Cement Sustainability Initiative (CSI)

Health and safety in the cement industry:
Examples of good practice

Health and safety

December 2004

Version 1.0

World Business Council for
Sustainable Development

Note to reader:

This compilation study on good safety practices is offered as a "tool-kit", where each Company can decide what is most appropriate to implement in terms of its own corporate CSR strategy, in the context of its international, national and local legislative obligations. This compilation study is not necessarily applicable in its entirety to every situation.

Neither should this compilation be regarded necessarily as fully complete or exhaustive. It is offered in good faith as prudent advice and suggested good practice, but no legal responsibility can be entertained for any errors or omissions.

This document refers to employee Health & Safety issues and does not cover broader community, neighbour or social issues; these latter are covered in the TF5 document.

Throughout this document, unless otherwise specified, the term "employee" should in general be read as covering both direct and indirect employees

We are indebted to BP plc for kind permission to use their "Golden Rules of Safety" at various places in the document.

List of Contents

1. INTRODUCTION – THE KEY IMPORTANCE OF HEALTH AND SAFETY

1.1 Setting the Context

CSI Companies are already hugely committed to improvement in safety performance in their Companies, and very significant improvements are already being achieved.

Cement is one of the most widely used substances on earth. Making cement is an energy and resource intensive process with both local and global environmental, health and safety impacts. Recognizing these facts, several cement companies, initiated the Cement Sustainability Initiative (CSI) as a member-sponsored program of the World Business Council for Sustainable Development (WBCSD). Currently, sixteen cement companies, who together represent more that half the worldwide industry outside of China, sponsor the Initiative. Begun in late 1999, the Initiative established (1) independent research on the current performance of the industry and the major sustainability issues it faces; (2) a series of facilitated stakeholder dialogues in seven cities (Cairo, Curitiba, Bangkok, Lisbon, Brussels, Washington DC, and Beijing); (3) a set of independent recommendations to improve performance; and (4) an industry Agenda for Action to address the issues raised.

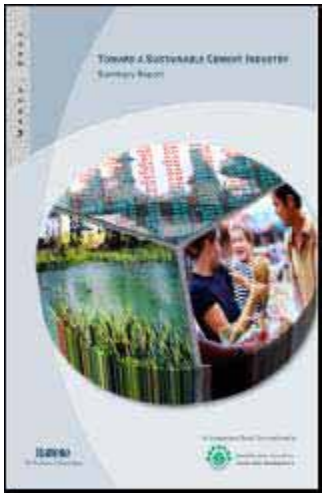
Ensuring healthy and safe working conditions for employees and contractors is a fundamental key to corporate social responsibility, and is one of the most important issues for the cement industry. CSI members recognize that more attention should be paid to this area across the whole industry and we are committed to playing a full part in that process.

As background the following extracts summarise the previous CSI findings on employee health and safety.

Extracts are given from:

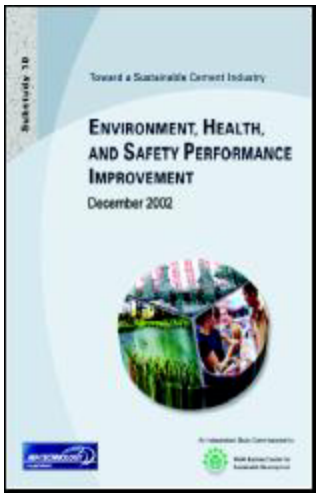
- The Summary CSI 2002 Report
- The Substudy 10 CSI Report
- The Agenda for Action

The Report of July 2002 concluded on Employee Well – Being that:



"The most important priority for cement companies with regard to employee well-being is the assurance of occupational health and safety, both for workers and contractor personnel. The cement industry is not nearly as advanced as some other heavy manufacturing industries in the implementation of occupational health and safety management systems. In the future, cement companies might consider the design of inherently safe plants that minimize potential mishaps. In addition, consistent with Sustainable Development principles, there are a number of other employee well-being issues that a company can support, including training, career development, and professional growth; respect for employee rights, such as freedom of communication and association; promotion of balance between commitment to work and personal or family life; promotion of diversity; and prohibition of discrimination and harassment. Such measures will contribute to employee productivity and safety-consciousness, as well as loyalty and pride."

Substudy 10 on Environment, Health and Safety Performance Improvement, December 2002, concluded that:



"The health and safety performance of the cement industry as a whole is lagging behind that of other, more proactive, sectors of manufacturing industry. Within the sector, there is a wide range of performances. The better companies have demonstrated that it is possible to achieve injury rates similar to the average for the manufacturing industry. However even the best have room for further improvement. There is a particular need for the industry to encourage and help those companies and plants that are significantly under-achieving to raise their safety standards to ensure a sustainable industry that meets social and employment expectations.

The Agenda for Action, July 2002, concluded that:

"Ensuring healthy and safe working conditions for employees and Contractors is one of the most important issues for the cement industry. We recognize that more attention should be paid to this area across the whole industry and we are committed to playing a full part in that process. A Health and Safety Task Force has already begun to meet and discuss options for future work, and will be central to delivering the Initiative's projects and commitments.

While systems for reporting on individual company occupation-related illness and injury rates do exist, in most cases we are not currently able to report industry-wide figures. The Battelle Institute's research correctly points out that public information in this area is hard to come by. From what we do know, we believe that the injury and injury rate in our industry is higher than others such as petrochemicals and petroleum refining. We regard this as unacceptable and believe that it is affecting the reputation of the cement industry as a whole. That is why we are asking the Task Force to first develop standard, cross company systems to measure, monitor and report on health and safety performance, which individual companies can then implement.

The design of buildings and equipment for safe operation obviously has a role to play in reducing injuries and incidents, and the companies supplying equipment to the industry are constantly improving and refining their products so that they meet the highest safety standards. However, in reality, regular effective health and safety training and a culture of safety are the most powerful tools to reduce injury and occupation-related illness rates. All the companies involved in this project have health and safety programs in place, and the Task Force will be establishing an information exchange for companies to share their experience, identify common causes of injuries and develop recommendations for continuous improvement."

The Agenda for Action, "What we are going to do" indicated following:

Joint projects	**Individual actions**

• We will accelerate action through a Health and Safety Task Force (already set up in parallel with the Battelle Institute's study), to ensure delivery of effective systems of measuring, monitoring and reporting on health and safety performance.
• The Task Force will:
  • develop an information exchange including information on the rates, origins and types of injuries and incidents that occur
  • share company experience
  • develop recommendations for prevention.
	• Each company will respond to the recommendations of the Health and Safety Task Force by:
	  • improving existing systems, procedures and training for tracking, following up and preventing injuries and incidents.
	  • measuring and reporting publicly on performance in a common format.

1.2 Actions taken by The Cement Sustainability Initiative (CSI) Task Force 3 (TF3)

Background

Driven by the common need to improve safety performance in the industry, several Cement Companies had already come together as the Cement Safety Task Force (CSTF) as far back as May 2001 in Monterrey, Mexico. Work then began on common industry-wide safety definitions to introduce real benchmarking, and all members began to share key data on fatalities and injuries. The CSTF continued to move forward with this work in 2002, and several other Companies also joined in. In May 2003, the CSTF was re-formed as TF3 under the CSI "Agenda for Action", and has continued to work forward together even more proactively since then.

Safety Reporting

By early 2004, TF3 achieved its primary target of agreeing industry Safety Definitions and Reporting Criteria, now published. Never before has there been a set of internationally agreed industry-wide definitions that enable accurate benchmarking and reporting throughout the cement industry. These definitions cover fatalities, fatality rates (for direct employees only), lost-time injuries and lost-time injury frequency ratio (for direct employees only). Other definitions, including a lost-time injury severity ratio, are being drafted for future agreement.

Agreement on these definitions has enabled the preparation of a combined CSI safety reporting format, and a first-off overall report has now been compiled on data submitted by 10 CSI Companies covering the year 2003. Reporting initially covers cement activities only, but in due course it is hoped that the reporting will cover all the building materials activities of all CSI companies.

Management of Health and Safety

As promised under the Agenda for Action, TF3 has now drafted this Compilation Study in Good Practices in Health and Safety in the Cement Industry. This guideline document outlines how the management of both health and safety can and should be achieved, without being over-prescriptive. It gives practical guidance on good practice in safety procedures in the cement industry based on experience and focused on the identified fatality and injury causes. It also gives parallel employee health guidelines, again focused on the most common health concerns, in particular relating to the increasingly common use of alternate fuels. Most CSI Companies have already implemented such guidelines, though a need has been identified to disseminate these to the wider industry and external stakeholders.

1.3 Best Practice in Health & Safety

Recently the Conference Board (http://www.conference-board.org/aboutus/about.cfm) published a research report: R-1334-03-RR, 'Driving Toward "0"', Best Practices in Corporate Safety and Health, in which it collated Best Practice gems of wisdom from a wide range of industries. The findings may be summarised as in this extract.

Full document URL: http://www.conference-board.org/publications/describe.cfm?id=724

What Do the Best Companies Do for Safety and Health?

Les Smith, manager of business development for DNV Business Solutions, a recognized global performance measurement firm, finds that the best companies:

Clearly describe what people are expected to do for safety
Every level of employee, from the most senior executive to the newly hired worker, clearly understands what is expected. There are specific, demanding standards for each person in all major work activities. Without adequate standards, there can be no meaningful measurement, evaluation, correction or commendation of performance.

Make safety a line management responsibility and accountability
Safety is better served when it is so ingrained into every activity that it becomes impossible to ignore it. There is little talk of doing things the safe way and more talk of doing things the right way. Safety is equal to all considerations of production, costs, and quality. This is reflected in performance appraisals, salary adjustments, and promotions.

Incorporate safety into the business process as an operational strategy
Leaders around the world increasingly recognise that a well-managed safety system provides an operational strategy to improve overall management. But in recent years a significant number of major organisations have discovered that applying the tools and techniques of good safety management gives them not only reduced injuries and illnesses but also measurable improvements in efficiency, quality and productivity.

Use proactive health and safety measurements
Leading management consultants have emphasised: "If you can't measure it, you can't manage it; if you can't manage it, you can't improve it". The heart of safety management is measuring performance in quantifiable, objective terms. Leading companies constantly assess their process to determine if they are adequately controlling risk. Although they include in their "safety" measurement after-the-fact consequences such as OHSA recordable rates and lost time rates, they do not rely solely on trailing indicators.

Have executives that do not *support* health and safety management – they *lead* it
Scaling the heights of health and safety excellence requires the same leadership skills as attaining excellence in any other area. Health and safety performance is a reflection of corporate culture and senior management influences that culture more than any other group. As in other areas, executive leadership will dictate the kind of safety performance it insists on.

2. OCCUPATIONAL HEALTH & SAFETY (OHS) MANAGEMENT SYSTEMS

2.1 General Requirements for OHS Management Systems

The precise scope of OHS management systems will vary by company, country and other local factors, but in general as a minimum will require

- An OHS Policy
- An organisation structure to implement that policy
- An implementation programme
- A method for evaluating the success of that implementation and providing feedback
- An action plan for continuous improvement

The ILO document ILO-OSH 2001 sets out these elements in full details below. It is up to each company to adapt this to its particular corporate OHS objectives.

- http://www.ilo.org/public/english/protection/safework/managmnt/guide.htm

International Finance Corporation Environmental, Health and Safety Guidelines:

- http://ifcln1.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines
- http://ifcln1.ifc.org/ifcext/enviro.nsf/AttachmentsByTitle/gui_OHS/$FILE/OHSguideline.pdf

Draft OHSAS 18001 Standard for Health and Safety:

- http://www.ohsas-18001-occupational-health-and-safety.com/index.htm

European Agency for Safety and Health at Work:

- http://agency.osha.eu.int
    - The Use of Occupational Safety and Health Management Systems in the Member States of the European Union:
    - http://agency.osha.eu.int/publications/reports/307/en/index.htm

2.2 Sample OHS Management systems used by some CSI Companies

As an example of generalised OHS Policy the attached policy is used by a CSI company.

The Group Health & Safety Policy requires all our locations managers to:

- Comply with all applicable Health & Safety Legislation
- Provide a healthy and safe workplace for all employed (both Direct and Contracted Employees)
- Continuously improve towards Best Industry Health &Safety Practice

The Group H&S Policy also requires all employed (both Direct and Contract Employees) to:

- Work in a healthy and safe manner as required by law and as directed by management

Another example of a commitment to OH&S used by a CSI company:

The company places the highest value on ensuring the health and safety of our employees, subcontractors, third parties, and visitors. Yet comparison of our performance with best-of-class companies in similar industries such as mining and heavy manufacturing shows that we do not do as well in OH&S as they do. We must significantly improve. Our goals are to not have a single injury resulting in death or permanent disability and to substantially reduce lost time through injury.

The company takes the challenge of achieving these goals seriously. During 2002/2003, the Executive Committee designated OH&S as a principal corporate focus. We have set global OH&S targets and standards that are mandatory for all Group companies, including contractors. To assist in attaining these targets and standards, we have developed an OH&S handbook that describes the main elements, systems, and procedures of our approach. We have also produced a standard assessment audit protocol for our companies to use in checking their progress toward achieving the global standards.

Some elements of the OHS Management systems used by another CSI company are outlined below

Health & Safety Policy

Guiding Principles

All people working on our sites have a right to expect safe and healthy work conditions and the duty to contribute to such conditions with responsible behaviour.
We regard H&S as core business values being integrated in the overall business performance
Every injury or case of ill health resulting from employment is avoidable with appropriate systems of work, equipment, substances, training and supervision

Effective H&S management includes risk assessment from the initial plant design and construction stage, commissioning and overall planning for organisation of work and maintenance
All our operations must continually improve their H&S performance

Key Roles and Responsibilities

It is up to every manager at every level to ensure the Health and Safety of those people in the workplace under their responsibility. The manager must implement the policy and systems within their zone of control and influence
The Chief Executive Officer assumes this responsibility at Group level. He takes great care to ensure that within each division and Business Unit the management has the authority, skill and resources required to exercise this responsibility
The Group Executive Vice President HR and Organisation for the company is responsible for coordinating and reviewing overall H&S Policy, recommending on such matters to the Executive Committee
All employees have responsibilities for the health and Safety of themselves and others affected by their actions

Main Processes and Tools at Corporate Level

Annual Report to the Executive Committee
Reporting fatalities within 24 hours to the Executive Committee
Annual H&S Divisions directors meeting, to drive exchange of best practices and to develop common standards
Audit Department assignments in order to ensure that processes are in place
If necessary, enquiries regarding Divisional/Business performance

Main Processes and Tools at Divisional Level

Divisions have an occupational H&S Management System to deliver continual improvement in performance. This is based on a H&S policy that reflects the Corporate Policy as regards its principles, framework, responsibilities, co-ordination and monitoring. This includes new Units joining the company. Specific resources (human, financial) are dedicated and identified to reach the targets.

Risk Analysis

Management processes shall be in place to ensure risks are adequately identified, controlled and managed.

The analysis is regularly updated, notably during the installation of new equipment, changes in the organisation, etc.

Employees, Contractors and customers shall be informed of the risks and the measures taken to eliminate or minimise them.

A monitoring and alert system shall be in place that puts risk control at appropriate management level depending on its seriousness.

Safety Audits and Inspections

Workshop audits and inspections are planned and take place on a regular basis. They are reported and give rise to corrective and preventative actions, which are managed in the same way as injury analysis.

These inspections and audits are conducted by the line management, trained for that purpose, including the Top Management. Personnel are involved as much as possible in these audits and inspections.

In addition to these internal audits there are crossed audits between different sites, which use the so-called “fresh view” technique.

Analyses of Injuries and Malfunctions

Any significant injury, near-miss or malfunction is subject to an in-depth and methodical inquiry, led by the line manager in his sector of responsibility, with the assistance of the safety body and the personnel injured or involved.

A report shall be prepared detailing what happened and the action taken (or to be taken and time-scaled) to prevent a recurrence. The investigation effort shall be proportional to the potential risk.

Injury reporting and communication shall be in accordance with the Group and Divisional directives.

The Health & Safety Management Committee shall regularly check the relevance of any action undertaken and ensure that the actions are effected.

Prevention and Control of Risks

Fixed and Mobile Equipment

New installations are designed and built taking into account the safety of operating and maintenance personnel.

The installations and mobile equipment shall be effectively maintained and where appropriate, examined and inspected. Those subject to regulatory controls are monitored.

Personal Protection Equipment

Personal protection equipment for work shall be identified, the circumstances in which it should be worn defined, and suitable arrangements made including training & supervision to ensure it is worn (See appendix for datasheet on PPE usage)

Instructions, Rules and Procedures

Instructions, rules and procedures are designed so work may be performed safely, without risk to health, and in accordance with risk assessment. They shall be:
Written
Up-dated
In line with regulations
Realistic

Known and understood by all parties involved
Followed and respected

Emergency/Security Plans

All sites shall have emergency plans in place, pertinent to the nature of their operations and assessed site risks. These plans shall be updated, as required, communicated and practiced on a regular basis.

