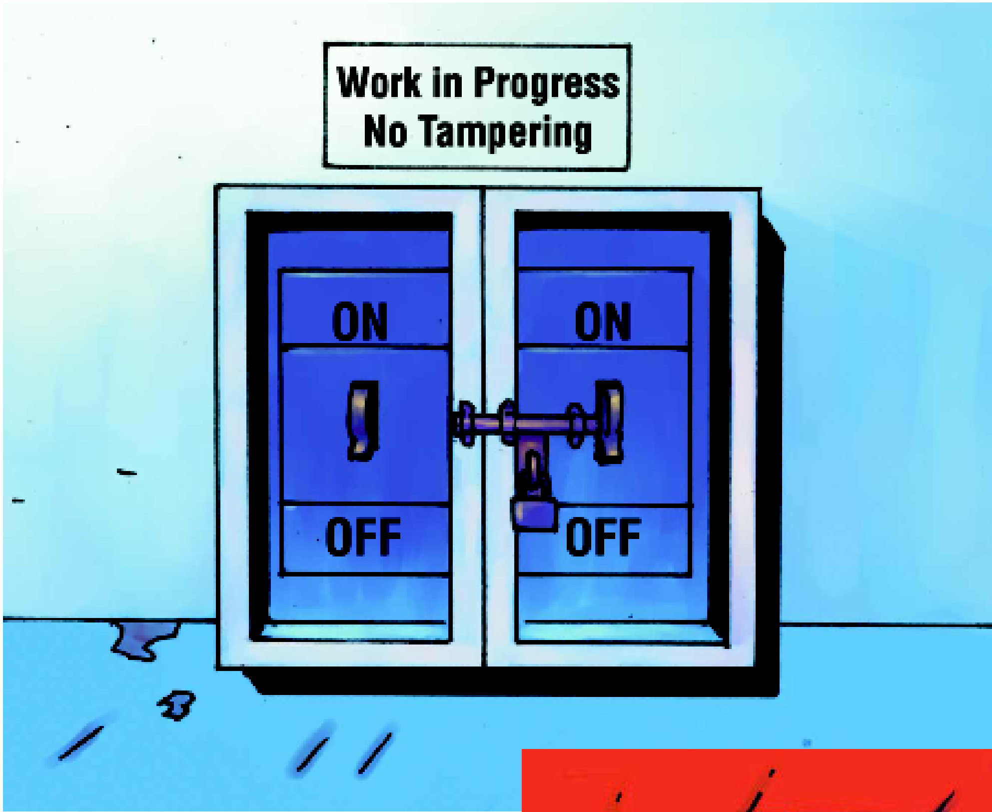
Lessons to learn

For the prevention of electrical hazard in this situation,

(a) Work should be conducted by a Registered Electrical Worker or under immediate supervision of an authorized person.

(b) Fused spur unit should be rendered dead before commencing cable connection.

(c) Clear communication should be maintained for work to be safely done.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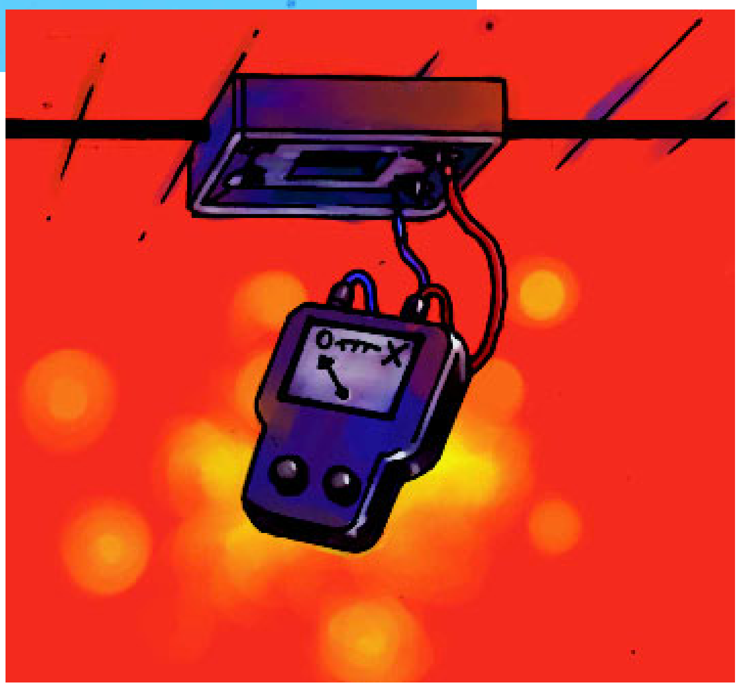

ENQUIRY

If you wish to know more about occupational safety and health information, you may contact Occupational Safety and Health Branch of the Labour Department through –

Hotline : 2559 2297
E-mail : enquiry@labour.gov.hk

Information on the services offered by Occupational Safety and Health Council can be obtained through hotline 2739 9000.