



# INDIAN SAFETY ENGINEER

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**Zuari Cement**  
Italcementi Group  
Chennai Grinding Unit

**SAFETY PROFESSIONALS VISIT  
FROM  
SAFETY ENGINEERS ASSOCIATION  
CHENNAI**



A Factory Visit programme was organized to the Athipattu Unit of M/s. Zuari Cements Ltd., on 26<sup>th</sup> March 2016. Twenty Members participated. Mr. VSV Rajan, Asia Regional Safety Manager and Mr. P. Jagadeesan, General Manager, EHS coordinated the visit from ZCL. Mr. Nagendra Prasad, General Manager & Unit Head of Chennai Unit extended hearty welcome to the participants and briefed on the Operations.

Mr. VSV Rajan presented on the HSE Management Systems and Audit systems that are implemented in the Group companies. Mr. S. Rajan, EHS Manager explained the HSE Management Systems followed in the company. Their Line Managers explained the safety aspects pertaining to their areas of operation.

Safety Systems such as Lock Out Tag Out and Reverse Lock Out Tag Out, Safety Dash Board, Star Award, Drivers Passport, Employee Safety Self Assessment system Etc were very informative to the visiting group. During the Close Out meeting, SEA Members appreciated the active participation and Team work exhibited by the ZCL team at Chennai Unit and thanked the company for their hospitality and the time spent on the visit. Members thanked SEA for organizing such useful Factory Visit programme and expressed their interest to participate in similar factory visits in future.

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## FROM THE DESK OF PRESIDENT



Dear Members,

Greetings to all of you!!

82<sup>nd</sup> Executive Committee meeting of SEA was held on 19<sup>th</sup> March 2016. SEA has organized a Factory Visit programme to M/s. Zuari Cements Ltd, at their Athipattu, Chennai Unit. About 20 members participated and gave a very good feedback on the visit. Our quarterly journal “Indian Safety Engineer” and the monthly ‘Safety Alerts’ are brought out and distributed to Members periodically. We are trying to organize the next Professionals Development Programme shortly.

Mumbai Chapter of SEA has informed about their next technical meet programme to be held during May/June 2016. Our efforts to form a SEA Chapter at Gujarat is still continuing and hopes on constituting the Chapter soon.

Students Chapter at Anna University, Chennai is active and most of the members participate in our Technical Meet programmes and get benefitted.

Safety Professionals Meet (SPM) for the year 2016 is planned to be held during June 2016 and this time it is considered to provide opportunity for the members and other participants to review compliance to Electrical Regulations and discuss with concerned Regulatory Authorities.

Soliciting members for their active participation and support in SEA activities.

Best Wishes!

**S. Ulaganathan**  
President, SEA (India)

## National Safety Day and National Safety Week

After Independence, there was rapid industrialisation in the country which also resulted in increase in number of accidents. At that time, there was no such body for guiding the industries on safety.

In view of the raising trend on industrial accidents in the country, the labour ministers conference in its 22<sup>nd</sup> session 1962, recommended that “a conference on safety in factories should be convened and the question of setting up the National Safety Council for conducting campaign on accident Prevention should be considered”.

The recommendation of the conference was approved by the 24<sup>th</sup> session of the standing Labour Committee which met on 13<sup>th</sup> and 14<sup>th</sup> February 1966 at New Delhi under the chairmanship of Late Shri Jagajeevan Ram, the then Union Labour Minister and the proposal concerning the constitution of National Safety Council was set up on 4<sup>th</sup> March 1966 by the Ministry.

Subsequently it was decided that this day, 4<sup>th</sup> March should be commemorated as National Safety Day every year in the form of National awareness campaign on safety.

Since 1972, national Safety day is celebrated every year through out the country to reiterate the importance of safety and to create safety awareness.

**National Safety Day/Week 2016:** National Safety Day/Week is a whole week safety campaign which would be celebrated from 4<sup>th</sup> of March (Friday) to the 10<sup>th</sup> of March (Thursday) in 2016.

**National Safety Day/Week Celebration:** It is celebrated by uniting together the governmental and nongovernmental organizations including the health organizations and industrial members. They are well supplied with all the centrally designed promotional materials and utilities (badge, stickers, banners, instruction card, poster, wallet, leather belt and bag) printed with SHE slogans and messages by the Council to fulfill the following objectives:

For the convenience of the campaign organizing organizational members:

(Contd. on page 3)

# TRAUMATIC BRAIN INJURIES IN CONSTRUCTION

Falling 25 feet to the ground from a roof, being struck in the head by a steel beam as it is transported across a worksite, or getting hit by a vehicle moving supplies-these are only a few examples of why the construction industry has the greatest number of both fatal and nonfatal traumatic brain injuries (TBIs) among U.S. workplaces. From 2003 to 2010, 2,210 construction workers died because of a TBI (a rate of 2.6 per 100,000 FTE workers). These deaths represented 25% of all construction fatalities and 24% of all occupational TBI fatalities during the same period.

The numbers are tragic but there is some good news: the rate of fatal TBIs in construction decreased by 6.2% each year between 2003 and 2010. Some of this decline can be attributed to the overall decline in the rates of work-related deaths and fatal TBIs (including that are both work- and nonwork-related). Another reason is that spending and employment in construction decreased when the economic recession hit in 2007 resulting in fewer workers exposed to construction hazards. Despite these declines, TBIs remain one of the major causes of deaths in the construction industry.