Exercises shall be conducted and drilled on a regular basis, covering notably scenarios of high potential risks. (See Appendix for an Emergency Preparedness Policy)

Contractors

Health and Safety regulations apply equally to Contractors and their employees working on site; contracts with Contractors should specify the rights and duties of each party in this respect. The contracted party's ability to work safely is a major selection criterion.

Health and Safety shall be effectively managed on work sites. This shall include where appropriate suitable, regular audits.

Contractors are actively assisted in safety matters.

Safety performance indicators for companies operating on site are recorded and reported. They serve as a performance evaluation tool.

Poor safety performance shall not be tolerated and may result in early termination.

Training and Communication

Training

Appropriate arrangements shall be made to ensure all personnel are suitably H&S competent. These arrangements shall provide appropriate training & experience.

Safety includes:
- training in safety behaviour and why H&S is important
- training in HSMS
- training in risk assessment
- training in procedures and methods
- training in use of working equipment
- training for obtaining authorizations and licenses

It concerns all personnel:
- new recruits and temporary employees
- "established" staff (recycling, top-up courses, transfers, changes)
- management (*audits, inquiries, prevention plans, facilitating meetings etc.)
- Contractors as required

All safety training is registered, notably in the individual personnel files, regularly reviewed.

Communication

Communication is an important factor of the safety programme. This shall include information on the site's safety plan, provide feedback on performance and actions taken, learning points to prevent injuries. It encourages a free flow of information (top-down and bottom up)

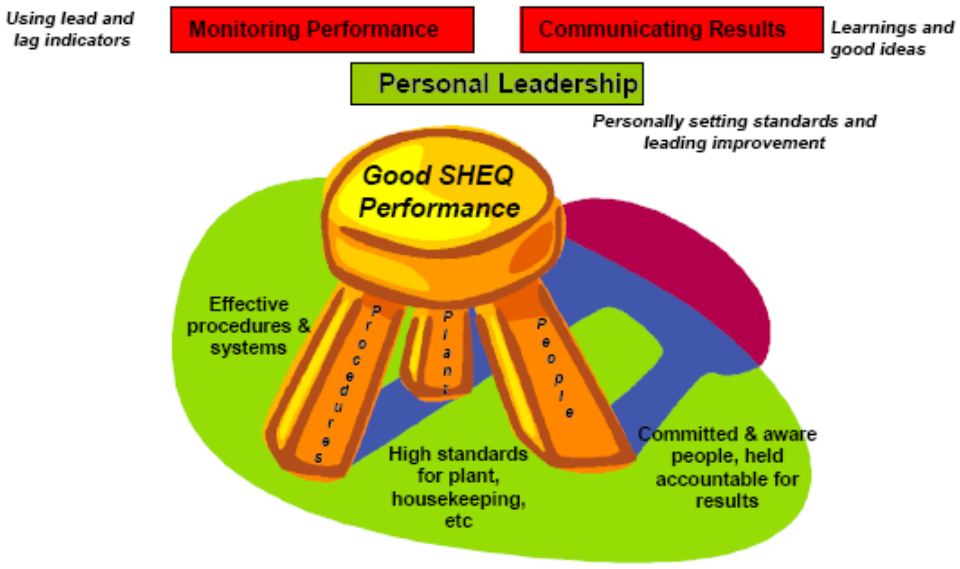
A recent article in the International Cement Review (June 2004) outlined the key components of a more finalised OHS management system that could be independently certified to the new voluntary draft British Standard OHSAS 18001

http://www.ohsas-18001-occupational-health-and-safety.com/

The main components of a H&S management system required under this are proposed as:

- Safety Management Systems
- Occupational health and safety policy
- Planning and organisation for health and safety
- Risk Assessment and the implementation, operation and maintenance of risk control measures
- Measuring health and safety performance and procedures for corrective action in response to health and safety events
- Auditing and Management review of performance

The Australian Cement Industry Federation summarises the overall approach very effectively in this diagram:



2.3 Contractor Passport Systems

The analysis shows Contractors (Indirect Employees) to be at greater risk of fatalities and probably also of injuries. While Contractors are of course ultimately responsible for their own safety, there is a clear onus on management to ensure that Contractors are fully aware of the risks of working on sites and equally to ensure that the Contractors set about working in a safe and responsible manner.

Some countries (e.g. Ireland, UK) have developed a "passport" system for pre-educating and pre-qualifying Contractors in Safety terms before coming on site. This scheme is outlined below. The general principles should apply in all circumstances.

Contractor safety 'passport' systems are widely used for both offshore and onshore operations in the oil and gas industry worldwide. They provide a simple and practical means to ensure that all Contractors working on a company's site are competent, suitably briefed and trained in the sites safety systems and minimum safety requirements. Safety passport systems vary in format and scope, but typically include the following:

- Each contractor is issued with a signed and dated 'passport' on satisfactory completion of the site safety induction training program and any competence or specialist training checks

- The passport typically has a limited validity both in terms of the type of work the contractor can undertake (e.g. hot work) and the time the passport is valid for.
- The passport system requires that refresher training at specified intervals is needed to keep the passport valid

- Passport schemes may include different passports and requirements for workers and supervisors

- The 'passport' provides a simple means for both the contractor and the company personnel to check if that person is trained and suitable to undertake a given task, and when retraining is required. If the passport is not valid, the contractor cannot do the work. This provides an incentive for Contractors to ensure they have the right training and accreditation, and to keep their passport up-to-date

- Safety passport training elements could include

    - Introduction to Health and Safety Law
    - Work Permits
    - Safe Working Practices
    - Electrical Lock-out Procedures
    - Safe Access and Egress
    - Injury and First Aid Procedures
    - Hot works (welding and cutting) Procedures
    - Fire Precautions and Procedures
    - Hazardous substances handling & risks and Personnel Protective Equipment
    - Manual Handling
    - Working with Cranes and Heavy Equipment
    - Excavations
    - Tool Box Talks
    - Risk Assessment

- In some cases a number of companies operating similar facilities have got together and developed a common contractor safety passport system. This avoids the need for unnecessary and repetitive training were the contractor to need a different passport for every site.

2.4 Safety Slogans

As part of their OHS Management System, many of the CSI companies have developed safety slogans and signage. These are used to highlight the importance of safety on a day to day basis and to ensure that employees are aware of their responsibilities for safe working. Below are a few examples of slogans used.

La sécurité, ma priorité. LAFARGE CIMENTS

Holcim Strength - Performance - Passionate about safety

World-Class Safety
Oldcastle
CRH

3. SAFETY MANAGEMENT

3.1 CSI Safety Definitions & Reporting Criteria

A detailed document discussing definitions and reporting criteria is available on the WBCSD website:

http://www.wbcsd.ch/DocRoot/fucY6kajLmftTR8CgnWO/cement-safety-guide.pdf

3.2 Fatality Analysis 2000 - 2003

As fatalities are the most serious tragedy that can happen in the Cement Industry, TF3 set about gathering all statistical data available, and analysed it thoroughly to derive the best possible fatality prevention strategy.

Data from a number of CSI members was collated and analysed as follows:

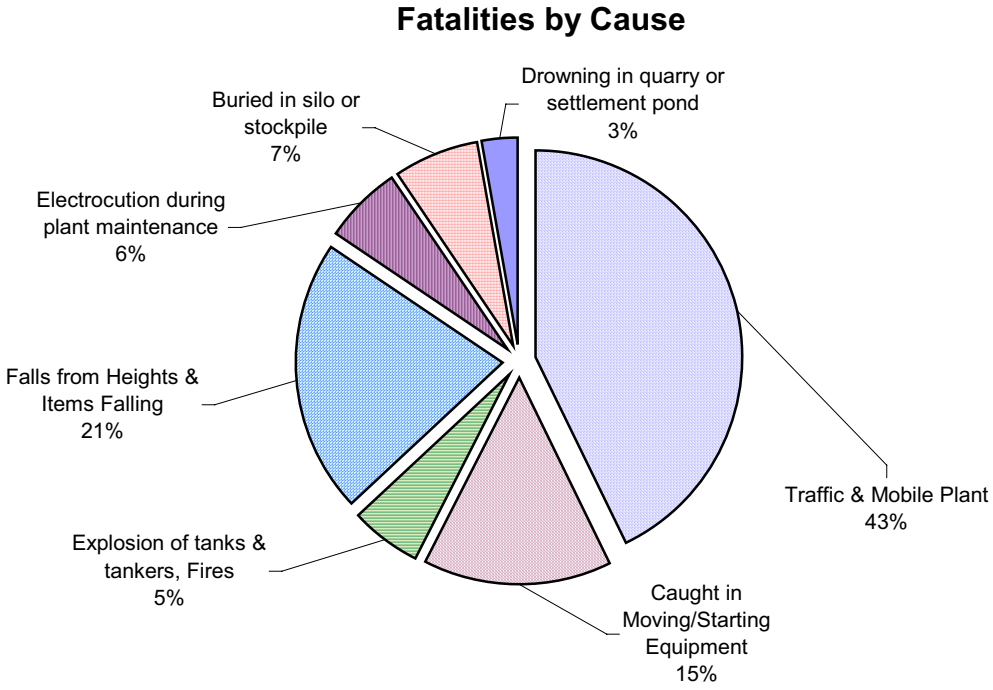
- There was a total of 389 Fatalities in ~300,000 employed over last 4 years
- The Contractor Fatality Ratio, where available, was 8 times that of Employees
- The combined overall ratio (for Employees & Contractors) was 2.67 for that study.

CSI Company Fatality Causes

Analysis by cause shows that 79% of all fatalities arise from 3 main causes

- Traffic & Mobile Plant (43%)
- Falls from Heights & Items falling (21%)
- Caught in Moving/Starting Equipment (15%)

Others were…



Fatality Ratios by Activity and Category

Analysis by business activity indicates that on average Aggregates, Concrete and Asphalt (ACA) activities have similar or slightly lower Fatality Ratios as cement activities. At this time the CSI has focused initially on cement activities. Current Data for other activities has a higher level of uncertainty, though appears to have lower Fatality Ratios.

Fatalities by Age, hour, day and month, work category

Analysis of data for those 3 years showed

- Employee Fatalities peak in **30's & 40's**
- Contractor Fatalities peak in **later 40's & 50's**
- Third Party Fatalities peak in the **teens**
- Data collected also show: Highest Peak fatality time is **10am to Noon**
- More fatalities occur on **Monday** than on any other day of the week
- Peak injury rates occur in **January & March**, possibly related to cold weather conditions
- **Drivers** account for nearly 50% of the fatalities

Fatalities by Region

Analysis by Region indicated much higher Risk in Developing Regions such as Asia, Africa and South America. Contractor risk predominated in Western Europe & Middle East & Africa, while Third Party risk predominated in Asia

Fatality Ratios Compared to Other Industries

Compared to other industries, the overall Cement Industry Fatality Ratio was found to be higher than that of many. This effect is mainly due to a high Contractor Fatality Ratio while the Employee Fatality Ratio was somewhat above the average for similar industries.

Life saving rules used by one peer company:

- Any person working on equipment with moving parts must personally ensure the equipment is de-energized, isolated and locked/tagged out
- No person may disable or bypass a process safety interlock - either mechanical or electrical
- Any person working from a position with the potential for a fall of 1.8 meters or more must use fall protection
- Any person doing flame welding, cutting or brazing up to 6 meters from any flammable material must obtain a proper hot work permit and apply the requirements
- Any person entering a confined space must obtain a proper confined space entry permit and apply the requirements
- Prescribed PPE shall always be worn when exposed to open processes or systems (e.g. clearing material blockages, electrical work, etc …)
- Using illegal drugs is strictly forbidden on any site - use of alcohol or other legal drugs that can effect personal concentration is discouraged

3.3 Conclusion: Fatality Causes & Prevention

The table below summarises those at higher risk of Fatalities, the main causes and corresponding prevention strategies. It is vital that management addresses these prevention strategies, and abides consistently by them in daily plant management.

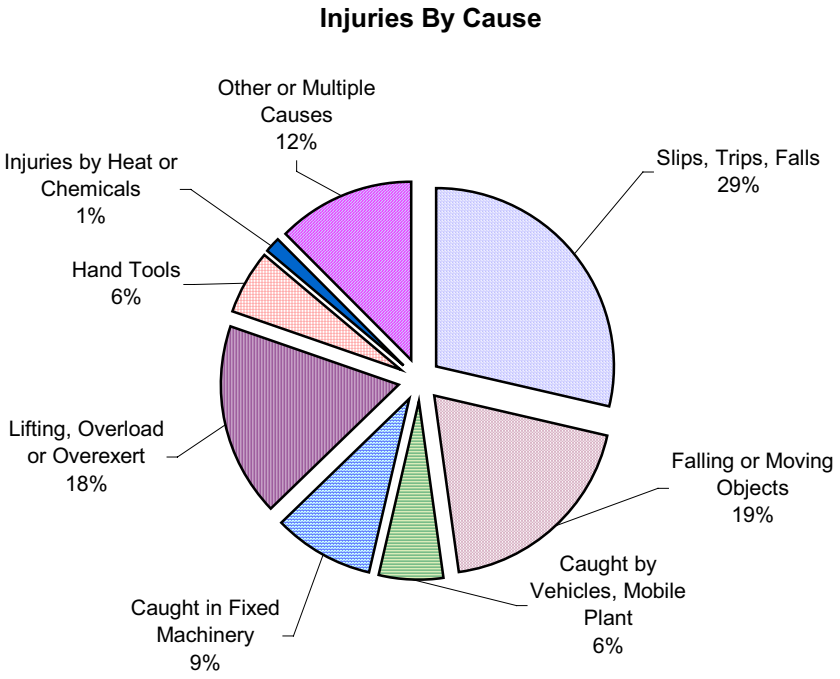
High Risk Categories:	Prevention:
• Contractors	• Contractor Safety Management
• Young/Temporary Employees	• Special Safety Induction
Direct Causes	
• Traffic & Mobile Plant (43%)	• Driver Training
• Falls from Heights, Objects falling from Heights (21%)	• Safety Procedures for Work at Heights, Overhead Protection
• Caught in Starting/Moving Equipment (15%)	• Plant Isolation Procedures

3.4 Lost Time Injury Analysis

The following statistics relate to the data made available by one CSI company.

Typical Injury Causes & Types

Main causes are Slips, Trips and Falls (29%), Falling or Moving Objects (19%) and Lifting, Overload and Exertion (18%). These three causes account for 66% of the total accidents.



- Most Injuries are to Arms and Hands (32%), Legs and Feet (25%) and Back (13%)
- These injuries are 71% of the total

Typical Injury Categories and Ages

- Plant Operators (39%) and General Operatives (33%) are the most injury prone.
- 30-39 is the most injury prone age range (33%), followed by 20-29 (25%), and 40-49 (24%)

3.5 Conclusion on Injury Causes & Prevention

The table below summarises the main injury causes and the corresponding prevention strategies. These prevention strategies should be embedded in ongoing daily plant management.

Injury Causes:	**Prevention:**
• Slip, Trips & Falls	• Housekeeping, clear designated walkways
• Falling/Moving Objects	• Guards on Machines and elevated areas
• Lifting & Overload	• Manual Handling Training
Injury Types	
• Arms and Hands	• Proper use of PPE
• Legs and Feet	• Proper use of PPE
• Back Injuries	• Lifting gear, forklifts
(PPE: Personal Protective Equipment)	

3.6 The Injury Triangle

For each industry, as shown in the example right, there are statistical relationships between the various categories of seriousness of injuries from “near misses” through to fataltities. This emphasises the importance of monitoring and reduction of “near misses” in order to also reduce more serious injury. The CSI TF3 does not collect and analyse near miss data but some CSI companies are doing so on an individual basis and this has proven extremely beneficial.

3.7 Injury Prevention Guidelines

Information regarding the prevention of injuries in various languages can be found: this list is not complete, other sources may exist and comparable.

- ILO Guideline Prevention of Major Industrial Accidents, 1991
    - (http://www.ilo.org/public/english/protection/safework/cops/english/download/e910972.pdf)
- WHO Occupational Health

  (http://www.who.int/oeh/OCHweb/OCHweb/OSHpages/OSHDocuments/WHOOSHDocuments/WHOOCHDocuments.htm)
- IFC; Environmental, Health & Safety Guidelines

  (http://ifcln1.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines)
    - Environmental, Health & Safety guidelines for Constructions Materials Plants (http://ifcln1.ifc.org/ifcext/enviro.nsf/AttachmentsByTitle/gui_constmatplants/$FILE/constmat.pdf)
- European Agency for Safety and Health at Work
    - Factsheets, in all official languages of the EU (http://agency.osha.eu.int/publications/factsheets/index_en.htm)
- U.S. Department of Labor, Occupational Safety & Health Administration (OSHA)

  (http://www.osha.gov/html/a-z-index.html#S)
- Canada, Workers' Compensation Board of B.C. (WCB) – Health and Safety Centre

  (http://regulation.healthandsafetycenter.com/s/Home.asp)
- Australian Government, National Occupational Health and Safety Commission, National Standards and Codes of Practice

  (http://www.worksafe.gov.au/OHSLegalObligations/NationalStandards/nationalstandards.htm)
- Japan International Centre for Occupational Safety and Health (JICOSH), Guidelines

  (http://www.jicosh.gr.jp/english/guideline/index.html)
- Japan Industrial Safety and Health Association (JISHA)

  (http://www.jisha.or.jp/)

- Asia-Pacific Occupational Safety and Health Organization (APOSHO)

  (http://www.aposho.org/members.html)

3.8 Good Practices in Safety

The following sections give examples of good practice in safety in cement plants.

3.8.1 Mobile Plant

Common hazards associated with the heavy plant (e.g. dumper trucks, front loading shovels, fork lift trucks) used in quarrying and bulk material transport include vehicle impact and twisted ankles during embarking and disembarking. Vehicle impact has the potential for particularly high severity incidents, both in quarries and on the manufacturing sites. When reporting and analyzing incidents, it is helpful to distinguish between production, quarrying and general off-site transport activities. Incidents can be reduced by improved driver training, increasing awareness of the people working alongside these vehicles, and by using dedicated routes and crossings to help keep vehicles and pedestrians apart. Modern vehicles also offer improved visibility, helping further reduce the risks as the older equipment is replaced.

Safe Reversing for Road Haulage Vehicles and Mobile Plant

The following standards are minimum requirements used by one CSI company to ensure safe and effective systems are in place for reversing vehicles. Additional requirements within local legislation must also be complied with at all times.

All company owned and hired road haulage vehicles and mobile plant must have an effective audible reverse warning system and, where possible, a visual reverse warning system as well, e.g. a reversing bleeper accompanied by white reversing lights.

Road haulage vehicles and mobile plant that are owned by contractors who work on behalf of the company must also have effective audible and visual reverse warning systems.

A risk assessment must be carried out at each location to identify any further control measures that may be required, e.g. traffic management systems, signage or trained banksmen etc. In addition, risk assessments must be carried out for all vehicles and mobile plant to identify whether improved driver visibility is required, e.g. additional mirrors or a reversing camera with a monitor inside the driver's cab.

Operators of regular collect customer vehicles and other vehicles that visit company sites must be strongly encouraged to fit appropriate reverse warning devices. To ensure such vehicles can manoeuvre safely in the interim, alternative safe operating procedures must be established.

Where environmental constraints present problems regarding the use of audible reverse warning systems, an alternative audible device should be fitted, e.g. a device that alters its sound intensity depending upon the ambient noise levels or a device that is directionally focussed and less intrusive for neighbours (known as "white noise"). If local legislation strictly prohibits all of the available audible systems an alternative, but equally effective system, must be in place.

All reverse warning systems must be regularly checked and, in particular, before the beginning of each working day/shift. When checking the audible reverse warning systems, the check must also ensure an adequate level of noise intensity is being maintained.

Rear view camera technology is helping loader operators and truck drivers keep an eye on what is happening in areas they typically wouldn't be able to see. Features of the rear-vision camera system include:

- Heavy-duty design can withstand harsh environments. Water-resistant.
- Black-and-white or colour systems.
- Infrared illuminators for low-light working conditions.
- Multi-sectional cables for easy maintenance.
- Wide field of view.
- Built-in microphone for crisp, clear audio.
- High-impact-resistant housing.
- Backlight compensation to control picture quality in all lighting conditions.

Always Drive Defensively

Some vehicle drivers think knowing basic driving techniques such as changing gears, braking and getting around is enough to be considered a good driver. This is wrong, since to be a safe driver you need not only to know techniques, but also be responsible and keep a professional attitude relative to everything going on while driving; whether it's with ourselves, with the road conditions other drivers, pedestrians and weather conditions. (See appendix for Safe Driving datasheet).

The Good Driver

Some activities that allow driving properly are:

Attention:
It means to always be alert to what happens or could happen; not only what you do, but also what other drivers or people can do.
Accountability: Be accountable for the possible consequences of each action or event. It means taking the right and timely decision, according to the situation at hand.

Keep calm:
Keep cool and calm, even under external provocation. Don't get carried away.
Caution: Love for life, ours and others', leads to careful driving, granting right of way to pedestrians, emergency vehicles, etc.

Obey road signs:
Know and always obey road signs, even if no vehicles are nearby. This prevents possible injuries. Properly operate and maintain your vehicle: Any mechanical failure costs time and money. Injuries caused by mechanical failures can lead to fatal consequences.

Defensive Driving:

The main activity to develop is defensive driving. Many injuries can be avoided anticipating and covering the mistakes of others. Defensive driving means anticipating and thinking ahead of others. The rules for defensive driving are:

Always be alert to avoid unpleasant surprises Keep an eye not only on the road, but also to the sides. Use the mirrors. When visibility is limited, reduce speed.
Keep a safe distance from vehicles in front of you. Use the 3-4 second rule: 3 seconds lead distance under normal conditions, and 4 seconds in case of adverse driving conditions. When driving, keep full control of the vehicle. Indicate your moves to other drivers when stopping and maneuvering. Announce them ahead of time. Although you have the right-of-way, keep an eye on other vehicles. Never assume they'll grant you the right-of-way.

Never irritate other drivers, whether provoking them or in vengeance. Anticipate pedestrian's reaction, especially near schools and hospitals.

3.8.2 Working at Height

Controls relating to working at height or in confined areas (e.g. Permit-to-work, task risk assessment) are effective in reducing injuries by raising awareness of the hazards and ensuring the correct work methods are followed and that the proper precautions are taken. Mandatory use of safety equipment (harnesses, safety nets) to properly protect workers from falls, posting of permits, and regular inspections of the job site are commonly employed techniques. (See appendix for Working at Heights datasheet)

Ladders

1. Ladders are primarily for access only.
2. Before use, check that the ladder is in good condition
3. Ladders must be tied and/or footed at all times.
4. Ladders must extend 1 metre above the working platform to provide handholds when mounting/dismounting
5. As an angle guide, ladders must be one-out for every four up.

Scaffolding

1. All scaffolding must be erected, altered or dismantled by a trained, competent and certified scaffolder.
2. Fall arrest equipment must be used by scaffolders if working above 4 metres with unprotected edges. (For other personnel, this limit is usually 2 metres.)
3. Scaffolds must be inspected by a competent person and reports entered into the Scaffolding Log.
    a. Before first use
    b. After substantial alterations
    c. Following strong winds or collision
    d. At regular intervals not exceeding 7 days
4. Never work on scaffold unless minimum platform width is 4 boards, with handrail, intermediate rail and toe board fitted.
5. Minor works may be carried out without handrails but only if a full harness is worn and anchored
6. Access must be by a secured ladder
7. Do not take up boards, move handrails or remove ties to gain access for work.

Changes must only be made by a competent scaffolder.

Mobile Scaffold Tower

1. Must be erected by a trained, competent and certified person, in accordance with manufacturer's recommendations.
2. Must be erected on firm level ground, free from underground services.
3. Area beneath must be cordoned off by suitable means or signage.
4. Working platforms must have handrail. Intermediate rail and toeboards fitted. Access must be by internal ladders.

Working at the Quarry Face

Drillers and those loading shotholes are working close to the edge of the quarry face, although they may inadvertently approach the edge and a form of edge protection is required. The recommended system involves the use of strapping between

aluminium poles, the straps are then ratcheted tight. The poles and strapping can be purchased directly from a specialist supplier. It is important that a safety harness/lanyard is also provided to deal with a situation where a person may have to go in front of the barrier. A safe system of work, to incorporate all parts of this system should be provided to the Safety Officers. All those who may be required to use the harness must be trained in the use of same.

Use of Safety Nets

During roof work, a safety harness is used as a means of protecting the person from falling. However, it is not always practical for roofers to be continuously clipped on, due to the lack of a secure point. The actual use of the harness system by construction workers on such roofwork is quite low – this is due to the discomfort and restrictions in using the harness. Failure to use the harness is a common complaint on construction work at our sites. To counter these problems the use of Safety nets should be considered. These are installed under the entire area at which work at height is taking place. It is important to note that the harness system should still be in use and that edge protection is still required on roofing work. The installation of the nets should only be carried out by a competent contractor.

Inspection of Safety Harnesses

All Safety Harnesses (including those worn by contractors) should be checked prior to use for the following :

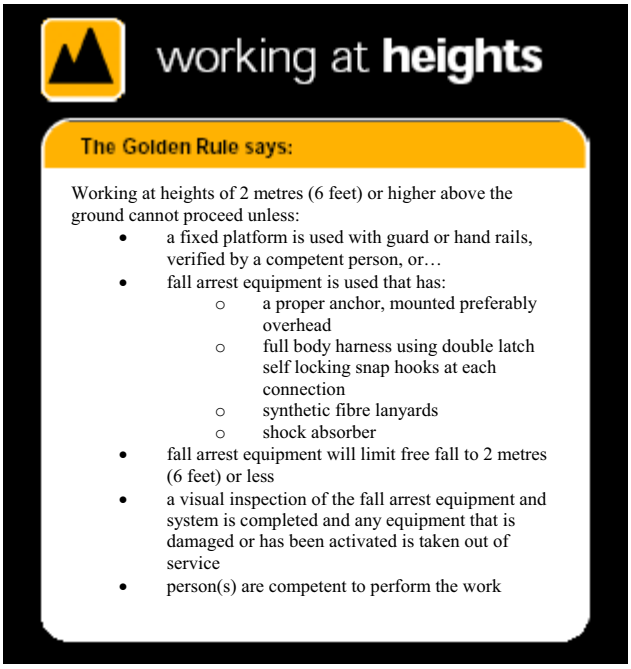
a) That the traceability label is adequately attached to the product

b) Check the webbing and ropes for:
- Cuts, tears
- Excessive wear
- Burns, chemical attack
- Hardening of the fibres
- Sewing must be free of cuts

c) Check the metal fittings for :
- Sharp edges
- Excessive wear
- Correct operation
- Distortion

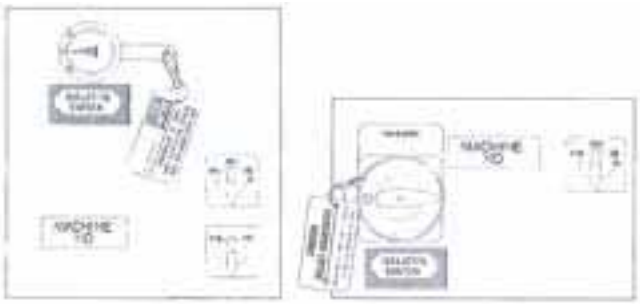
d) Do not subject the PPE to activities where it is likely to be damaged e.g. do not choke the lanyard

e) If PPE is wet and damp, dry in a well ventilated area, away from any direct heat source

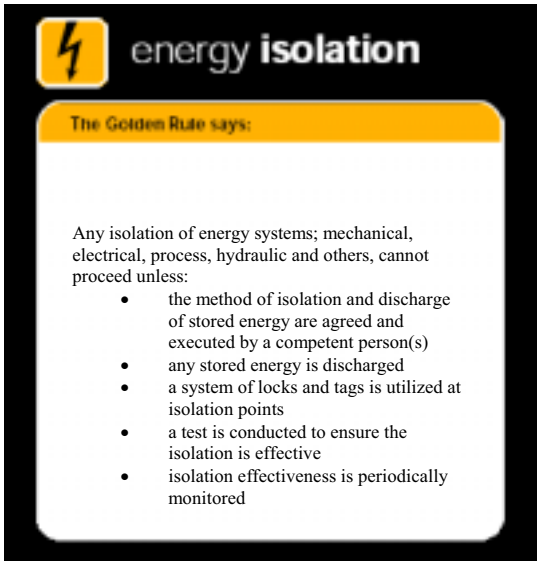


3.8.3 Plant Isolation/Lock-Out

Plant Isolation is one of the most important areas of plant safety, with improvements in the technology in the industry, these procedures become more complex, however effective systems which fully isolate machinery from all energy sources are essential. (See appendix for Tag Out Lock Out Procedures)



A System to Isolate from Danger



A detailed written isolation procedure should be set out and approved. This should cover all areas of isolation:

Electrical Isolation:

- Turn off electrical isolating switches, ensure that local isolation is effective, some machinery requires sub station isolation. Each worker should have his own key ensuring isolation.

Process Isolation:

- Turn off compressed air supply
- Shut off steam
- Prevent elevator run-back
- Divert traffic
- Prevent in-flow of material
- Isolate barring gear
- Etc. etc.

This process should be detailed for each potential isolation procedure. Each step should be performed and then Tagged off. Final check should be made by Supervisor before commencement of maintenance work.

3.8.4 Slips, Trips and Falls

Slips, trips and falls are another common cause of injuries in the industry. These can arise from the uneven surfaces in the quarries and roads and from lapses in good housekeeping within the manufacturing plants. As borne out in the injury analysis, Slips, Trips and Falls cause almost 30% of all injuries. (See appendix for Slips, Trips and falls Prevention Policy)

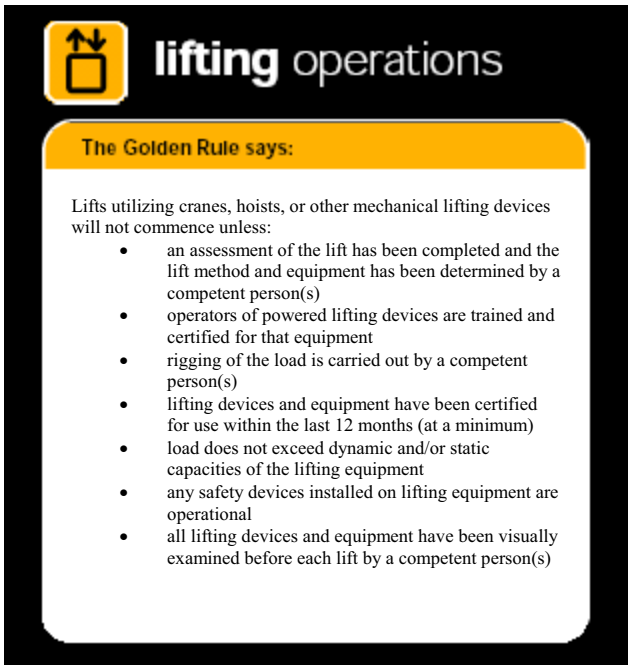
Slips, trips and Falls can be minimized through following simple housekeeping procedures:

- Keep work places tidy
- Use the scrap and dirt bins where provided
- Tidy stacking and tidy layout prevents injuries
- **THE JOB ISN'T FINISHED UNTIL YOU'VE TIDIED UP**
- Good housekeeping leads to greater safety
- Pile material so that it is stable and steady
- Put tools and other equipment where they can not possibly fall or be knocked on to someone below.
- Clearly mark, fence or cover all openings in floor, roof or ground.
- Keep gangways, paths, roads and stairways clear of obstacles
- All excavations in the plant should be surrounded with a handrail
- Provide all scaffolds and platforms with toe boards and railings.
- When working overhead remove all loose material such as bolts, screws, tools, timbers, fittings, etc. when the job is finished.
- Never throw tools or materials, always pass them from hand to hand.
- A nut or bolt falling from a height can kill a person **REMEMBER THAT**

3.8.5 Manual Handling

Due to the repetitive nature of some of the tasks related to cement production, it is very important to ensure that the correct training in given to employees in relation to manual handling. (See appendix for Manual Handling Procedures)

- Size up the job first. If you think it is too heavy, get help – or use a crane or fork lift.
- Look out for sharp edges, splinters and nails.
- Pull out or knock down projecting nails before you pass material on or throw it out for scrap
- Don't try to carry a load you cannot see over. Remove obstructions before lifting.
- Stack goods carefully and tidily on trucks and trailers
- When lifting heavy objects, use your legs as much as possible to save your back muscles.
- Get a good grip of the articles
- Keep your back straight and chin in
- Slacken and bend your knees
- Take up a firm stand, lift steadily and do not twist your body
- When lifting or guiding pieces of equipment, watch for nipping points.



3.8.6 Fire

As a generality, there are few combustible materials in the process equipment in a cement plant, with the exception of conveyor belts. Several cases of significant conveyor belt fires have arisen (see photo), where belt misalignment and/or friction caused heat build-up and subsequent ignition. Thereafter the fire can spread in minutes to the entire conveyor, typically resulting in toxic smoke emission and severe damage to the conveyor gantry. In employee health and safety terms it is therefore vitally important that there are safe exit routes for rapid exit at both ends of the conveyor. Heat detectors may be used at conveyor tension stations, and belts may be purchased made of less/non-combustible material, to lessen the risk of fire. Fire fighting procedures must also be in place.