## How Common Are TBIs in Construction?

Researchers at the National Institute for Occupational Safety and Health (NIOSH) recently took a close look at deaths due to TBIs in the construction industry in the United States during 2003 to 2010. Their 2016 report in the American Journal of Industrial Medicine describes findings such as these:

- Workers in small construction companies (<20 employees) were more than 2.5 times more likely than those in larger companies (?100 employees) to die from a TBI. (Contd. on next page)

## National Safety....

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- For making sure about the quality materials which should reflect the national SHE issues.
- For generating support to the organizations in order to contribute to the economic self-reliance of the National Safety Council.

In order to organize this campaign, a national level governmental support is given to the members. The campaign is well planned to make it highly visible among the people through the efficient use of an electronic media journals, newspapers and other industrial magazines.

Following national level activities for whole week such as variety of public functions including seminars, debates, poster of safety messages and slogans distribution, essay competitions, safety awards distribution, banner exhibition, play of drama and songs, training programs, workshops, display of films over SHE issues are held during the campaign celebration. Safety Pledge event is carried out by the organizational employees.

Safety activities based training programs are held for the industrial staffs over various topics to carry out their responsibilities very well. Dur-

ing training session they are taught about the testing and examination of pressure vessels, lifting machines, chemical and electrical safety, risk handling and assessment, fire control, first aid knowledge and etc.

## Objectives of Celebrating National Safety Day/Week

- National Safety Day/Week is celebrated on national level all over the country to make aware of people about safety including the various health and environmental movements.
- It is celebrated to get the goal of great level of the public participation to play the major safety roles in different industrial sectors.
- Through the celebration it is largely promoted the utilization of participative approach by the owners of the company by promoting their staffs in the safety, health and environmental activities.
- Through this campaign, the need-based activities, self-observance with legal requisites and professional SHE (safety, health and environmental) activities are encouraged among staffs at the work places.
- Work place safety is promoted to a great level by reminding the em-

ployers and employees including other staffs of their legal responsibilities.

- To get the goal of developing and strengthening the SHE activities among people to the workplaces.
- Serve the society with preventive culture and scientific state of mind by organizing a safety approach.

## Themes of National Safety Day/Week

- National Safety Day/week theme of 2015 was "Build a Safety Culture for Sustainable Supply Chain".
- National Safety Day/week theme of 2014 was "Manage stress at Workplace and Control Hazards" and "Safety: It Takes All of Us".
- National Safety Day/week theme of 2013 was "Working Together to Ensure Safe and Healthy Workplace".
- National Safety Day/week theme of 2012 was "Ensure safe and healthy working environment - A fundamental human right".
- National Safety Day/week theme of 2011 was "Establish and maintain preventative safety and health culture". ■

## BERYLLIUM – CERTAIN FACTS

Beryllium is a lightweight metal used primarily in alloys to add strength, thermal stability and other properties valued in the aerospace and defense industries. Workers can develop adverse health effects from breathing beryllium in dust, mist, fumes, or in other forms, or through skin contact with beryllium particulate, fumes, or solutions.

Employers must reduce exposure to this toxic substance to or below the permissible exposure limit (PEL) of 2.0 micrograms per cubic meter of air ( $\mu\text{g}/\text{m}^3$ ) averaged over 8 hours through feasible engineering and work practice controls. Employers must also provide workers with adequate personal protective equipment (PPE) to prevent skin contact with beryllium particulate, fumes, or solutions.

**Chronic Beryllium Disease (CBD)** is a chronic granulomatous lung disease caused by inhalation of airborne beryllium by individuals who have been previously sensitized to beryllium. Workers can develop chronic beryllium disease (also known as berylliosis) from exposure to airborne beryllium even at levels below the current PEL of  $2 \mu\text{g}/\text{m}^3$ . CBD signs and symptoms can include shortness of breath, an unexplained cough, fatigue, weight loss, fever, and night sweats. Some workers with CBD may develop severe symptoms very quickly that become fatal, while others may not experience signs and symptoms until months or years after their exposure to beryllium. CBD can continue to progress even after a worker has been removed from

exposure. CBD is a chronic obstructive lung disorder that may adversely affect quality of life and shorten life expectancy. Sarcoidosis, a granulomatous lung disease of unknown cause or origin, has similar signs and symptoms with CBD that may make diagnosing CBD difficult without a record of occupational beryllium exposure. Beryllium sensitization is the activation of the body's immune response to beryllium. Beryllium sensitization can result from inhalation or skin exposure to beryllium. Sensitization alone rarely results in noticeable symptoms. An individual must become sensitized to beryllium before he or she can develop CBD. Lung cancer is associated with occupational

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### Traumatic Brain....

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- Males were 7 times more likely than females to die from a TBI.
- Older workers (>65 years) were almost 4 times more likely than younger workers (25-34 years) to have a fatal TBI.
- The TBI fatality rate was significantly higher for foreign-born than for native-born workers.
- Falls, especially from roofs, ladders, and scaffolds, led to >50% of fatal work-related TBIs.
- Structural iron and steel workers and roofers had the highest fatal TBI rate, and TBIs related to falls caused most of their deaths.

### How Do We Protect Workers from TBIs?

Armed with the data above, safety

and health professionals can work to prevent fatal TBIs in construction. A nationwide construction falls-prevention campaign, started by NIOSH, OSHA, and the CPWR-The Center for Construction Research and Training, seeks to raise awareness by encouraging everyone in construction to work safely and use the right safety equipment while working at heights, such as on roofs, ladders, and scaffolds. The Safety Stand-Down, stemming from the campaign, will occur during May 2-6, 2016. Also, to prevent falls from ladders, a NIOSH smartphone application provides visual and audio signals and safety tips for safe ladder positioning has been downloaded to over 63,000 smartphones as of January 31, 2016.