Electrical cables may also cause or transmit a fire, also with emission of highly toxic smoke. For that reason, cable tunnels can present a significant safety hazard in case of fire, and it is very important to have defined routes for rapid personnel exit.

Storage of fuels of all types must of course be in accordance with local fire regulations and good practice. This applies also to external stockpiles of coal, pet-coke, tyres and the like, where appropriate fire precautions will be required, particularly in hot dry weather.

It goes without saying that storage of waste combustible materials will create a fire hazard. Proper waste disposal and good housekeeping is the best form of prevention.

3.8.7 Entry into Silos and Confined Spaces

A confined space is any space of an enclosed nature where there is a risk of death or serious injury from hazardous substances or dangerous conditions. The risks in confined spaces arise due to

- Lack of oxygen
- Poisonous gas, fumes or vapour
- Liquids and solids, which can fill the space suddenly
- Fire and explosions
- Dust
- Hot conditions

To minimize the risks associated with confined entry:

- Avoid entry to confined spaces,

e.g. by doing the work from outside
- Blockages can be cleared in silos by use of remotely operated rotating flail devices, vibrators or air purgers
- Inspection, sampling and cleaning operations using the right equipment
- Remote cameras can be used for internal inspection of vessels

- If entry is unavoidable, follow a safe system of work
  - Appointment of supervisor
  - Are people suitably trained for this work?
  - Isolation
  - Cleaning before entry
  - Check the size of the entrance
  - Provision of ventilation
  - Testing the air
  - Provisions of special tools and lighting
  - Provision of breathing apparatus

- Put in place adequate emergency arrangements before work starts.
  - Check how alarm is raised
  - Rescue and resuscitation equipment
  - Capabilities of rescuers (knowledge of rescue and resuscitation equipment)
  - Shut down
  - First-aid procedures
  - Local Emergency services

(See appendix for procedures on entering kilns)

3.8.8 Electrocution

As cement plants are very energy intensive, there will be significant power distribution equipment in all plants. Electrical maintenance must be conducted on a professional basis not to present safety hazards. Isolation/Lock-out procedures must be rigorously adhered to. Due cognizance must be given to the possibility of back-feed due to looped systems or energisation in reverse direction: the electrical supervisor must manage these issues.

It goes without saying that non-competent or unauthorised persons should not open up or attempt to work on electrical equipment, even if intended as part of plant isolation procedures. If such persons need to access inside electrical equipment (for example to re-set overload trips), then they must be protected against injury by contact with live terminal and busbars (such as by covering these in plastic housing).

The other main electrical hazard to be considered is accidental contact by high vehicles or equipment touching overhead wires. If such overhead wires exist, then appropriate warning signs and "gates" will be required to prevent contact. It will also be beneficial to provide instruction, in case of such an incident, in jumping clear without simultaneous vehicle to ground contact. (See appendix for Electrical Risks datasheet)

3.8.9 Drowning

Drowning can occur in ponds in quarries, in settlement facilities, in water supplies or sewage works, or in slurry basins in wet process plants.

Most drownings relate to uninvited entry by third parties. Such third parties are often children or young people attracted by the possibility of swimming in warm weather, but unaware of the water hazards or depth. Hence the important focus is prevention of access by appropriate fencing and warning notices.

In all cases where personnel activity can be expected, there should be handrails to prevent falling into the water, and life-belts and other rescue equipment like ladders should be provided. If an employee has to work near or over deeper water, a safety harness or life jacket should be worn.

3.8.10 Machine Guarding

Where there is a risk of physical contact with moving parts of work equipment which could lead to injuries, those parts must be provided with guards or devices to prevent access to danger zones.

"Code of Practice for the Safeguarding of Machinery used in Coated Stone, Aggregates, Ready Mixed Concrete and Slag Plants"
British Aggregates Construction Materials Industries

The basic principles for reducing risk of injury from machinery in motion are as follows:

- Identify the hazard(s)
- Eliminate or reduce the hazard by design
- Use of safeguard
- Use of safe working practices
- The use of safeguards should always be adopted wherever possible, ahead of safe working practices.

Dangers from Machinery

Injuries at machinery may occur as a result of:

- Contact or entanglement with the machinery
- Trapping between the machine and any material or fixed structures
- Contact or entanglement with any material in motion
- Being struck by ejected parts of the machinery
- Being struck by material ejected from the machinery

Selection of Safeguards

Access not required during normal operations

Where access to the danger area is not required during normal operation of the machinery, safeguards should be considered in the following order of priority

- Fixed enclosure guard
- All fixed guards are required to be fixed in such a way that a tool is required to remove them.
- Fixed distance guard
- Interlocking device
- Trip device

Access is required during normal operation

In such situations safeguards, should be considered in the following order of priority.

- Interlocking guard
- Automatic guard
- Trip device
- Adjustable guard (e.g. top guard on circular saw)
- Self adjusting guard
- Two hand control device
- Hold-to-run control (e.g. inch button or slow crawl system)

Safe Working Procedures

Especially for maintenance purposes, it may be necessary to remove guards or disturb other safety systems for work to be carried out. In such situations, suitable safe working procedures need to be devised and implemented, the most common is a lock-off system.

Guard Design and Construction

Guard design and construction should both be sufficient to withstand expected wear and tear in a harsh environment and provide the minimum interference with activities during operation and other phases of machine life so as to reduce any incentive to defeat the safeguard. Good spillage control is important in this respect.

As a general rule, guards should be designed to follow the contours of the machinery, but where this is not possible measures should be taken to reduce the need for access within the guarded area. Where such a need cannot be reduced, then the provision of perimeter guarding can provide better working space than close proximity guards, subject to adequate safeguards being implemented as regards entry to the enclosure.

As a separate point and in relation to Machine Isolation, the use of personal tags/locks and hasp locks should be introduced – the use of such Safety devices should be introduced in conjunction with specific training programs.

3.8.11 Heat Burns

Incidents and injuries resulting in burns arise from contact with hot clinker or cement powder. Hazards are particularly associated with hot cement kiln dust (CKD), and dust on preheater systems. Chemical (alkali) burns may also result from contact with CKD. A study in the cement industry in Egypt over the period 1991-1995 showed that 155 burns injuries occurred in a population of 3200 workers (El-Megeed et al., 1999). The total number of working days lost was 4776 with a mean of 31 days per case. This study emphasizes the need to ensure effective controls are put in place.

During normal operation the hot raw, intermediate and final products are contained or highlighted. There is far greater risk when contact is possible during abnormal operation of the plant, when clearing blockages, carrying out maintenance or in emergency situations. It is not always obvious when something is hot, the risks include personal injury – severe burns and fire – from contact with combustible materials; oils, scaffold boards, ladders, electrical cabling, etc.

Raw Mill and Preheater Tower: Material in the mill is at temperatures up to 120ºC, in the tower the material can be as hot as 900ºC. Contact with the material is more likely when:

- Clearing blockages in the tower where there is the potential for it to flush through the process
- During rodding and cardoxing where it can be ejected over a wide area

Hot Clinker: Contact is possible in the:

- clinker cooler building
- along the clinker pan conveyors
- in the clinker dome
- along the belts to the cement mills

Precipitator and By-Pass Dust: Contact is possible when:

- access is required to the precipitator hoppers
- working on the screws and drag chain conveyors
- maintaining the dust transfer pumps

Hot Cement: Contact is possible when:

- accessing the cement transfer lines
- working on the packers
- carrying out work on the cement screw conveyors and drag chains

What do we need to do to reduce the risk of injury to us and our colleagues?

Control / Manage the risk through the ERIC P hierarchy:

- **E**liminate the hazard
- **R**educe the risk at source
- **I**solate people from the hazard
- **C**ontrol the risk by other means
- **P**rotect yourself with the correct PPE

3.8.12 Job Risk Assessment

For higher risk activities it is strongly recommended that a job risk assessment is implemented, as a confirmation that a supervisor has checked the area and that all necessary precautions have been undertaken. In many of these situations, particularly where a large number of machines need to be electrically isolated to ensure safe working conditions, a permit to work system should also be implemented.

The risk assessments should contain the following:

- The location of the plant or equipment
- The work to be done
- List of the hazards identified
- List of the precautions taken
- Personal Protective Equipment that should be worn
- Issuer of Permit and length of time permit is valid for

Risk assessments are required for activities such as the following:

Quarries

- Drill loading and blasting
- Drilling
- Loading and Transporting Raw Materials
- Handling Explosives
- Storage and Handling of fuels and Lubricants

Raw Materials

- Safe Practices in Crushing area
- Changing wear elements in impact crushers
- Working into stackers and reclaimers
- Working on overhead cranes

Mills

- Working in rotating scrubbers
- Working inside horizontal mills
- Working in belt conveyors
- Working in vertical bucket elevators
- Working in rollers and table of vertical mills
- Working in aero sliders
- Working in induced draft air fans and exhausters
- Working in vibrating screens
- Working in pneumatic transportation systems
- Working in hoppers
- Working in Air heaters

Calcination

- Working in Bag houses
- Use and handling of high pressure cleaning equipment
- Working in clinker cooler
- Inspection and unclogging of rotating valves
- Inspection and unclogging of helicoidal conveyor

- Working in electrostatic precipitators
- Inspection and change of water spraying nozzles
- Entering to silos
- Unblocking of cyclones
- Entering to kiln
- Inspection and cleaning of preheating tower
- Repairing refractory bricks at kilns
- Unblocking and cleaning of transfer chutes
- Working in satellite type clinker chutes
- Cleaning and unblocking of sedimentation chamber
- Deactivation and blocking of air blasters
- Providing maintenance in kilns without cooling down
- Starting the kiln
- Cleaning and inspection of burner in the kiln
- Changing fuel spray nozzle
- Working in ducts and cyclones at preheater
- Changing main burner of the kiln
- Working in inclined elevators and drag chains

Packing and Shipment

- Load bulk tanks and hoppers
- Safety rules for manual handling of bags
- Safety practices for manual handling of bags
- Safety practices for the storage of packaging bags
- Railroad operation within the plant
- Warehouse of finished products pallets
- Intervention in extraction systems of storage silos
- Intervention in bag filling machines

Service

- Inspection and work in coal and pet-coke mills
- Safety in laboratory works
- Fuel storage and delivery
- Safety regulations for works in fuel and steam lines
- General warehouse safety
- Regulations for steam boilers
- Handling, transport and storage of coal or pet-coke
- Inspection and work in electrical substations
- Residual water treatment
- Working in water cooling towers
- Entry into a confined space
- Hot work
- Welding, where there is a risk of fire or explosion
- Working under overhead electricity lines
- Removal of fixed guards from a mobile crusher
- Any other high risk site activity

Permits to Work inside main plant items such as kilns or mills will require careful pre-planning. Isolation must be vigorously carried out not only on the main plant drives but also on barring gears and exhaust fans, as well as all material transport machinery to and from that

plant item as an inadvertent start-up of any of these machines could have severe safety consequences.

It is also vitally important to consider the risks and to ensure effective isolation, from "invisible" dangers, that is pneumatic, hydraulic or gravitational energy. Injuries can easily occur if energy from these is unintentionally released.

3.8.13 Helicopter Overflight Hazard

In May 2002, a helicopter crew photographing a cement plant in Israel crash- landed due to engine failure, resulting in severe injuries. The subsequent investigations revealed several similar injuries due to helicopters flying too low above active stacks, the low oxygen concentration there apparently causing engine flame-out and failure. Extreme caution and prior consultation is therefore advised in planning any such helicopter overflights.

3.8.14 Other Good Practices

The use of "high visibility" clothing is strongly recommended particularly under poorer lighting conditions.

Good lighting around cement plants is also a pre-requisite for safety of night-time operation and maintenance activities.

Use of mobile phones should be restricted in areas where inattention could cause serious consequences.

4. HEALTH MANAGEMENT

4.1 Health Issues

The main health hazards which may have implications for health associated with the cement industry and its allied activities (aggregates and concrete) are typically as follows:

- Airborne dust
- Noise and vibration
- Dangerous atmospheres
- Radiation hazards
- Handling of alternative fuels

Specific guidelines on these occupational health issues are given in the sections that follow.

Some other health issues that may be encountered but are not specifically related to the cement industry and its associated activities are:

- Smoking and other drug dependencies.
- High blood pressure
- Diabetes
- Nutrition and obesity
- Stress and mental health
- Heat stress, cold and wet conditions
- Heart disease
- Diseases such as HIV/AIDS, Typhoid, Malaria

Sufficient general health guidelines already exist on these non-occupational issues and so are not treated any further in this document. However many CSI companies do include internal guidelines and support on these issues as part of their employee well-being programmes. Several also provide similar support for employee's families and local communities, which is very laudable.

4.2 Health Monitoring and Reporting

While there are known health consequences to over-exposure of any of the occupational health hazards outlined above, the incidence of such over exposure is generally so low as not to require statistical monitoring or reporting.

No universal industry standard yet exists on monitoring and reporting. The chemical industry uses a ratio based on the number of occupational illnesses reported per million manhours worked, but admits reporting to be inconsistent from country to country.

4.3 Guidelines on Specific Occupational Health Issues

4.3.1 Airborne Dust

Cement production carries with it an inherent capacity to produce dust, which without effective controls can lead to respiratory disease.

Studies carried out by the HSE in the UK in 1994 and the INRS in Norway (2002) could not find any evidence supporting a causal relationship between cement dust exposure and cancer

incidence in cement workers, though there were some indications of elevated chronic obstructive lung diseases.

Clearly it is good practice to limit dust levels and employee exposure both in terms of employee health and good housekeeping. Various limits exist in different countries. In particular, exposure limits for Respirable Crystalline Silica are now under review SCOEL (Scientific Committee on Occupational Exposure Limits). Appropriate respiratory protection should be worn where work has to be carried out in dusty areas in cement plants,

4.3.2 Noise and Vibration

The main sources of noise are the milling plants used to grind the cement product. Noise deflectors and improved sound insulation are now being used to reduce noise levels: again it is the maintenance and cleaning personnel who are most at risk. Improved noise personal protective equipment is also helping reduce the effects of exposure. Whole body vibration is another issue that is creeping up the safety agenda. Workers driving older heavy mobile equipment can be exposed to vibration, but the risks are small compared to that in other industries such as mining or construction, where vibrating equipment (jack-hammers for example) are commonplace. Modern mobile equipment combine lower inherent vibration with damped seating and insulated cabins, reducing the hazard to insignificant levels.

Noise and vibration limits within the EU are evidently being revised to reduce occupational exposure to Whole Body Vibration from plant and equipment.

European Parliament voted on the Physical Agents (Vibration) Directive, and the amendment proposing the exposure limit of 0.8 metre/sec/sec was adopted this will restrict the length of time workers will be able to operate machinery. The allowable decibel levels are also being reviewed; PPE will now be required for noise levels above 80 dB(A) and 112 Pa compared with the previous levels of 85 dB(A) and 200 Pa. (See appendix for table of all noise levels)

In terms of noise protection, it is essentially when sound levels exceed defined levels, for workers to wear appropriate hearing protection. Failure to do so will result in gradual hearing loss. (See appendix for sample policy on PPE for noise.) Many companies regularly monitor employee auditory functions to ensure this does not exceed natural decline with age.

Vibration protection depends mainly on the design of equipment. In general in the cement industry this concern relates only to quarry trucks.

4.3.3 Dangerous Atmospheres

In the case of the cement industry, this can arise in:

- Coal and petroleum coke mill areas, where fine airborne particles can create an explosion hazard.
- Kiln and raw mill cyclones and ducting where unventilated process gases could lead to a shortfall of oxygen during maintenance work.

Working in Coal/Petroleum Coke Processing Areas

- Quantities of coal or coke may self-ignite if conditions allow, leading to the possibility of bursting into flame – avoid spillages where possible – clean up spillages as soon as they occur.

- A mixture of coal dust or coke dust and air is potentially explosive, leading to the possibility of a violent blast – avoid creating dust clouds – remove source of ignition such as glowing coal, sparks, welding, grinding, static, electricity, smoking etc.

- Smoking is strictly forbidden at all times throughout all the coal processing areas

- Specific written instructions must be obtained before any welding, burning, grinding or other flame heat producing work commences in coal processing areas.

- Ensure that the required earthing connections have been made before operation of vacuum cleaning equipment.

4.3.4 Radiation Hazards

These can arise where low-level nuclear devices are used as hopper and silo level indicators. The following guidelines should be applied:

- No person, unless otherwise cleared on each occasion by the Radiological Protection Officer should go nearer than the perimeter of the cage which exists around each source.

- No person is to go inside a vessel on which a radioactive source is mounted. If it is necessary to enter such a vessel then one must wait until the Radiological Protection Officer has stated that source has been removed.

- Only tradesmen who have been specifically instructed are permitted to remove or refit a source. Furthermore the Radiological Protection Officer should be informed before a tradesman works on source removal or refitting.

4.3.6 Environmental Health

Cement-making raw materials do sometimes contain trace amounts of toxic elements such as mercury, thallium, iodine, cadmium and other heavy metals. Stack emissions are monitored where appropriate for these trace components; the results generally indicate so low (with reference to WHO standards) as to not present any health hazard to employees or plant neighbours.

The cement-making process can also lead to trace emissions of POP's (Persistent Organic Pollutants). A major study carried out in co-operation by the WBCSD and Cembureau confirmed that POP emissions values in over 1000 kilns in 17 countries were well under internationally accepted WHO limits, and were unaffected by the use of secondary fuels.

4.3.7 Handling of Alternative Fuels

For both economic, social and environmental reasons, there is an increasing use of alternative or secondary fuels in the cement industry, particularly in more developed economies.

These alternative fuels may in themselves be hazardous, and therefore demand specific health management. A specific example by Holcim is given in the insert.

Guidelines on the Use of Alternative Fuels

There are nine basic tenets of a suitable AFR policy:

Triple Bottom Line Aspects

I. Act as a partner to society, offering waste management solutions
II. Keep our environment safe
III. Add value to our core business

What We Do

IV. Ensure occupational health & safety
V. Refuse the listed "banned wastes"
VI. Guarantee the quality of our products

How We Do it

VII. Comply with the relevant regulations and promote best practices
VIII. Monitor and control the inputs, process, products and emissions
IX. Communicate transparently

AFR OH&S Guidelines

The ten principles that must be applied are as follows:

Design Safety

I. Assessment of site/facility suitability

Risk Assessment

II. Criteria for acceptance of wastes
III. Industrial hygiene monitoring program

Management Systems

IV. Preventive checks
V. Emergency plan
VI. Documentation of systems and procedures
VII. Audit system and review
VIII. Mandatory hazard communication
IX. Site induction
X. Specific training

Specific precautions relating to various alternative fuel types are as follows:

Plastics: Recycled plastics are normally used in shredded form and conveyed pneumatically. There can be considerable associated dust requiring eye protection and breathing masks as well as full body clothing, metal silos and ducts need electrical earthing to prevent an explosion hazard. Fire protection is also required, as well as evacuation instruction in the case of fire, as smoke vapours can be toxic.

Solvents: Recycled solvents must be rigorously sampled at intake because of variable chemical and physical composition in order to determine health precautions. Most solvents are toxic and may be flammable. Therefore health precautions are similar to those used in the source industry (e.g. chemical, pharmaceutical) Intake and storage systems must be designed for safe, automated handling, with spill, fire and explosion protection, with an associated emergency plan. Health procedures require eye protection, breathing masks and full cover clothing.

Used Oils: Used oils will need to be checked for PCB content, which will determine precise precautions required. Requirements are generally similar to those for solvents, with similar health precautions.

Photographic Wastes: Photographic liquid wastes are sometimes used to give NO_x reduction through SNCR (Selective Non-Catalytic Reduction). The main health concerns are to skin and eyes, hence the main precautions are use of eye protection and gloves.

Oil Emulsions: Generally similar requirements as for used oils.

Sewage Sludge: While sewage sludge is generally pre-treated there is a possibility of biological infection. Hence the main emphasis is on avoidance of skin contact and skin protections through use of gloves and appropriate clothing, followed by usual employee hygiene precautions afterwards. There is also an associated fire risk.

Animal Fat: Animal fat should be pre-treated to avoid any possibility of CJD infection (deriving from “Mad Cow Disease”). As for sewage sludge, the main precautions include avoidance of skin contact with usual employee hygiene precautions afterwards.

Meat and Bone Meal: Similar precautions as for animal fat, with the added recommendation to minimize any risk for infection by keeping the material dry at all times.

This listing of secondary fuels is indicative rather than exhaustive. In general rules for handling these and any other materials should be equivalent to those used in the industry from which these are sourced. In all cases, sampling of all loads at intake is essential to determining the safe handling, storage and use of these materials.

Other General Guidelines are:

All operating personnel should have a thorough knowledge of methods for competent operation of the fuel handling systems in normal operation, startup, shutdowns and emergency situations.

Persons handling fuels should be advised of hazards, proper procedures, precautions, health effects and recommendations for emergency treatment. Specific health monitoring and, where appropriate, inoculations should be considered. Safety data sheets should be located in work areas.

An emergency plan should adequately address possible emergencies that may arise during transport, storage, handling, and processing. Regular drills should be carried out to test the effectiveness of the plan.

An emergency shower and eye washing station should be clearly marked and located near the storage areas of liquid and alternative fuels.

4.3.8 Other possible health risks

Other health risks which can occasionally arise in cement plants are:

Health risks due to vermin and others pests can arise particularly in warmer countries due to unhygienic conditions. These can also arise due to storage of secondary fuels such as tyres, where crevices can contain pools of water and provide breeding grounds.

Minor quantities of toxic chemicals may also be used in the manufacturing process. These include laboratory chemicals and other cleaning fluids and solvents. Transformers and capacitors may also contain PCB (Poly-Chloro-Biphenyl) liquids. In all cases, management must ensure that adequate training in use of these substances and MSDS (Materials Safety Data Sheets) are provided.

In cases where open-loop water cooling tower systems exist (such as in air-conditioning systems), there is a possibility for the occurrence of Legionnaire's Disease. Regular disinfection of the cooling system will prevent this.

In older plants it will be appropriate to check out the possibility for existence of friable asbestos or asbestos-containing materials, and if found to exist, to carry out a risk assessment and appropriate encapsulation, area isolation or remedial measures. Such materials will most frequently be found in ductwork insulation or flexible seals.

4.4 Product related health risks

Due to its properties, e.g. the high pH value, the handling of cement has to be done carefully. In a variety of countries national or international directives regulate the marketing and use of cement and cement preparations. In most cases the use of Material Safety Data Sheets (MSDS) is compulsory or recommended.

MSDS enable users of cement to take the necessary measures relating to protection of health and safety in the workplace. To facilitate the creation of MSDS CEMBUREAU, the European Cement Association, published a guide for the compilation.

Based on the information of the MSDS persons placing substances and preparations on the market should ensure that persons, coming in contact with cement, have received appropriate training and use the protective equipment correctly.

Due to the properties of cement, the forceful use of appropriate Personnel Protection Equipment, mentioned in the MSDS, is recommended. Special attention has to be paid to

skin protection
eye protection
protection of the respiratory system.

Joint approach concerning Health & Safety when working with wet cement preparations

Cembureau, BIBM, ERMCO, FIEC, December 2002

- The producers should clearly indicate the potential risk and the means of protection against cement dermatitis by appropriate labeling and Material Safety Data Sheets.
- The contractors (employers) should provide adequate information and related operational instructions to workers about potential risks when dealing with cement preparations.
- The contractors (employers) should provide adequate protective equipment (e.g. special Chromium VI-free gloves, boots etc.)
- The workers should effectively follow the instructions received and use the protective equipment correctly

5. CONTACT DETAILS

The following persons, who have served as members of the TF3, which drafted this document may be contacted for further information and advice:

CEMEX	Miguel A	González	miguelangel.gonzalez@cemex.com	+52 81 8305 18 82
CEMEX	Ricardo	Ochoa	Ricardo.ochoat@ext.cemex.com	+52 81 8305 1500
Cimpor	Manuela	Machado	mmachado@cimpor.pt	+351 21 940 8778
CRH	Jim	O'Brien	jim.obrien@crh.com	+353 1 404 1133
CRH	John	Masterson	jmasterson@crh.com	+353 1 404 1108
HeidelbergCement	Berni	Gumauskas	berni.gumauskas@cementa.se	+46 498 281000
HeidelbergCement	Klaus	Hormann	klaus.hormann@htc-gmbh.com	+49 6221 481 298
Holcim	Ted	Anderson	ted.anderson@holcim.com	+41 79 610 6953
Holcim	Albert	Tien	albert.tien@holcim.com	+41 58 858 5456
Italcementi	Stéphane	Doumenc	s.doumenc@itcgr.net	+33 1 34 77 79 09
Italcementi	Jean	Ducasse	j.ducasse@itcgr.net	+33 1 30 98 73 68
Lafarge	Alain	Guillen	alain.guillen@lafarge.com	+33 1 44 34 1946
Lafarge	Marcel	Duboué	marcel.duboue@lafarge.com	+33 1 44 34 12 43
RMC	Richard	Claydon	Richard.Claydon@rmc.co.uk	+44 1527 575777
RMC	Andrew	Taylor	andrew.taylor@rmc.co.uk	+44 1527 575 777
Siam Cement	Vichai	Rarat	vichair@cementhai.co.th	+66 2 586 3093
Taiheiyo	Yoshito	Izumi	Yoshito_Izumi@taiheiyo-cement.co.jp	+81 3 6226 9109
Taiheiyo	Minori	Takada	Minori_Takada@taiheiyo-cement.co.jp	+81 3 6226 9109
Uniland	Jordi	Flores	jflores@uniland.es	+34 93 898 3900
WBCSD	Howard	Klee	klee@wbcsd.org	+41 22 839 3124
WBCSD	Estelle	Geisinger	geisinger@wbcsd.org	+41 22 839 3195

Some of the TF3 members at a recent meeting in Geneva where this document was finalised.

6. REFERENCE LIST OF OTHER GOOD PRACTICES

The following documents will provide further details on health and safety good practice.

Guidelines/Tools

Safety in the Cement Industry: Guidelines for measuring and reporting
http://www.wbcsd.org/plugins/DocSearch/details.asp?type=DocDet&ObjectId=Njc5Nw
Ensuring healthy and safe working conditions for employees and contractors is one of the most important issues for the cement industry. The purpose of this document is to ensure the accurate register of all occupational injuries of CSI member companies in order to have the same basis on which to produce a consolidated report of safety indicators.

Reference Material
WBCSD Resources

- Environment, Health & Safety Performance Improvement
- http://www.wbcsd.org/web/projects/cement/tf3/sub_ehs.pdf
- Executive summary, *WBCSD CSI Substudy 10 (December 2002)*
-
- Environment, Health & Safety Performance Improvement
- http://www.wbcsd.org/web/projects/cement/tf3/final_report10.pdf
- Full document, *WBCSD CSI Substudy 10 (December 2002)*

- Mobility 2030: Meeting the Challenges to Sustainability
- http://www.wbcsd.org/web/projects/cement/tf3/mobility-full.pdf
- Information on road safety, *WBCSD (July 2004)*

Independent Resources

Occupational Safety & Health (Guidelines, Codes of Practices, etc.)

-
- Guidelines on Occupational Safety and Health Management Systems
- http://www.wbcsd.org/web/projects/cement/tf3/guidelin.pdf
- Full document, *ILO-OSH (2001)*
-
- Guidelines on Occupational Safety and Health Management Systems
- http://www.wbcsd.org/web/projects/cement/tf3/ILO-GUIDELINES-ON-OSHMS-2001.pdf
- Background & general summary, *ILO-OSH (2001)*
-
- Safety and Health in Construction – An ILO code of practice
- http://www.wbcsd.org/web/projects/cement/tf3/construc.pdf
- *ILO (1992)*
-
- Safety in the use of chemicals at work – An ILO code of practice
- http://www.wbcsd.org/web/projects/cement/tf3/chemical.pdf
- *ILO (1993)*
-
- GRI Health and Safety Protocol (Draft)
- http://www.wbcsd.org/web/projects/cement/tf3/GRI-H-S_DraftPC.pdf
- For use with the GRI 2002 Sustainability Reporting Guidelines, *GRI (May 2004)*
-

- Protocol of 2002 to the Occupational Safety and Health Convention, 1981
- http://www.wbcsd.org/web/projects/cement/tf3/ILO-S-H-PROTOCOL-2002.pdf
- *International Labour Conference (20 June 2002)*
-
- Training Guide – Cement & Concrete
- http://www.wbcsd.org/web/projects/cement/tf3/d000254.pdf
- A checklist/evaluation form for use by supervisors/ foremen, *CDC eLCOSH (1994)*
-
- Cement Hazards and Controls: Health Risks and Precautions in using Portland Cement (Taken from Construction Safety Magazine, Volume 12, Number 2, Summer 2001)
- http://www.cdc.gov/elcosh/docs/d0500/d000513/d000513.html
- (HTML) *CDC eLCOSH*
-
- Fundamentals of Industrial Hygiene (5th Edition)
- http://www.wbcsd.org/web/projects/cement/tf3/fihAppendices.pdf
- *National Safety Council (2002)*

- Recommendation Concerning the List of Occupational Diseases and the Recording and Notification of Occupational Accidents and Diseases (ILO Recommendation 194)
- http://www.wbcsd.org/web/projects/cement/tf3/ILO-RECOMMENDATION-194.pdf
- International Labour Conference (20 June 2002)

Road Safety

-
- The Coming Plague of Road Traffic Injuries: A Preventable Burden for Rich and Poor Countries
- http://www.wbcsd.org/web/projects/cement/tf3/safety.pdf
- Background article, *Global Road Safety (2004)*
-
- World Report on Road Traffic Injury Prevention
- http://www.wbcsd.org/web/projects/cement/tf3/summary_en_rev.pdf
- *WHO (2004)*

- Global Road Safety Partnership: Annual Report 2004
- http://www.wbcsd.org/web/projects/cement/tf3/AR04FINAL.pdf
- *Global Road Safety Partnership (June 2004)*

Skin Allergies

-
- Epidemiological assessment of the occurrence of allergic dermatitis in workers in the construction industry related to the content of Cr(VI) in cement
- http://www.wbcsd.org/web/projects/cement/tf3/NIOH-study_chromium_allergic_dermatitis.pdf
- *National Institute of Occupational Health (May 2003)*
-
- Contact Dermatitis and Allergy - Occupational skin disease in the construction industry
- http://www.wbcsd.org/web/projects/cement/tf3/Bock-et-al_Article-Contact-dermatitis.pdf
- *By M. Bock et al., British Journal of Dermatology (April 2003)*

Respiratory Issues

-
- Final Rule on Air Contaminants Project (extract) – A Toxicologic Review of Selected Chemicals (relating to Portland Cement)
- http://www.wbcsd.org/web/projects/cement/tf3/osha-comments.htm
- Comments, *OSHA (19 January 1989)*
-
- NIOSH and Respiratory Protection
- http://www.wbcsd.org/web/projects/cement/tf3/NIOSH-RESPIRATORY-PROTECTION.pdf
- A report covering the selection, use and maintenance of respiratory protective devices available in 1987 (to protect workers against airborne contaminants), *National Institute of Occupational Health (1987)*
-
- Respiratory Symptoms and Ventilatory Function in Workers Exposed to Portland Cement Dust
- http://www.wbcsd.org/web/projects/cement/tf3/Fell-et-al_Article-Respiratory_Symptoms_Cement_Dust.pdf
- *By Anne Kristin Moller Fell et al., Journal of Occupational and Environmental Medicine (Volume 45, Number 9, September 2003)*

Initiatives

-
- SafeWork Global Programme on Safety, Health and the Environment
- http://www.wbcsd.org/web/projects/cement/tf3/ILO-SAFEWORK-GLOBAL-PROGRAM.pdf
- *ILO InFocus Programme on Safety and Health at Work and the Environment (2003)*

Statistics

-
- Table: Fatal occupational injuries by industry (All United States, 1997 to 2002)
- http://www.wbcsd.org/web/projects/cement/tf3/cftb0170.pdf
- *Bureau of Labor Statistics (US)*
-
- Table: Incidence rates of nonfatal occupational injuries and illnesses by industry and case types (2002)
- http://www.wbcsd.org/web/projects/cement/tf3/ostb1244.pdf
- *Bureau of Labor Statistics (US)*

Industry-related Resources

-
- Professor Jean-Paul Escande's Interview "Cement and Health" (English translation)
- http://www.wbcsd.org/web/projects/cement/tf3/Interview_with_Prof-Escande.pdf
- *Conducted by Syndicat Francais De L'Industrie Cimentiere (SFIC) (March 2003)*
-
- Chromium VI in Cement - The Saga of a Piece of EU Legislation
- http://www.wbcsd.org/web/projects/cement/tf3/CEMBUREAU-Article_GCL_Mag.pdf
- *By Jean-Marie Chandelle, Chief Executive Of Cembureau, Global Cement and Lime: Environment (July-August 2003)*

- Joint approach concerning Health & Safety when working with wet cement preparations
- http://www.wbcsd.org/web/projects/cement/tf3/CEMBUREAU-Article_GCL_Mag.pdf
- *By CEMBUREAU/BIBM/ERMCO/FIEC (2003)*
-
- Die Bedeutung des Chromates in Zementen und zementhaltigen Zubereitungen
- http://www.wbcsd.org/web/projects/cement/tf3/VDZ-Sachstandsbericht-Chromat.pdf
- VDZ Sachstandsbericht (5 January 1999)

Interesting Links

-
- Electronic Library of Construction Occupational Safety and Health
- http://www.cdc.gov/elcosh/docs/hazard/chemical_cement.html
- Various CDC links regarding health hazards relating to concrete manufacture

GLOSSARY OF DEFINITIONS:

Directly Employed = Own payroll employees, including full-time, part-time and temporary employees, the latter two estimated as full-time equivalents. These include employees in all companies where there is management control and companies where there are management/technical agreements.