Improved harness sizing designs for protecting workers from falls due to poor fit or improper size selection; and a worker-support bracket and safety rail assembly that provides a guardrail system to protect workers from falling through unprotected roofs are among a few other NIOSH research studies that address falls.

Construction is a hazardous industry, and its workers are at high risk for TBIs and their life-threatening or life-long consequences. Thus, despite the drop in fatal TBI rates in construction, prevention efforts addressing these injuries continue to be implemented and improved, especially among high-risk workers. ■

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# THERMAL METAL SPRAYING

**Employers:** Protect yourself and your workers from hazards caused by thermal metal spraying. In 2003, a worker died in Oregon shortly after spending two days applying chromium- and nickel-based thermal sprays at a worksite in Washington State. The victim had been applying thermal metal sprays using portable equipment at a temporary worksite with inadequate ventilation. He was not wearing an appropriate respirator and other personal protective equipment when he did the work. The victim developed progressive symptoms of fatigue, shortness of breath and coughing. He was later found dead in his home. A post-mortem examination revealed

lung damage consistent with toxic exposure.

Following an investigation by Oregon-OSHA, the employer was cited for multiple violations related to the overexposure, personal protective equipment, respirators and engineering controls.

## **What is thermal metal spraying?**

The term "thermal metal spraying" refers to a process in which metals are melted and sprayed on a surface to form a coating. The metals may be melted using a variety of heating processes, and sprayed metals can be pure metals or alloys in the form of powders, wires, or rods. Other names for thermal metal spraying include

flame spraying, metal spraying, plasma spraying, electric arc spraying, metallizing, and hardfacing.

Thermal metal spraying may be used to build up worn parts, apply a corrosion-resistant layer or to apply soldering or brazing filler metals. The process is used in many industries including aerospace, agriculture, automotive, electronic, machine shops, marine, pulp and paper, and transportation.

## **Why is thermal metal spraying hazardous?**

There are multiple health and safety hazards for the operator and anyone else in the vicinity of the work:

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## **Beryllium....**

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exposure to beryllium by inhaling beryllium containing dust, fumes or mist. The International Agency for Research on Cancer (IARC) lists beryllium as a Group 1 carcinogen (causes cancer in humans), and the National Toxicology Program (NTP) lists beryllium as a known human carcinogen.

## **Occupations with Potential Exposure to Beryllium (Be) include:**

- Be Metal/Alloy Production Workers
- Be Oxide/Ceramics Production Workers
- Foundry Workers
- Machinists and Machine Operators
- Metal Fabricators
- Welders
- Dental Technicians

- Abrasive Blasters (slags)

## **Medical Screening and Surveillance**

Workers with potential exposure to beryllium should participate in medical screening and surveillance as recommended by a medical professional with expertise in occupational exposure to beryllium and related health effects.

**Medical screening** - Medical screening should include a beryllium lymphocyte proliferation test (BeLPT) and may include biopsy by fiber optic bronchoscopy, X-ray, CT scan or positive blood or bronchoalveolar lavage BeLPT. BeLPT is a recognized blood test for measuring the immune response to beryllium in order to diagnose beryllium sensitization. Beryllium-specific lymphocyte proliferation in an individual's peripheral blood sample indicates an abnormal immune response and beryllium

sensitization. Workers sensitized to beryllium are at risk for developing CBD and need continuing medical follow-up. CBD is diagnosed when medical screening identifies a beryllium exposure history and characteristics in the lung that indicate CBD. Medical surveillance - is the systematic collection and analysis of health information on a group of workers. Medical surveillance programs provide for early identification and treatment for health effects and feedback to employers and employees that sensitization and/ or CBD has occurred. If sensitization and/or CBD are identified, the employer should evaluate workplace controls to reduce or eliminate the exposure.

## **Treatment**

There is no known cure for CBD. Treatment may include corticosteroids, oxygen, and other means to ease symptoms or slow the disease progression. ■

# WORKING SAFELY WITH ELECTRICITY

Working with electricity can be hazardous. Engineers, linemen, electricians, and others work with electricity directly, including overhead lines, cable harnesses, and circuit assemblies. Office workers and salespeople work with electricity indirectly and may also be exposed to electrical hazards.

## Generators

One of the common tools utilized following the loss of power are portable generators. Most generators are gasoline powered and use internal combustion engines to produce electricity. Carbon monoxide is a colorless and odorless gas produced during the operation of gasoline powered generators. When inhaled, the gas reduces your ability to utilize oxygen. Symptoms of carbon monoxide poisoning include headache, nausea and tiredness that can lead to unconsciousness and ultimately prove fatal.

- DO NOT bring a generator indoors. Be sure it is located outdoors in a location where the

exhaust gases cannot enter a home or building. Good ventilation is the key.

- Be sure that the main circuit breaker is OFF and locked out prior to starting any generator. This will prevent inadvertent energization of power lines from back feed electrical energy from generators and help protect utility line workers from possible electrocution.
- Turn off generators and let them cool prior to refueling.

## Power Lines

Overhead and buried power lines are especially hazardous because they carry extremely high voltage. Fatal electrocution is the main risk, but burns and falls are also hazards.

- Look for overhead power lines and buried power line indicators.
- Stay at least 10 feet away from overhead power lines and assume they are energized.
- De-energize and ground lines

when working near them.

- Before maintenance isolate the energy lines by following Lock Out and Tag Out (LOTO) systems.
- Use non-conductive wood or fiberglass ladders when working near power lines.

## Extension Cords

Normal wear on cords can loosen or expose wires. Cords that are not 3-wire type, not designed for hard-usage, or that have been modified, increase your risk of contacting electrical current.

- Use only equipment that is approved to meet OSHA standards.
- Do not modify cords or use them incorrectly.
- Use factory-assembled cord sets and only extension cords that are 3-wire type.
- Use only cords, connection devices, and fittings that are equipped with strain relief.