Indirectly Employed = Contractors and Sub-Contractors, also estimated as full-time equivalents. This includes all individuals, firms or corporations contracting for performance of work, either on a short-term (for a specific job) or long-term basis (such as drivers or maintenance crews).

Third Party = any person not categorized as Directly or Indirectly Employed. Third Parties typically include customers and visitors to company locations (whether specifically invited or not). Also included are drivers or passengers involved in off-site motor injuries with company vehicles, but only if there is company or employee (direct or indirect) culpability.

Fatality = A death resulting from a work-related incident, with no time limit between the date of the incident and the date of death. Fatalities are reported for Directly Employed, Indirectly Employed and Third Parties. Excluded in all cases are all fatalities in transport to and from work, fatalities due to criminal acts, and fatalities due to natural causes.

Fatality Rate = # Fatalities in a year per 10,000 people directly employed

Lost Time Injury (LTI) = A work-related injury causing the absence of 1 or more working days (or shifts), counting from the day after the injury, before the person returns to normal or restricted work. LTI's include any injury such as a contusion, cut, fracture, sprain, amputation, or other harm resulting from a work-related event or a single instantaneous exposure in the work environment as well as acute illnesses or syndromes and immediate reactions which may be caused by a harmful exposure due to inhalation, absorption, ingestion or direct contact.

LTI’s are reported for Directly Employed and Indirectly Employed; LTI’s to Third Parties are not reported as there is no basis for counting lost working days. Excluded for both Directly and Indirectly Employed are injuries in transport to and from work, injuries due to criminal acts, injuries due to natural causes and occupational diseases.

LTI Frequency Rate = # LTI in a year per million hours worked.

Worked Hours = All actual hours worked and paid.

Appendices

More Examples of Good Practice from CSI Companies

List of Appendices

CEMEX

JUST A DAY WITHOUT ACCIDENTS...TODAY

DRIVE SAFELY

Always drive defensive !!

Most of us drivers of any vehicle think knowing basic driving techniques such as changing gears, breaking and getting around is enough to be considered a good driver.

This is wrong, since to be a safe driver you need not only to know techniques, but also be responsible and keep a professional attitude relative to everything going on while we drive; whether it's with ourselves, with the road conditions other drivers, pedestrians and weather conditions.

THE GOOD DRIVER:

Some activities that allow driving properly are:

Attention:
Attention to always be alert to what happens or could happen; not only what you do, but also what other drivers or people can do.
Accountability:
Be accountable of the possible consequences of each action or event. It means taking the right and timely decisions, according to the situation at hand.

Keep calm:
Keep cool and calm, even under external provocations. Don't get carried away.
Caution:
Love for life, ours and others', leads to careful driving, courting right of way to pedestrians, emergency vehicles, etc.

Obey road signs:
Know and always obey road signs, even if no vehicles are nearby. This prevents possible accidents.
Properly operate and maintain your vehicle:
Any mechanical failure costs us time and money. Accidents caused by mechanical failures can lead to fatal consequences.

DEFENSIVE DRIVING:

The main activity in driving is defensive driving. Many accidents can be avoided, anticipating and covering the mistakes of others.

Defensive driving means anticipating and thinking ahead of others. The rules for defensive driving are:

Always be alert to avoid unpleasant surprises.
Keep an eye not only on the road, but also to the sides. Use the mirrors.
When visibility is limited, reduce speed.

Keep a safe distance from vehicles in front of you.
Use the 3-4 second rule: 3 seconds level distance under normal conditions, and 4 seconds in case of adverse driving conditions.
When driving, keep full control of the vehicle.
Anticipate your moves to other drivers when stopping and maneuvering. Announce them ahead of time.
Although you have the right of way, keep an eye on other vehicles. Never assume they'll grant you the right of way.

Never irritate other drivers, whether provoking them or in vengeance.
Anticipate pedestrian's reaction, especially in schools and hospitals.

THE ROAD:

An important aspect for the driver is knowing the road where she'll be driving. She better the knowledge of the road, the safer the driving. Some things that help us classify roads are:

1. Travel surface: can be asphalt, dirt or concrete on it are the lanes where traffic runs.
2. Shoulder: it's to the side of the road, providing a place to park the vehicle.
3. Divider: it divides streets, avenues or highways down the middle, defining the direction of travel.
4. Trough: it helps water to drain off the road, avoiding floods on the travel surface.
5. Intersections: they're the crossing of two or more roads. There are two kinds of intersections: level intersection. When the crossing is at the same level. Bridge intersection: When a bridge is used for two or more roads that cross.

An important aspect for the proper driving of a vehicle is the daily revision. This allows for anticipating possible damages or failures in the vehicle, reducing the risk of accident due to this.

The following is a general vehicle revision procedure:

STEP 1: Cabin, left side: Check vehicle's license data, identification, tire scores, oil, gauges, seat control, brake pressure, cpt or fluid levels, windshield wiper status, condition of doors and cabin, headlamps and license etc.

STEP 2: Cabin, front: Check fluids' level, steering and fluid leaks, physical condition, battery, alarm (driver's side, corrosion, leaks, and other similar parts such as transmission, engine, etc.

STEP 3: Right side of truck body: Check general conditions, doors and lights.

STEP 4: Rear: door, Check reflexes, tires, fluid leaks, suspension, brake hoses, eclipse axe brake and axes, etc.

STEP 5: Rear of truck: Check rear lumbar reverse and stop lights, identifying parts and general physical state.

STEP 6: Left side of truck body: lumbar to right side, also check identifying to indicate whether carrying hazardous materials and that all documents come accordingly.

ROAD SIGNS

Another characteristic of a good driver is the obedience to road signs. These are for helping friendly streets, ways of our dangers, or letters of prohibition or limitation. Therefore, every driver should obey and obey them.

Road signs are divided in 3 groups:

Preventive:
They report any danger or variation of the road. It has black characters on yellow background.
Restrictive:
These indicate limitation or prohibition. They have white background with red and black characters.
Informative:
They serve as guide to locate streets or highways, city names, or services.
They have white or green background when indicating a destination, and blue background to indicate services.

EMERGENCY TELEPHONE NUMBERS:

In case of emergency call to:

CEMEX

JUST A DAY WITHOUT ACCIDENTS...TODAY

FIRE PREVENTION AND PROTECTION

Fires could initiate in almost everywhere, we are all responsible to prevent them

Fires happen suddenly and quickly and, their consequences are frequently catastrophic. Everyday we shall be aware of any potential fire condition and we shall quickly act to prevent it.

In case of fire, the speed of action to extinguish it is extremely important so, we all must know how to act in such a case.

FIRE PREVENTION:

- Keep workplace free of grease and liquid fuels.
- Know and follow all hot-work permits available.
- Ensure that all flammable liquids and combustible materials are stored according to company policies.
- Ensure proper disposal of waste.
- Know all fire risks that would arise at your workplace.
- Report all electrical installations in bad condition.
- Clean and report any leakage or spill immediately.
- Never obstruct an exit or an extinguisher
- If you smoke, do it only in designated areas.

THE FIRE TRIANGLE

USE OF EXTINGUISHERS:

When you use using an extinguisher, follow this simple four steps procedure (P.A.S.S.):

Pull the pin. This unlocks the lever and releases the extinguisher.

Squeeze the lever to release the extinguishing agent. Some extinguishers have a button to push instead of a lever.

Aim the nozzle (or hose) at the base of the fire. Be sure to stand back at least 3 feet.

Sweep the extinguisher from side to side, aiming the nozzle at the base of the fire until the flame appears to be out.

FIRE CLASSES:

Class A: Ordinary combustibles, such as wood, cloth, paper, rubber and many plastics

Class B: Flammable liquids such as gasoline, oil, grease, tar, oil-based paint, lacquer, and flammable gas.

Class C: Energized electrical equipment including wiring, fuse boxes, circuit breakers, machinery and appliances

Class D: Combustible metals such as magnesium, titanium, zirconium, sodium, lithium and potassium.

EMERGENCY TELEPHONE NUMBERS:

In case of Emergency call for:


CEMEX
HEARING PROTECTION
Noise is annoying and unpleasant. It interferes with our activities and injures us both physically and psychologically.
Noise can cause a temporary and partial loss of our hearing capacity, make us angry, lose concentration in our tasks, increase our stress level and add to other ailments as high blood pressure, ulcers, headaches and sleeping disorders.
¿HOW DOES THE EAR WORK?
Through our ear, sound waves are detected in the 20-20,000 Hz range and become electric impulses that are transmitted to the brain to be deciphered.
The hearing system is divided in three parts: outside, inside and middle ear.
¿HOW IS NOISE MEASURED?
Sound measuring device, formed by a sensitive voltmeter, a microphone, an amplifier calibrated to different frequencies and an indicator. The voltmeter measures the electric signals emitted from the microphone, that are shown on the indicator after being amplified.
NOISE CONTROL:
TYPES OF PROTECTION:
Designed to cover the entire ear providing a proper seal. Available to wear over the head, on the neck or connected to the hard hat.
MAXIMUM ALLOWABLE EXPOSURE
Maximum Allowable Exposure Time per Work Shift.
Time (hours)
NSCE dB(A)
8 90
4 93
2 96
1 99
0.5 102
0.25 105
3 ELEMENTS OF A HEARING PROTECTION PROGRAM
NOTE!
Protectors (plugs or shells) can attenuate 20-30 dB(A) according to the model and levels of noise... however when maximum protection is required, use both at the same time.
EMERGENCY TELEPHONE NUMBERS:

CEMEX

JUST A DAY WITHOUT ACCIDENTS...TODAY

TAGS AND LOCKS FOR YOUR SAFETY

Use for any repair job.

A safety lock means turning off or closing any power source from the source itself and place a physical block that secures the breaker, valve or switch so that it can only be activated by the same person who placed the lock.

A safety tag is when we place a tag on the power source acting as a reminder to not restore that power source.

PROCEDURE:

9 steps for a safe Lock Out/Tag Out procedure:

1. Follow the normal machinery and equipment power-off procedures.

2. Disconnect the energy source(s) from their main switch.

3. Check to make sure no power sources are present in machinery and equipment.

4. Try to power the machinery to verify no power is present.

5. Place the lock and tag on each switch and valve that provides a service.

6. Before re-energizing the machine, perform visual inspection and tests on the equipment and make a head-count of all involved personnel to make sure everyone is outside the risk area.

7. Inform personnel that locks and tags shall be removed, or wait until your supervisor informs everyone.

8. Every lock and tag must be removed by the worker who placed them.
Once the last lock is removed, follow the set procedure for starting equipment.

PREVENTION:

When doing work on a machine, make sure to block all of its power sources. These can be:

- Electric
- Pneumatic
- Hydraulic
- Mechanical
- Thermal
- Pressurized water

The lock out/tag out system is applicable to:

- Block the flow of energy from the power source to the machinery.
- Prevent an unexpected equipment start.

NOTE!

If more than one person is involved in the blocked machine, each must place his/her own lock and tag.

PREVENTION:

Key factors for reducing these accidents:

1. Request training on specific lock out/tag out procedures for machinery and equipment of your work area.

2. Promote this procedure among your peers and report those who do not perform it. It's much better to be warned on time, than having a serious condition later on.

EMERGENCY TELEPHONE NUMBERS:

In case of Emergency call to:


CEMEX
JUST A DAY WITHOUT ACCIDENTS...TODAY
CARE FOR YOUR BACK
Don't use your back to lift objects!!
Back injuries remain the #1 occupational health issue. Many back injuries are extremely painful and can result in extended periods of discomfort, pain and permanent disability. Workers suffering back injuries can have serious consequences such as lost time, long bouts of pain and suffering.
The key points to remember for reducing back injuries are described next:
PREVENTION:
Before starting to move any loads, check the situation, avoiding as much as posible any manual lifting.
If the loads to be carried have sharp corners, use safety gloves.
It is advisable to use lumbar support belt when handling heavy loads.
Check the area where you'll do load handling to make sure of the place's physical state to prevent falling or tripping.
Stay close to the load with your legs apart shoulder width, and for balance put one foot slightly forward of the other.
Squat and bend your knees (never your waist). Put your chin against your chest while keeping your back as straight as possible.
Before lifting, make sure you have a firm grip on the object.
Maximum accepted weights and load – unload frequencies for adult men and women
From floor to waist
From waist to shoulder
From waist to floor
From shoulder to waist
Start lifting with your legs, straightening them slowly. Never twist your body during this step.
After lifting the object, keep as close to your body as possible. When the center of gravity is far from the body, severe stress is exerted on the lumbar region.
Never twist your body while carrying the object. Use your legs as an axis to do so.
For unloading objects, follow the same steps in reverse, always keeping your back straight, tucking in your stomach and bending only your knees.
NOTE!
To reduce the risk of over-efforts and back injuries, the problem has to be tackled from different standpoints. Rarely do we discuss the work design, tool selection and training to reduce risks.
Obviously, the best solution is limiting the need to manually lift objects. This is possible if we have the proper tools and equipment to help, such as cranes, winches, load tables, etc.
EMERGENCY TELEPHONE NUMBERS: In case of Emergency call to:

CEMEX

JUST A DAY WITHOUT ACCIDENTS...TODAY

ELECTRICAL RISKS

Electricity is a potential killer!!!

The human body is made up mostly of water, minerals and some chemical substances, making it an excellent conductor of electricity. Since the flow of electric current depends on the simultaneous contact between two amounts of voltage, any body part that accidentally makes an arc can create a new electric circuit offering a lower resistance. When this happens, we have an electric shock.

You must learn to recognize unsafe conditions related to electric circuits and equipment. Some precautions to consider for observing safe work practices are:

PREVENTION:

1. Don't work near an energy source whenever your clothes, tools and the work area are wet. Your hands must be as dry as possible when working on electric circuits.
   When working outdoors on electric equipment, always wear rubber gloves.
2. Make sure there aren't dust particles and flammable fumes nearby electric circuits.
   Ventilate the work area to reduce the concentration of atmospheric hazards below the danger level around electric circuits.
3. Always check electric power tools before starting any job.
   Un-energize any equipment using lockout, tag-out procedures, and check that the equipment is properly un-energized.
4. Remember that electric work represents a high risk, therefore your personal protection equipment must be special: shoes, gloves, hard hat, and clothing must be dielectric.
5. The insulated handles on electric power tools are effective only when free from cracks, wear and tear. Never try to improvise a tool's insulation.
6. When working on electric equipment, only limit approved insulation materials. Never assume that a tool's insulation is good for all jobs, especially when doing work on energized circuits.
   Remember there are special equipment such as hot sticks, line changers, etc. Immediately request them if you don't have them.
7. Check with electric measuring devices the double insulation sealing and the third energy cable, and also make sure the ground cable works properly.
   Always use three power lines so the ground fault breaker is operational.
8. Check that covers and guards are in place and safe in all breakers, and that energy lines are not worn, torn or cut.
   Make sure all energy lines are within the range of the power tools being used.
9. Make sure the plug and wall socket are in good shape before using them.
   Don't move tools while they're energized, it can damage the insulation or break the connection.
10. Never remove the ground connector of a three way plug to make it fit in a wall socket.
    Don't use more than one plug per each double wall socket.
11. Un-energize electric circuits before connecting test equipment. Energize only when taking readings and then un-energize again when disconnecting test equipment.
    Select the proper test equipment for the job and use the recommended test procedure.
    Never exceed test equipment limitations and make sure the equipment is in safe condition.
12. Always use non-conducting materials: use wooden or fiber glass ladders to work on electric equipment. Never use aluminum ladders since they conduct electricity.

NOTE!

Do not perform any electric work for which you haven't been assigned and/or trained to perform.

EMERGENCY TELEPHONE NUMBERS:
In case of Emergency call to:

CEMEX

JUST A DAY WITHOUT ACCIDENTS...TO DAY

BREATHING PROTECTION

Airborne pollutants are not often seen, but they're there to harm you.

Breathing protection equipment is mandatory whenever there is a risk of pollutants such as dust, smoke, fog, fumes or gases, or when the air has an oxygen concentration below 19.5%.

10 ELEMENTS OF A BREATHING PROTECTION PROGRAM:

1. Understand the risks of your work area where breathing protection is required. Use the proper respirator for the risk, and only from certified brands. Make sure the respirator has a snug fit. A poor seal provides inefficient breathing protection.

2. Follow the manufacturer's recommendations, as well as know the respirator's limitations. Clean regular basis, clean and disinfect your respirator. Store the respirator according to manufacturer's instructions, and keep in a clean place.

3. Check the respirator before each use. Request periodic monitoring of pollutants in your work area to minimize their presence.

4. Report any fugitive emissions or poorly ventilated areas so they can be corrected at once.

5. Take your regular medical exam, with lung capacity (spirometry) tests and other required analysis.

HOW DO THE LUNGS WORK?

When you breathe, the air inhaled comes through the nose and mouth, and reaches the lungs through the trachea. Once there, air divides into a large amount of small tubes, called bronchus and terminal bronchiole that end in the alveoli. These alveoli are little sacks with the important function of exchanging oxygen for carbon dioxide, the blood's waste. This carbon dioxide travels in the opposite direction until exhaled by mouth or nose.

We see the importance of keeping clean and healthy alveoli because of the fatal consequences of breathing a harmful gas or accumulation of foreign matter leading to a poor oxygenation of the blood.

This effect is slow and unnoticeable, but with irreversible consequences.

WHAT DETERMINES THE DANGER OF A POLLUTANT ?

1. Exposure Time
2. Concentration of the Airborne Pollutant
3. Pollutant's Intrinsic Toxicity
4. Breathing Frequency and Volume of Air Breathed
5. Individual Sensitivity

TYPES OF PROTECTION:
There are two main types of breathing protection equipment.

- Air Purifier Respirators: They remove pollutants through a mechanical or absorption filter.
- Self Contained Respirators with Air Supply: Provide clean air from a non contaminated source.

NOTE!

Breathing protection equipment is not an annoyance nor a luxury. If you use it, you'll be thankful for it.

EMERGENCY TELEPHONE NUMBERS:

In case of emergency call to:


CEMEX
JUST A DAY WITHOUT ACCIDENTS...TODAY
SLIPS, TRIPS AND FALLS
We're more prone to have an accident due to slipping or tripping than by any other risk related to our specific job.
Walking is so natural that we seldom pay attention to it. However, if we don't have the proper attention sooner or later we may slip or trip causing a fall that can be severe.
The prevention of these accidents has much to do with common sense and staying alert and aware of safety at all times.
TO REDUCE
THE RISK OF TRIPPING...
Keep your work area well lighted.
Keep the areas you walk on clean and tidy.
Avoid placing electric extension cords over the floor, or at least fasten them to prevent them from moving.
Report any floors, handrails and stairs in poor condition.
Avoid running on the stairs and always use the handrail.
Avoid carrying any objects that hinder your vision.
TO AVOID
SLIPPING...
Walk slowly, taking short steps. This controls your center of balance.
Use slip resistant shoes.
Clean any spills you find or report them to the proper personnel.
Slipping occurs when there is poor friction between your foot and the surface you're walking on. Stay aware of the following conditions that might cause you to loose your balance:
Wet floors or liquid spills.
Highly polished floors.
Ice, snow, rain, gravel or mud on the floor.
Tripping occurs when your foot strikes an object while moving at enough speed to loose your
EMERGENCY TELEPHONE NUMBERS:
In case of Emergency call to:
NOTE!
Avoid jumping. Even in short heights, the surface can be loose and if you fall, you might suffer a dislocation or strike with your foot any object on the surface.
PREVENTION:
Key factors to reduce these accidents:
1 Keep a clean and tidy work area.
2 Safety shoes with slip resistant sole.
3 Avoid walking on any surface that are wet, oily or need repair.
4 Do not jobs that you are not sure you can do safety.

CEMEX

JUST A DAY WITHOUT ACCIDENTS...TODAY

PERSONAL PROTECTION EQUIPMENT (PPE)

Always use it, work safe.

Often times, workers are the need of working under unsafe conditions, and each day they're exposed to severe injuries that unfortunately could lead to a fatality. Employers and workers must strive to minimize any risks. The use of personal protection equipment is an additional measure workers can use to minimize the risk of an injury and reduce work hazards.

PPE

The six main personal protection equipment are:

Head Protection

Proper head protection aids against the following risk types:

- Falling objects
- Head objects your head can hit
- Electric exposure

Foot Protection

Proper foot protection guards you against the following dangers:

- Compression
- Electricity
- Slipping
- Piercing
- Chemical substances
- Moisture and
- Extreme heat or cold
- Injuries

Eyes and facial protection

Some primary risks to your eyes and face include: injuries due to gases, vapors and fluids, dust, powder, fumes and fogs; airborne objects or particles; and laser radiation.

Personal protection equipment that help protect eyes and face are:

- Safety glasses
- Safety goggles
- Facial protection mask
- Welding face shield

Full body protection

consists of vests, jackets, apron and full body suits. Full body equipment protects against:

- Chemical substances
- Dust
- Extreme temperature radiation
- Injuries due to impact

Hands protection

Proper hand protection guards against the following risks:

- Mechanical risks
- Electrical risks
- Environmental risks
- Harsh substances

Hearing protection

Noise exposure can cause:

- High blood pressure
- Stress and irritability
- Loss of hearing
- Fatigue.

The two broad categories of hearing protection include:

- Ear plugs
- Ear covers

Personal protection equipment

is designed to protect workers from health and safety hazards that cannot be practically eliminated from the work environment. Generally, personal protection equipment is designed to protect several body parts, including head, face, eyes, ears, hands, arms and feet.

EMERGENCY TELEPHONE NUMBERS:

In case of Emergency call to:

NOTE!

Remember:
PPE does not eliminate hazard; Just reduces consequences. Be prepared. Calculate risks before starting any task. Care yourself.

Before purchasing an effective PPE system,

it's recommendable to perform a "Risk Analysis" to determine any present or potential hazards and thus make an accurate choice of the PPE. A risk analysis should include the following aspects:

- Sources of movement
- Heat sources
- Chemical exposure
- Dust and hazardous particles
- Sources of light radiation
- Falling objects
- Rotating equipment
- Sharp objects
- Electric hazards
- Other worker's behavior

CEMEX

JUST A DAY WITHOUT ACCIDENTS...TODAY

EMERGENCY PREPAREDNESS

Do you know what to do in an emergency?

There's not one place in the world free from emergencies. These can be of any type and at any time, but their consequences are the same: personal harm and injuries, environmental or property damages.

Anticipating and preparing for potential emergencies is the best way to minimize possible losses, and this is achieved by having an action plan known by everyone.

PROCEDURE:

BEFORE AN EMERGENCY

1. Know the location of the exits
   Make sure you know the safest evacuation route and head count zones. Ask for maps and signage to be installed.
2. Know the location of extinguishers and learn to use them.
3. Know the procedure to report an emergency.

DURING THE EMERGENCY

1. Keep calm
   Avoid panic and confusion... this is very important.
2. If you have a role in the plan
   Proceede to execute as set forth.
3. If you donot have an active rol
   Advance to your head count zone, calmly walking there, or follow these instructions.
4. In case of an earthquake
   Stay as close as possible to a structure or move under a solid piece of furniture such as a table or desk.. when leaving a building, always use the stairs.
5. Check for victims
   In case of finding them, ask someone to find help. Never leave a victim alone, and, if within a danger zone, take to a safe place.
   Apply first aid if necessary.

AFTER AN EMERGENCY

1. Stay in your head count zone
   Only after receiving instructions can you return to your work area or move out of the zone.

TYPES OF EMERGENCIES:

- Fire
- Explosions
- Flooding
- Hurricanes and tornadoes
- Earthquakes
- Sabotage
- Material spills and leaks

EMERGENCY TELEPHONE NUMBERS:

NOTE!

It is indispensable that you know this site's emergency plan, as well as what to do in case of an emergency.

EMERGENCY PLAN:

This is a description of what everybody does in case of an emergency, and should contain:

1. Probable types of emergency at the site.
2. Procedures to declare an emergency (alarm system).
3. Evacuation routes and head-counting zones.
4. The defined roles of each employee during the emergency.
5. Critical operations procedures.
6. Medical and rescue assignments.

CEMEX

JUST A DAY WITHOUT ACCIDENTS...TODAY

OVERHEAD WORKS

Always use fall protection systems; they can save your life.

Any works performed above 7 feet are considered overhead works.

PREVENTIVE MEASURES FOR THE PROPER USE OF THE PERSONAL PROTECTION SYSTEM:

1. Make sure the system is capable of supporting up to 5000 lbs.
2. Check your equipment before using and use only approved materials.
3. Follow the manufacturer's recommendations.
4. Always use lifelines no longer than 7 feet, and use karabiners with locks to prevent them from opening accidentally.
5. Always use an anchor point above your work area, never in front or below. Make the best possible knot over a fixed and sturdy support.
6. Always keep 3 contact points when walking or climbing on platforms (2 hands + 1 foot, or 2 feet + 1 hand).
7. Do your job exerting great care and don't rush.
8. Follow the safety rules and precautions indicated by your supervisor.

WHAT YOU SHOULD NOT DO WHEN WORKING AT HEIGHTS!

- Never work at heights without protection.
- Never underestimate any risks. If you observe any unsafe condition, report it and don't work until it's corrected.
- Don't ... carry anything while climbing ... remember the three points of contact rule.
- Never work at heights with harsh weather conditions (hard rain, foggy, strong winds, etc.)
- Never walk on roofs when uncertain of its supporting capability. Never walk over plexiglass roofing.
- Never use the safety belt as a harness since a fall might hurt your back.

TYPES OF PROTECTION

There are three basic types of fall protection:

HANDRAILS:

Barrier that protects from falls at the edges of scaffolds and platforms. They're normally 3 feet high and have three horizontal bars. The two upper bars are made of 1-2" pipe, and the lower one is a 4" pipe to prevent tool or materials from dropping.

CONTAINMENT NET:

Containment nets are used in temporary building sites when handrails are unpractical.

They should be installed as close as possible to the platform and no farther than 10 yards from them.

They're used to protect people below the net, but this protection is not recommended for people working over the net.

PERSONAL PROTECTION SYSTEM:

An individual protection system used by people working in elevated areas, consisting of:

1. Harness
2. Lanyards (joining the harness with the line)
3. Lifeline
4. Anchors
5. Decelerating device (optional)

EMERGENCY TELEPHONE NUMBERS

In case of Emergency call to:

Management of Traffic on RMC Premises

The following standards are minimum requirements that must be achieved by all Group operations. Additional requirements within local legislation must also be complied with at all times.

1) All traffic routes on RMC premises will be designed, constructed and maintained to ensure safe movement of vehicles and pedestrians. In particular, the routes must be without hazardous potholes, obstructions, debris or excessive slopes / inclines. Where additional hazards may be present due to inclement weather, suitable precautions must be taken.

2) Traffic routes will be designed to ensure that, where possible, delivery / haulage vehicles and mobile plant are segregated from pedestrians and where practicable, this should be achieved by physical means. Where segregation is not possible a suitable and sufficient local risk assessment must identify effective control measures, which must be in place at all times.

3) Risk assessments will be carried out for traffic activities on RMC premises and suitable and effective control measures will be identified and implemented.

4) Site rules will include details about the safe procedures that are to be adopted by drivers and pedestrians and the requirements of the rules will be enforced at all times.

5) Where possible, areas for loading and unloading, vehicle maintenance, sheeting / netting of loads, etc. must be separated from the main flow of traffic.

6) At all RMC premises, there will be sufficient signs and / or road markings directing all visitors to safe reception, parking, loading or delivery areas, etc. as appropriate.

7) At all premises there will be appropriate safe speed limits, strategically placed speed limit signs and restrictions will be enforced.

8) Where possible, one-way systems and/or other traffic routing plans will be established to minimise the risk of injuries. In particular, efforts will be made to minimise the need for large vehicles with reduced rear visibility to reverse.

9) Traffic routes will be planned and designed to ensure adequate visibility and where necessary, additional measures, e.g. fixed mirrors, artificial lighting, etc will be installed at strategic places along the route.

10) Where there are vulnerable structures or other hazards, such as height restrictions (E.g. Overhead electricity cables, etc.), open edges on roads / at excavations or high-risk pedestrian routes, suitable and sufficient barriers must be in place to prevent injury or damage. Where barriers are inappropriate, e.g. at some plant loading points, then signs must be posted to clearly indicate any restrictions.

Ref No 1 – issued 29. 06. 01

Safe Reversing for Road Haulage Vehicles and Mobile Plant

The following standards are minimum requirements that must be achieved by all Group Operations to ensure safe and effective systems are in place for reversing vehicles. Additional requirements within local legislation must also be complied with at all times.

1. All Company owned and hired road haulage vehicles and mobile plant must have an effective audible reverse warning system and, where possible, a visual reverse warning system as well, e.g. a reversing bleeper accompanied by white reversing lights.

2. Road haulage vehicles and mobile plant that are owned by contractors who work on behalf of RMC must also have effective audible and visual reverse warning systems.

3. A risk assessment must be carried out at each location to identify any further control measures that may be required, e.g. traffic management systems, signage or trained banksmen etc. In addition, risk assessments must be carried out for all vehicles and mobile plant to identify whether improved driver visibility is required, e.g. additional mirrors or a reversing camera with a monitor inside the driver's cab.

4. Operators of regular collect customer vehicles and other vehicles that visit our sites must be strongly encouraged to fit appropriate reverse warning devices. To ensure such vehicles can manoeuvre safely in the interim, alternative safe operating procedures must be established.

5. Where environmental constraints present problems regarding the use of audible reverse warning systems, an alternative audible device should be fitted, e.g. a device that alters its sound intensity depending upon the ambient noise levels or a device that is directionally focussed and less intrusive for neighbours (known as "white noise"). If local legislation strictly prohibits all of the available audible systems an alternative, but equally effective system, must be in place.

6. All reverse warning systems must be regularly checked and, in particular, before the beginning of each working day/shift. When checking the audible reverse warning systems, the check must also ensure an adequate level of noise intensity is being maintained.

These standards must be applied in conjunction with the RMC Standards for Management of Traffic on RMC Premises and Management of Risk Assessment.


Responsibility in action
An Overview
THIS PERSON IS RESPONSIBLE FOR YOUR SAFETY
Quality Delivery Responsibility
RMC Group


INCONTOURNABLE
RINGARDAGE
Ringardage
CRÉATION ET APPLICATION D'UNE PROCÉDURE POUR...
...la condamnation des canons à air
...le ringardage au ringard
...le ringardage à l'Atumat
...le ringardage avec Cardox
...le pétardage
...le débourrage de cyclones
...le tir au canon pour destruction des anneaux de four
TIROT TROT
Je connais et j'applique les procédures de ringardage.
La sécurité, ma priorité.


INCONTOURNABLE
CONSIGNATION
Consignation
ON N'INTERVIENT PAS SUR UNE MACHINE EN MARCHE.
LES 4 ACTIONS DE LA CONSIGNATION :
Je n'interviens pas sur une machine en marche
La sécurité, ma priorité.


INCONTOURNABLE
SOUS-TRAITANCE INTÉRIM
Sous-traitance et intérim
En 2004, RÉALISER UN PLAN DE PRÉVENTION ÉCRIT pour chaque intervention
DÉDIER UNE PERSONNE À TEMPS PLEIN à la supervision sécurité pour tout arrêt de four significatif programmé pour maintenance.
POUR TOUTES LES CONSULTATIONS,
SENSIBILISATION à la sécurité et aux risques spécifiques au cimentier :
> Lors d'un chantier, je respecte les incontournables sous-traitance.
La sécurité, ma priorité.
LAFARGE CIMENTS


INCONTOURNABLE
CHARGEMENT VRAC
Chargement Vrac
Depuis janvier 2004 : Interdiction au chauffeur de monter sur sa citerne de façon non protégée.
Les MOYENS DE PROTECTION sont :
> soit, sur le camion, une rambarde de protection déployable depuis le bas
> soit, au poste de chargement, une plate-forme d'accès à la citerne
En l'absence de l'un de ces deux moyens de protection, le chargement ou le déchargement est refusé.
À terme (courant 2004), le seul moyen de protection sera : UNE PLATE-FORME D'ACCÈS AUX CITERNES.
La sécurité, ma priorité.
LAFARGE CIMENTS


INCONTOURNABLE
CONCRÉTION
Concretion
INCONTOURNABLE
CONCRÉTION
1
IL EST INTERDIT DE PASSER SANS PROTECTIONS SOUS UN CROÛTAGE, UNE CONCRÉTION OU UN BATISSAGE ENCORE EN PLACE, même pour une simple visite.
> Il est interdit de passer sous une concrétion sans protections spécifiques.
La sécurité, ma priorité.
LAFARGE


INCONTOURNABLE
CHARGEMENT SACS
Chargement Sacs
INCONTOURNABLE
CHARGEMENT SACS
1
Chaque usine, selon ses spécificités, détermine un ESPACE SÉCURISÉ OBLIGATOIRE POUR LE CHAUFFEUR pendant le chargement :
> espace dédié
> ou met en place une procédure assurant sa sécurité pendant le chargement (risque chariot élévateur, autres camions...)
> Je charge uniquement quand le chauffeur est dans un espace sécurisé et porte ses EPIs.
La sécurité, ma priorité.
LAFARGE


CẤM
PROHIBITION
QUY ĐỊNH KHI ĐIỀU KHIỂN XE ĐẠP XE MÁY
TỐC ĐỘ CHO PHÉP TỚI:
20 Km/h ĐỐI VỚI XE MÁY
10 Km/h ĐỐI VỚI XE ĐẠP
* NGHIÊM CẤM ĐÁNH VÕNG TRÊN ĐƯỜNG
* CHỈ ĐƯỢC ĐÈO THÊM MỘT NGƯỜI PHÍA SAU
* TUÂN THEO CHỈ DẪN CỦA CÁC BIỂN BÁO GIAO THÔNG TRONG NHÀ MÁY
Giám đốc Nhà máy

TAIHEIYO CEMENT

OHSMS in Taiheiyo Cement
Towards the Zero-accident and Total Participation Campaign

The Occupational Health & Safety (OHS) policy and Occupational Health & Safety Management System (OHSMS,OSHMS in Japan) of Taiheiyo Cement Corporation are outlined below.