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## Thermal Metal....

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- **Metal fumes:** Harmful levels of chromium, cobalt, nickel, lead, cadmium and other toxic metals may be generated.
- **Gases:** The spray may contain asphyxiating gases (argon, nitrogen, hydrogen, and helium), water/steam, nitrogen oxide, ozone, carbon monoxide, and carbon dioxide or fuel gases such as acetylene, methane and propylene, depending on the process.
- **Metallic dusts:** Fine metallic powders are both an explosive and inhalation hazard.

• **Noise:** The process generates a significant noise hazard, which can cause hearing loss.

• **Non-ionizing radiation:** Ultraviolet and infrared radiation can damage the eyes and skin.

• **Other hazards include:** Electrical, burns, mechanical, fire, compressed gases, and infrasound (sub-audible sound).

## How do I protect my workers and myself?

You should contact your equipment manufacturer and spray-material suppliers to ensure that the equipment is being used ac-

ording to recommended operating guidelines.

Due to the numerous hazards associated with this process, it is not possible to describe here all the control measures that apply to thermal metal spraying. Prior to thermal metal spraying, you must assess the hazards and take appropriate precautions, which may include training workers, providing adequate ventilation, establishing programs for respiratory protection and hearing conservation, providing additional personal protective equipment, etc. ■

# CARBIDE TIPS CREATE HEALTH PROBLEMS

Workers who file saw blades or those who machine tools with tungsten carbide (or other "hard metal") tips may be exposed to toxic levels of cadmium, a cancer-causing agent, and cobalt, a suspected cancer-causing agent. Grinding and filing hard metals may produce high levels of exposure to cobalt, and brazing operations may create high exposures to cadmium. Even though employers use local ventilation and wet grinding methods, overexposure still may occur. According to medical studies, toxic effects of exposure may include kidney disease, asthma, anemia, emphysema, and hard metal lung disease with reduced lung function.

Hard metals are metal alloys with properties of extreme hardness, wear-resistance, and high temperature stability.

Hard metals are used for cutting

and drilling tools, as well as for metalworking dies and special machine parts.

Hard metal alloys are actually metal composites, made by mixing metal carbides and binder metals in powdered form, and then pressing the compound into desired shapes under high temperature and pressure.

Tungsten carbide is the most commonly used hard metal in the U.S. Cobalt is the most common binder metal.

The amount of cobalt in most hard metal alloys varies from as little as 2 percent up to 25-30 percent. Certain hard metals, such as "stellite," may contain more than 50 percent cobalt, although airborne cobalt exposures with stellite grinding may be lower than with grinding other hard metals.

Cadmium is common in the brazing solders used to attach hard metal

pieces to other metal pieces.

Hard metals are commonly encountered here either as an existing component in a manufactured tool or as hard metal pieces used in manufacturing or reconditioning tools.

There is no evidence of substantial exposure to cobalt or cadmium during the actual use of tools containing tungsten carbide or other hard metal. But workers can be significantly exposed or overexposed to cobalt or cadmium during the manufacture or reconditioning of tools with hard metal parts, such as tungsten carbide-tipped saw blades.

Tooling operations that commonly produce exposure to cobalt or cadmium include: dry or wet grinding of hard metal tips/parts on saw blades or other metal tools, and brazing or welding hard metal tips/

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## Working Safely....

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- Remove cords from receptacles by pulling on the plugs, not the cords.

## Equipment

Due to the dynamic, rugged nature of construction work, normal use of electrical equipment causes wear and tear that results in insulation breaks, short-circuits, and exposed wires. If there is no ground-fault protection, it can cause a ground-fault that sends current through the worker's body.

- Use ground-fault circuit interrupters (GFCIs) (ELCB) on all 120-volt, single-phase, 15- and 20-ampere receptacles, or have an assured equipment grounding conductor program

(AEGCP).

- Use double-insulated tools and equipment, distinctively marked.
- Visually inspect all electrical equipment before use. Remove from service any equipment with frayed cords, missing ground prongs, cracked tool casings, etc.

## Electrical Incidents

If the power supply to the electrical equipment is not grounded or the path has been broken, fault current may travel through a worker's body, causing electrical burns or death. Even when the power system is properly grounded, electrical equipment can instantly change from safe to hazardous because of extreme conditions and rough

treatment.

- Visually inspect electrical equipment before use. Take any defective equipment out of service.
- Ground all power supply systems, electrical circuits, and electrical equipment.
- Frequently inspect electrical systems to insure that the path to ground is continuous.
- Do not remove ground prongs from cord- and plug-connected equipment or extension cords.
- Use double-insulated tools and ground all exposed metal parts of equipment.
- Avoid standing in wet areas when using portable electrical power tools. ■

## **Carbide tips....**

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parts on to saw blades or other tools.

Workers who may be involved in these operations include tool makers, saw filers, grinders, machinists, brazers, welders and others.

These people may work in hard metal tool manufacturing firms, at businesses that recondition dull or broken hard metal tools, or in tool reconditioning or machining shops within larger businesses that use hard metal tools. Lumber mills, for example, commonly employ full-time saw filers who repair and maintain hard metal-tipped saw blades.

Other types of wood or metal product fabrication businesses also may have workers routinely involved in hard metal tool reconditioning.

Studies have revealed worker overexposures to cadmium from brazing with cadmium-containing solder, from grinding or sandblasting hard metal tools made with cadmium-containing solder, and even from grinding operations in which "cadmium free" solders were used to attach the hard metals.

Workers also can be exposed to cadmium by ingestion and through contact with cadmium in dust on hands and work surfaces.

Cobalt, which is a routine ingredient of tungsten carbide and other hard metals, may be released into air during the manufacture, finishing, grinding, filing, sharpening, brazing, welding, or sandblasting of hard metal.

Exposure could be in the form of cobalt metal fumes created when hard metal is brazed or welded to other metals, or as airborne cobalt metal produced by dry or wet

grinding operations.

Grinding coolants commonly leach cobalt from ground hard metal, and the concentration of cobalt dissolved in coolant can increase over time. Even when hard metals are not actually being ground, wet grinding operations can generate a coolant mist that causes exposure to cobalt dissolved and suspended in the coolant.

All these forms of exposure could result in inhalation of cobalt by the worker at or near the operation. Monitoring of hard metal tool workers at manufacturing. Reconditioning worksites, as well as saw filers at lumber mills, has found many cases of worker overexposure to cobalt. It is not yet known if cobalt dissolved in coolant can be absorbed through the skin.

Acute overexposure to cadmium fumes can cause chemical pneumonia or pulmonary edema (leakage of body fluid into the lungs).

The major adverse health effects associated with long-term exposure to cadmium are on the kidneys and lungs. Long-term overexposures to cadmium can cause irreversible kidney damage or emphysema, a permanent and potentially disabling condition.

The kidney damage typically produces abnormal levels of protein in urine, and one method for monitoring cadmium exposure involves measurement of a urine protein.

Cadmium is also known to cause lung cancer in humans with long-term excessive exposure, and is suspected as a cause of prostate cancer. Cadmium has been shown clearly to induce cancers in laboratory animals.

Cobalt exposures can cause either asthma or "hard metal lung disease"

(inflammation or scarring of the lungs). Either of these lung conditions can develop quickly or over a long period of time, and can be associated with relatively low exposure levels.

Both conditions are potentially reversible if detected in early stages, but otherwise can progress rapidly or slowly to cause severe disability. Hard metal lung disease can be fatal. Cobalt is a definite carcinogen in animals, and a suspected carcinogen in humans.

Cobalt can cause skin sensitization and an allergic contact dermatitis (skin rash). Contact dermatitis is common in saw filers and tool grinders. It also may be caused by skin irritation from coolants or by sensitization to other metals, such as nickel or chromium.

The PELs are established at levels generally believed to ensure that nearly all workers will not suffer adverse health effects, even though they may be exposed daily to these levels in the workplace.

Exposure levels above the PEL are considered potentially harmful, and the law requires that employers ensure that employees are never exposed to levels over the PELs.

General health standards require ventilation and respiratory protection where overexposures to cobalt exist.

To monitor or assess if hard metal workers are being overexposed to cadmium or cobalt,

First, be sure you know of all operations where cadmium containing solders are used.

Identify any operations where tools with hard metal tips/ parts (containing cobalt) or with metals containing cadmium are being finished or reconditioned through processes such as brazing, welding,

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## Carbide tips....

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grinding, filing or sandblasting.

If you are not sure whether cadmium or cobalt exists in your workplace, check the Material Safety Data Sheets (MSDS) that must be provided by manufacturers of materials containing hazardous ingredients.

If you identify operations that could lead to cadmium exposures, initial monitoring of the air breathed by exposed workers is required. If you think cobalt exposures are possible, you are required to make sure cobalt exposures do not exceed the PEL. Compliance with this requirement can only be confirmed with air monitoring.

When monitoring for cobalt, one should also monitor for cadmium, because cadmium overexposures have been documented even when cadmium containing solders were not being used.

Monitoring, sample analysis, and interpretation of monitoring data is a specialized technical process that may be conducted by company hygiene professionals, hired safety and health consultants, or government or university occupational health consultants. Government or university hygiene consultants may provide initial monitoring free of charge, especially to small employers.

It is important to note that if a worker is exposed to a hazardous substance, such as cadmium or cobalt, a number of factors determine whether harmful health effects may occur, and the type and severity of effects. These factors include:

- How much of the hazardous substance the worker is exposed to.
- How long workers are exposed.

- Whether the substance is inhaled, ingested, or comes in contact with the skin.
- Which other chemicals the worker may be exposed to.
- Characteristics of individual workers.

Good initial monitoring helps to identify these factors and provides the best possible evaluation of each worker's exposure.

Cadmium exposure in excess of the allowable permissible exposure limit (PEL) is a serious occupational health concern.

In the case of cadmium, even exposures over the "action limit" ( $2.5 \mu\text{g}/\text{m}^3$ ), which is one-half the PEL ( $5.0 \mu\text{g}/\text{m}^3$ ), are a significant health concern.

The general and construction industry cadmium standards require that employers provide a medical monitoring program for workers with cadmium exposures above the action limit.

In some cases, the standards also require that medical monitoring be provided for workers who have acceptable or even no cadmium exposure at the present time, but who had higher exposure in the past.

Current state regulations require only that a worker's airborne exposure to cobalt be limited to less than the PEL ( $50 \mu\text{g}/\text{m}^3$ ). However, in view of the mentioned recommendations, it is prudent to strive for cobalt exposures well below the PEL.

The best control for cadmium exposures is to eliminate the use of cadmium, such as by replacing cadmium-containing solder or "filler metals" with cadmium-free materials for brazing operations.

Cadmium-free solders are commercially available for a wide range of applications, and tool and

saw blade manufacturers have successfully used them in many situations.

If a cadmium-free material cannot be used, another option is to physically confine the process and provide an efficient local air exhaust system to vent cadmium fumes away from the breathing zone of workers.

Hard metal workers should be protected from cobalt overexposures through proper confinement and local exhaust of certain operations, such as dry or wet grinding.

Local exhaust or confinement systems should be designed and tested by qualified individuals to ensure that the systems are effective in controlling exposures.

Workers may need to wear proper respiratory protection to protect themselves from exposures until the confinement or local exhaust system is set up, tested, and shown to reduce exposures effectively. However, respirators should not be considered a satisfactory long-term solution to exposure control.

To minimize exposures through ingestion, consumption of food, beverages and tobacco products should not be allowed in areas where exposures could occur. In addition, workers should wash their hands before eating, drinking, smoking or applying cosmetics.

Be aware that wet grinding does not necessarily control exposure hazards, and that dust levels that are not visible could still cause overexposures.

Train employees on the signs, symptoms, and prevention of cadmium and cobalt health hazards.

Workers should be advised to report all breathing difficulties that occur at work, even those for which there may be no obvious cause. ■

# GUIDELINES FOR SAFELY ENTERING AND CLEANING VESSEL SEWAGE TANKS

Sewage systems on vessels are known as Marine Sanitation Devices (MSDs) or Collection, Holding and Transfer Tanks (CHTs). Cleaning these systems is required for operations such as routine surveys and inspections, surface preservation, equipment modification, repairs and maintenance. Entering and cleaning sewage tanks, piping and components present specific hazards to workers that put them at risk for injuries and illnesses if they are not properly protected.

Workers are often exposed to dangerous atmospheres during tank opening and venting; manual pumping and stripping; breaking or dismantling components and piping; and pressure washing, mucking, and scaling. A dangerous atmosphere may expose workers to the risk of death, incapacitation, injury, chronic or acute illness, or impaired ability to escape unaided from a confined or enclosed space. When working on CHTs/MSDs, special attention should be given to good hygiene practices, proper use of personal protective equipment and safe confined space entry procedures.

The information in this document can help prevent exposing workers to the known and unknown dangers of handling treated or untreated sewage and gray water tanks during tank opening, entry, cleaning and related operations. Related components/operations include: piping, aeration, vacuuming, settling, and treatment tanks and apparatus;

sewage-contaminated water tanks or waste oil tanks, bilges, or sumps; and valves, pumps, grinders, macerators and other contaminated equipment.

## Sewage and Gray Water

- Sewage or “black water” includes any wastes contaminated by human excrement and other effluent (liquid waste), such as from urinals and toilets.
- “Gray water” includes wastewaters uncontaminated by human excrement such as liquids from drains, sinks, sculleries, drinking fountains, showers, washing water, food wastes, laundry waste, etc.

## Common Hazards in Tanks

- **Atmospheric hazards** include oxygen-deficiency and flammable or toxic gases such as methane and hydrogen sulfide. Methane gas is colorless, odorless and tasteless, but is highly flammable and is considered an asphyxiant. Hydrogen sulfide (H<sub>2</sub>S) is also colorless and flammable, but it is highly odorous and extremely toxic to humans. At approximately 100–150 ppm of H<sub>2</sub>S, the olfactory nerve is paralyzed after a few breaths. Within a very short time, the sense of smell disappears, giving a false sense that the harmful gas has gone away. These gases are detectable only by properly calibrated instruments.
- **Biological hazards** include pathogens (e.g., bacteria,

viruses, protozoa, parasitic worms, fungi) and other infectious microorganisms that can cause illnesses such as hepatitis, typhoid fever, dysentery and cholera. Inhaling or ingesting contaminated mists may result in serious illnesses.

- **Physical hazards** include slips, trips, and falls due to slippery and sloping surfaces; limited access and egress; corroded ladder rungs; and obstructions by piping and other structures. There is also the risk of receiving punctures and cuts from sharp edges..
- **Mechanical hazards** include energized equipment; rotating machinery; and waste stream leaks. Before any servicing is performed where the energization or startup, or the release of hazardous energy may occur, all energy sources must be identified and isolated, and the machinery, equipment, or system rendered inoperative.
- **Chemical hazards** include sewage treatment agents containing ammonium compounds, formaldehyde, chlorine products, sodium hydroxide, odor-control and sewage-biodegrading enzymes, sanitizers, biocides, cleaning or bleaching agents, pharmaceutical drugs, hormones and heavy metals.

*(To be Continued in the Next Issue)*

## CASE STUDY

### CONTACT WITH HAZARDOUS SUBSTANCES:

**Chemical Splash at Process Plant:** Exposure to hazardous substances without suitable protection measures in place may result in serious injuries or even death. For example, a corrosive chemical splash could cause skin burns and acute inhalation of toxic gases could result in severe irritation or damage to the respiratory system or even death.

Always carry out Risk Assessment (RA) before handling chemicals at the workplace.

Apply the hierarchy of controls (elimination, substitution, engineering controls, administrative measures, and personal protective equipment) to minimise exposure to chemicals. Refer to the container label/Safety Data Sheet (SDS) of the chemicals that are being handled and understand its basic chemistry including its incompatibility with other substances and environmental conditions. When working with hazardous substances, it is important to develop safe work practices and train workers to handle them safely. If personal protective equipment (PPE) is required, make sure that they are appropriate to protect against the specific hazard(s), wellmaintained and in good condition, worn correctly, and easily available to workers.

The following cases show the outcome when important safeguards are missing or lacking.

### Description of Incident

A worker was sent to collect samples from a process plant at

midnight as there was a recent process upset. For a representative sample, flushing of the sampling line was carried out before taking the actual sample. The worker drained the flushing liquid into an open bucket which would then be disposed into a waste pit. When the worker failed to locate the hatch on the pit cover for proper disposal of the liquid, he decided to open the pit cover. While moving the pit cover, the worker knocked over the bucket. Contents from the bucket splashed onto his arms, neck and lower half of his face. The worker suffered from chemical burns as result of the incident.

### Possible Causes and Contributing Factors

#### Medium

- The work area was insufficiently lit for the task and made it difficult for the worker to locate the hatch on the pit cover to carry out the disposal.

#### Man

- The worker decided to open the pit cover to dispose the flushing liquid when he failed to locate the disposal hatch.
- While moving the heavy pit cover, the worker lost his balance and knocked over the bucket containing flushing liquid from the sampling line.

#### Management

- Risk assessment was not performed; hence the job hazards were not identified.
- There was no safe work procedures for proper disposal of flushing liquid.



Sample collection point.



Disposal pit with pit cover removed.

1. Location of hatch on the pit cover.

- The worker was not provided with suitable PPE for protection against chemical splash during the sampling and disposal process.

### Recommendations and Learning Points

- Carry out risk assessment prior to any work involving hazardous chemicals and develop safe work procedures to include all control measures used to address the identified risks. Control measures to be put in place to ensure that risks are kept to a level as-low-as-reasonably-practicable (ALARP).
- Ensure any deviation from the standard operating procedures,

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## Chemical Splash....

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such as opening of the pit cover, as mentioned in this case, is subjected to management of change and risk assessment before implementation.

- Ensure all workplaces, including outdoor work areas are adequately lighted, especially at night.

- Paint the disposal hatch in a different colour to make sure it is clearly visible.

- Equip workers with suitable PPE like safety goggles, face shield, long sleeved chemical-resistant aprons, rubber gloves and safety shoes. Ensure that they are worn correctly for protection against chemical splash during sampling and disposal.

- Use sealed containers instead of open buckets to transfer hazardous chemicals if manual transfer is absolutely required. Where possible, eliminate the need for manual transfer by redesigning the sampling line to include in-line or closed loop flushing system direct to disposal pit.

## Hydrogen Sulphide Poisoning during Plant Shutdown Operation

### Description of Incident

Two workers deployed by a contractor were overcome by hydrogen sulphide (H<sub>2</sub>S) gas which leaked from a relief valve when they were trying to remove it. One of the workers fell to the ground from a five-storey scaffold but survived, while the other worker on the scaffold became unconscious due to inhalation of the leaked gas. The latter worker subsequently died of H<sub>2</sub>S poisoning.

### Causal Analysis

Evaluation of loss

- One worker injured

Type of contact

- Contact with hazardous substance (chemical)

Immediate cause(s)

- Inadequate lighting in work area
- Deviation from standard operating procedures
- Use of open container for transfer of chemical
- Inadequate PPE

Basic cause(s)

- No safe work procedures developed for the task
- No job hazard analysis

Failure of OSHMS

- Hazard identification, risk assessment and risk control
- Operating procedures and safe work practices
- Management of change
- Control of hazardous substances

### Possible Causes and Contributing Factors:

#### Man

- Both workers unscrewed the flange bolts of the wrong relief valve and failed to:

- Check the name/label on the relief valve before starting work; and

- Obtain a copy of the Permit-to-Work (PTW) before commencing work.

- The foreman did not show the workers the location of the relief valve to be removed and assumed

that they knew where it was as they acknowledged the location of the relief valve.

#### Medium

- H<sub>2</sub>S gas was released from the relief valve.

#### Machine

- The name/label on the relief valve was not legible.

- The relief valve was not isolated as the workers were not supposed to work on it.

#### Management

- The safe work procedures did not specify the step of identifying the correct valve prior to removal.

- The management allowed the workers to carry out the work unsupervised.

### Recommendations and Learning Points

- Workers must obtain a copy of the PTW to ensure that the work is authorised and conditions were met before commencing work.

- Workers should verify the equipment to be worked on by matching the equipment name/label that was stated on the PTW.



Scene of the accident the deceased was found on the scaffolding platform on the left.



Close-up view of the relief valve which leaked.

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## Hydrogen Sulphide....

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Report immediately to the permit issuer if the equipment cannot be verified.

- Ensure that all equipment labels are legible at all times.
- To prevent miscommunication, the foremen should physically bring the workers to the site to make sure that there is no confusion on the equipment to be worked on.
- Provide workers with a written document of the safe work procedures for the task and ensure that they undergo sufficient training for the assigned work. The safe

### Causal Analysis

Evaluation of loss	• One fatality and one worker seriously injured
Type of contact	• Contact with toxic gas, H <sub>2</sub> S due to inhalation
Immediate cause(s)	• Work carried out on wrong relief valve
Basic cause(s)	• Miscommunication • No safe work procedures for the task • Failure to obtain PTW • Lack of supervision
Failure of OSHMS	• Operating procedures and safe work practices • Training, awareness and competence • Consultation and communication • Contractors

work procedures should include checks to ensure that all the correct lines are isolated and lock-out tag-out (LOTO) measures are in place.

- Occupier and contractor management should supervise workers to ensure workplace safety especially during first breaks and verify that all safe work procedures are adhered to. ■

## CARBON MONOXIDE POISONING AT INDOOR PLACES

In recent months a total of 11 employees were poisoned by carbon monoxide (CO) at 3 separate work places.

Expert inspections tied the poisonings to propane- or liquid gas-powered equipment used in poorly ventilated, enclosed spaces. Built-in ventilation systems (HVACs) in these work spaces were either taken out of service (to avoid dust contamination during work activities) or not capable of removing a buildup of CO gas.

Hazard prevention starts with recognition that CO can become a danger on jobsites like the ones described here. Dangerously high levels of CO built up in the air:

- After just 2 hours of pressure washing a concrete floor inside a 200 foot-long town house garage
- Within 1 ½ hours of operating a power screed and two riding-power trowels inside a 12,000 sq. ft. ware house

- During the work shift while using a floor-scraper machine to remove tile inside a 22,000 sq. ft. office space.

will tell you if your ventilation setup is keeping CO below regulatory limits. If high CO levels persist, you may need to add a



Running just one propane-powered machine in a poorly ventilated space can lead to carbon monoxide poisoning, even in larger spaces like this one.

Industrial fans and negative-pressure air machines are often not enough to stop a serious CO build up, even in large spaces. Testing the air for CO during work activities

portable ventilation system that can ensure enough contaminated air is effectively vented to the outside and replaced by fresh air. ■

## IN THE NEWS

### **Statement by ILO Director-General: Getting to Equal by 2030, The Future is Now**

“Let’s work together to achieve genuine gender equality and women’s empowerment in the world of work. Decent work for women brings decent lives for all,” says ILO Director-General Guy Ryder.

International Women’s Day, is celebrated on March 08, 2016 and we affirm that when it comes to Getting to Equal by 2030, The Future is Now.

Last year the United Nations adopted a transformative agenda - the 2030 Agenda for Sustainable Development. If the Sustainable Development Goals (SDGs) are to be achieved permitting all to move forward together with fairness and justice, there must be readiness to act now on the commitments of the SDGs. What ultimately matters are the results and changes for the better in the lives of girls and boys, women and men everywhere.

They all stand to gain from gender equality as do families, enterprises and societies. The world of work is a privileged entry point to set in motion the transformations called for in the 2030 Agenda. Yet continuing and unacceptable gender gaps in the world of work persist and are captured with alarming clarity by a new ILO report, “Women at Work: Trends 2016”.

The report shows the enormous challenges women continue to face in finding and keeping decent jobs. It demonstrates the persistently unequal earning power of women and men. It lays out the imbalance between paid and unpaid work and between hours worked by each, and the difficulty women have in gaining access to adequate maternity protection and pensions.

It is also of serious concern that despite significant progress made by women over the past two decades in education, this has not translated into comparable improvements in their position at work.

These stubborn challenges raise important questions. How do we eliminate the gender pay gap in less than the 70 years it is estimated it will take at current rates of progress. Two generations is too long to wait to achieve pay equity.

Why is it taking so long to end discrimination and violence against women and girls; how do we get recognition of the value of unpaid care and domestic and other work and the consequences for women’s lack of access to quality work with social protection. What measures can ensure the full and effective participation of women at all levels of economic and public life?

As the ILO approaches its 100th anniversary in 2019, our Women at Work Centenary Initiative renews the Organization’s commitment to promote gender equality and to identify measures that will give new impetus to work in this domain, building on what has already worked. A global survey and research on the situation of women in the world of work will clearly identify aspirations and obstacles to guide innovative action.

Our actions must be immediate, effective and far-reaching. There is no time to waste. The 2030 Agenda is an opportunity to pool our efforts and develop coherent, mutually supporting policies for gender equality.

Let’s work together to achieve genuine gender equality and women’s empowerment in the world of work. Let us engage men and boys for women’s empowerment. Decent work for women brings decent lives for all.

## IN THE NEWS

### Toxic relationships: testing new chemicals

Researchers at Johns Hopkins University have mapped the world's "chemical landscape" to produce a toxicological database that can predict the safety of new chemicals for which there is no test information.

The project, launched at the American Association for the Advancement of Science meeting in Washington, uses safety data for 10,000 chemicals registered under the EU's Reach programme, which aims to assess the toxicology of every substance with sales or production of more than one tonne per year in Europe.

"There are 100,000 chemicals in products we use every day and we are missing 90 per cent of the safety information we need," says study leader Thomas Hartung. "We have come up with a computer model that can tell us which chemicals are similar to untested ones to give us an idea of what types of hazards they are likely to pose."

The team took 816,000 studies on 10,000 chemicals submitted to the European Chemical Agency, which administers Reach, and turned them into a searchable database. At the same time chemicals were grouped according to their known toxicities, from allergic skin reaction to serious eye damage.

### Tamil Nadu Student invents cost-effective Fire Extinguisher

Deeply impacted by the loss of life due to fire accident in cracker units in Sivakasi, a 13-year old boy in Tamil Nadu has come out with an innovative and low-cost fire sensor cum extinguisher device which can douse the flames immediately in the case of any mishap.

Hailing from a poor family with his mother, a daily labourer at a fire work factory at Jaminsilvarpatti in Sivakasi, having got injured in a similar mishap few years ago, Jayakumar decided to find a solution to the recurring problem of explosions in the cracker factories.

So as he was strapped for cash, Jayakumar, who is studying in the ninth standard in a government high school, found a messiah in the form of his Science teacher, who not only encouraged him in his invention, but also provided him with the funds required to make the device.

An elated Jayakumar immediately started working on his dream project and after a month of toil, he came out with the system, which detects and extinguishes flame. It could be offered by many small fire work establishment in and around Virudhunagar district of Tamil Nadu, country's nerve center, that produces 90 percent of country's cracker requirement every year.

Jayakumar's small but important invention fetched him the honor when he was presented with National Award for recognising his efforts in trying to mitigate such fire eventualities.

## Kind Attention of Members....

Even after repeated reminders to UPDATE the Postal Address and PERSONAL E-MAIL ID's many members have not taken it seriously. **Since most of the companies do not entertain bulk E-mails you would not be able to view the SAFETY ALERTS & other communications sent by us.** Hence, SEA (India) members are once again requested to send their **current postal address and active Email ID (personal)** to us at the earliest to:

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