The development of a safety management plan is based on the annual message on health and safety delivered by the company president as part of the New Year greeting.

Based on this message, the annual management plan is reviewed and developed for each site. An action plan and targets are then decided for every site and every section.
Along with annual plan, policies are implemented that ensure progress is made towards the targets through checks and a monthly reporting and monitoring system.
The results are reviewed and reflected in the policy and plan for the following year.

There is also a National Safety Week (the first week of July) and National Industrial Health Week (the first week of October), which is established by the Ministry of Health, Labour and Welfare. At this time, the company president and union leaders join together to raise OHS awareness by promoting a joint slogan and OHS message.

Furthermore, many other opportunities to promote health and safety throughout the year are taken advantage. For example, whenever there is a meeting or event in which all workers participate, a manager will give a short speech to reinforce OHS awareness or highlight a particular OHS activity. Opportunities to report on OHS activities in quarries and plant sites, including commendations for personnel, also exist at the annual Japan Cement Association Convention. Such events are an important feature in the year's OHS activities.

Holcim Ltd Contractor Control Guidelines

Introduction

In 2003, approximately 35% of all reported deaths and permanent disabilities in Holcim were related to contractors. This is a high percentage, considering the small number of people in relation to the number of Holcim employees. In order to help reduce the number of such incidents, Holcim Ltd wants all Group companies to have a program to manage contractors working on the behalf of Holcim - both on and offsite. Key elements of this program must include:

- Pre-qualification of the contractor based upon review of OH&S training records, actual OH&S performance, certification to do the work, experience with similar tasks and insurance coverage.
- Procurement contracts worded to ensure contractor OH&S
- Site induction training for contractors
- A Holcim employee serving as the contractor supervisor on site to:
    - Review contractor job specific safety plans
    - Review the work practices and conditions (has the authority to immediately stop all work due to unsafe work practices or conditions)
    - Serves as a liaison for the contractor

I. A checklist for contractor pre-qualification:

- Check certification
    - Proper company registration
    - Licensed to do the work/task(s) proposed, if needed
- Experience with same/similar task(s)
    - In Holcim
    - With other companies
- Review of OH&S training records - personnel trained as needed in:
    - General OH&S issues
    - Use of personal protective equipment (PPE)
    - Fire prevention/protection
    - Working at heights
    - Hot (flammable/explosive) work
    - Confined space entry
    - Excavation and digging
    - Safe handling of high electrical voltages
    - Pressurized vessels OH&S
    - Mobile equipment safety
    - Defensive driving
    - OH&S for hazardous materials/chemicals
- Review of OH&S performance
    - Records of any fines and/or citations
    - Records of any awards received
- Review of records of insurance:
    - General/special liability
    - Workers' compensation

- Review of the Specific Task Safety Plan
    - Including proper system for Management of Changes

II. Supplier Contract (example) wording with respect to OH&S performance

1.1 It is the policy of the Buyer to secure the health and safety of all personnel (own, and Suppliers') as well as the integrity and reliability of all property and equipment. Hence, the Supplier also recognizes their responsibility and accountability for the protection of all employees and preservation of the Buyer's property and equipment.

1.2 To comply with this policy, the Supplier will use properly qualified personnel and incorporate safeguards, rules and procedures which will minimize the risk of any personal injury to Buyer's people and loss of, or damage to, Buyer's property and equipment during the performance of the service provided.

1.3 Supplier's personnel must comply with Buyer's established OH&S rules, practices and procedures, use OH&S equipment, tools and any devices that are required/provided, and conduct themselves in a way which assures the health and safety of themselves, that of their fellow employees and/or any other persons.

1.4 Supplier's personnel are responsible for providing and maintaining a safe and healthy workplace where all hazards, unsafe acts and/or conditions are identified and analyzed before being controlled or eliminated. This must be documented in a (mandatory) health and safety program.

1.5 When working, all Supplier's personnel will conduct themselves in accordance with Buyer's OH&S standards, including having a proper OH&S plan for the work, work instructions, training and testing as needed, inspection and audit programs as well as recording and reporting of all accidents, unsafe actions and/or conditions.

III. Elements of a good contractor induction:

- General OH&S training (if needed - see pre-qualification requirements)
- Specific site induction
    - Review of site or facility layout and OH&S policy, procedures and rules
- Requirements for hazard identification and risk assessment
- Hazard communications
    - Specific hazard zones on the site and PPE considerations
- Emergency response
    - Fire and emergency procedures
    - First aid facilities
    - Environmental emission controls
- Recording and reporting

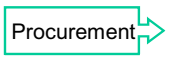
IV. Improving Contractor Oversight

- Contact person(s) for buyer and supplier identified
- Role of the Project/Job/Site Supervisor defined
- OH&S duties, responsibilities, accountabilities and power defined

References:

1. Holcim Ltd - OH&S Handbook
2. Holcim (US) - Theodore Plant - Contractor's Pre-Qualifying Manual
3. Holcim (Schweiz) - Schulungs CD für Fremdfirmen

In 2003, about 35% of reported deaths and permanent disabilities in Holcim were related to contractors. In order to help reduce the number of such incidents, CSR-OH&S recommends that all Group companies have a program to manage contractors working on the behalf of Holcim - both on & offsite. Key elements should include:



Pre-qualification of the contractor based upon review of OH&S training records, actual OH&S performance, certification to do the work, experience with similar tasks and insurance coverage.

Procurement contracts worded to ensure contractor OH&S

Site induction training for contractors

A Holcim employee serving as the contractor supervisor on site to:

Review specific contractor job safety plans and procedures;

Review actual work practices and conditions (has authority to stop all work immediately for unsafe work practices or conditions), and

Serve as a the liaison point with the company for the contractor

GUIDELINES FOR AN OH&S COMMITTEE

Site/Business[1] Unit OH&S Committee

As a Holcim recommended minimum, an OH&S Committee must contain both elected blue collar and appointed management representatives (at least 50% blue collar) and meet at least four times per annum. Minutes of meetings must be kept and communicated to the whole workforce. The committee must also address any problems associated with different languages in use at a site. Note that the requirements for formation and composition of such a committee are often specified by local legislation and this should be checked.

Function of the OH&S Committee:

1) As a main bottom up channel for OH&S issues/concerns to come to management
2) As a main driver for the OH&S program
    a. Disseminate information, do hazard/incident investigations and risk assessments, communicate OH&S issues/results and promote OH&S across the workforce.
3) As a body that suggests actions and programs based on reports, investigations, stats, etc

Following each OH&S Committee meeting, the Chair should attend a Plant Management Committee Meeting to report on OH&S and submit recommendations for consideration.

There are a number of issues to bear in mind so the committee functions well. These include:

A. (Establishment) The general workforce (blue collar) must elect their representatives, those from management can be nominated.
B. Suitable blue collar people can be encouraged to nominate, but none may be discouraged.
C. Making all workers aware of the name/s of their OH&S representatives
D. Planning/preparation of a meeting agenda for OH&S Committee meetings so that they are kept to a reasonable length
E. Ensuring that all members of the OH&S Committee are allocated responsibilities/tasks and given time to follow up on/do them outside normal committee time

Other considerations:

To be effective, OH&S Committee members must have received basic training in:

1. Functions of an OH&S committee and meeting practices/procedures
2. Overview of applicable legislation and regulations
3. How to do hazard identification and risk assessment as well as accident/incident investigations (root cause analysis, etc) and report writing
4. Delivering training (attend a Train-the-Trainer course)
5. Undertaking reviews, inspections and audits (qualify as OH&S Internal Auditors)

[1] Typically, these are geographic terms. A site would be a single large operation (say, over 50 people) such as a cement plant or major quarry. A business unit would comprise a number of smaller sites, like pre-mix concrete plants grouped under an area manager.

Management Committee (Headed by Site/Business Unit Manager)

This acts as the approval body for suggestions and recommendations from the OH&S Committee (normal management process). These further suggestions for actions are extracted from the Holcim OH&S Handbook and actually represent a high-level management checklist.

1) All members must do at least one OH&S Inspection and one Incident Investigation annually, not in their usual work area. This would include follow-up to ensure that any improvements identified as necessary actually occur.

2) Develop the plant OH&S policy, objectives and targets and Management Committee members communicate these to all employees.

3) Include OH&S knowledge and/or skills in the Training Master Plan (TMP) - Set a minimum level of OH&S training at (say) 12 hours/person per year.

4) Promote data collection and reporting by:
    a. OH&S being the agenda focus item monthly following the OH&S Committee meeting and included as the first/main item on the agenda in those meetings; and
    b. Up-dated statistics being in the minutes of those meetings as a standard item (definitions HARP Manual Ref - 8.2.1 Operational Indicators. All sub-Segments) https://web.holcim.com/harp/harpman.nsf/manuindex?OpenView&Start=1&Count=5000&Expand=8.2.1 - 8.2.1
    c. Mandating OH&S as the first agenda item for all regular internal meetings

5) Measure performance:
    a. Establish annual OH&S objectives and targets
    b. These objectives and targets then become part of performance compensation considerations in the Dialogue of top managers
    c. OH&S included in performance management / Dialogue of all other management and/or supervisory employees. Suggestion for wording, "Contribute positively to the achievement of company OH&S objectives and targets" - Examples for this could include doing OH&S inspections/accident investigations, being on a safety committee, preparing a Safe Working Procedure, not personally having an LTI, etc.

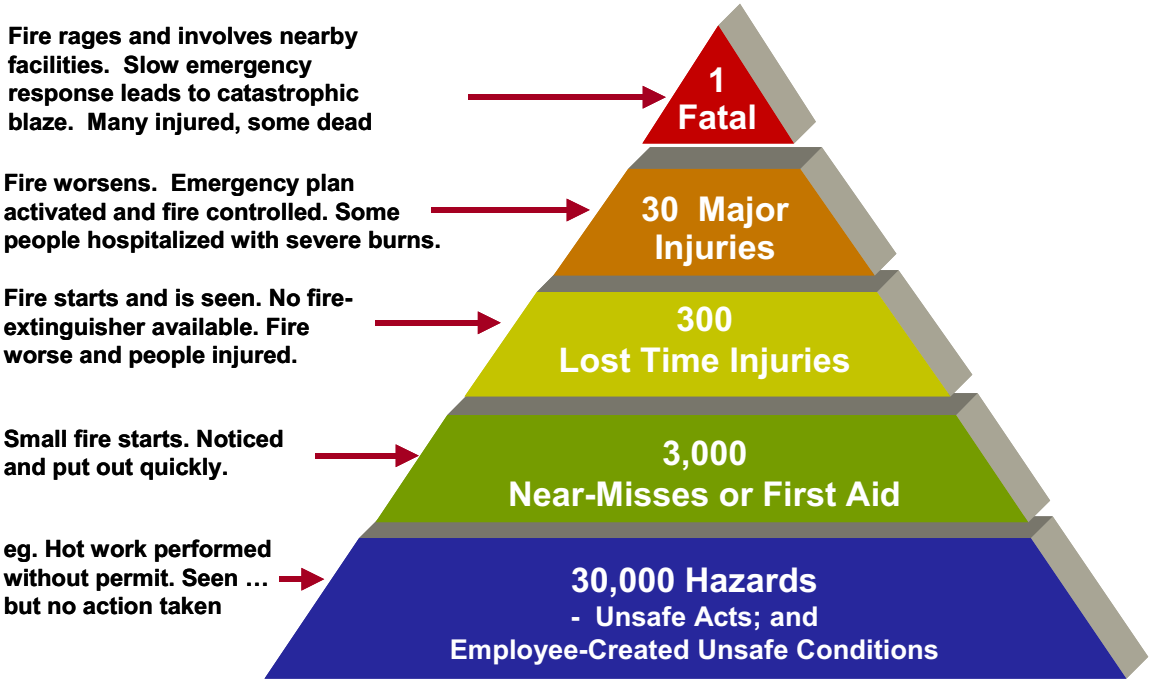
6) Share information by having an OH&S board at the main entrance showing performance. As a minimum, this should show:
    a. Current OH&S pyramid rating
    b. Target and current OH&S indicator performance
    c. Number of days since last accident causing death or permanent disablement
    d. Number of days since last lost time injury
    e. Previous best number of days between lost time injuries

    Other things that could be on the board are the OH&S policy and slogan/tag line, etc.

7) Communicate-communicate-communicate. Identify and implement at least three separate initiatives to inform employees about OH&S; e.g. a poster campaign, articles for in-house magazine, tool box talks by senior managers, OH&S week, etc

Holcim

The Bird Pyramid

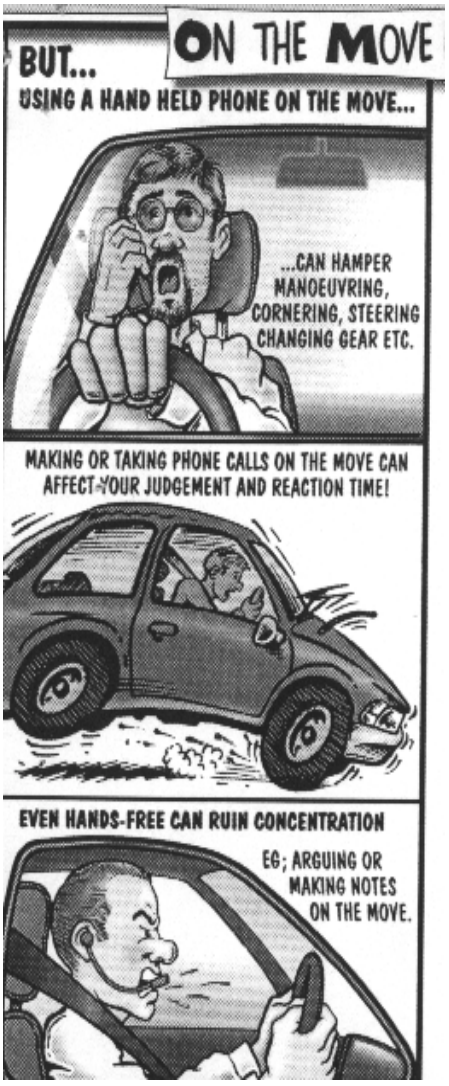


FARRANS "CARES" SITE SAFETY SYSTEM

SAFE USE OF MOBILE PHONES
"Stay Alert - Stay Alive"
TO SITE MANAGERS / SUPERVISORS / SUBCONTRACTORS:-

DO

- Carry a mobile phone if working alone in a remote area.
- If lone working, use your mobile phone to report to your Line Manager that you have finished for the day if you are not returning to the office.
- Carry a mobile phone if you are concerned about your safety going to or from work.
- Ensure you have quick and effective communications available for emergency situations.
- Limit the amount of time on the phone if you are concerned about radio waves.
- Switch your phone off when operating "Plant Machinery" or dangerous items of equipment.
- Ensure you are standing in a safe area before answering a call.
- Remember using a mobile phone "hands free kit" still increases the risk of an accident.
- Remember, mobile phones can ignite fuel and fumes.
- Remember, use of a mobile phone whilst driving may incur three penalty points and a £60.00 fine.



DO NOT

- Answer a call when operating Plant and Machinery.
- Answer a call if communicating with others on site radios. e.g. slinger/banksman / crane drivers.
- Use or operate a phone when climbing a ladder or other similar structures.
- Use a mobile phone when driving a vehicle especially if you do not have a hands free kit.
- Use the phone to call other staff when they are operating Plant and Machinery.
- Operate a mobile phone if working in an area of high traffic through flow.
- Operate mobile phones or other electrical equipment near petrol containers or other flammable substances. e.g. Petrol stations.
- Do not permit the use of mobile phones when excavating near gas pipelines.
- Use mobile phones in areas where the site rules strictly forbid them.
- Operate mobile phones when crossing traffic routes.

FICHA PRÁTICA DE SEGURANÇA N.º 5

SEGURANÇA NA CONDUÇÃO DE EMPILHADORES

SISTEMA INTEGRADO DE SAÚDE OCUPACIONAL

SEGURANÇA NA CONDUÇÃO DE EMPILHADORES

Empilhadores ou carros automotores de manutenção e de elevação de cargas, são todas as máquinas que se deslocam no solo, possuindo tracção motorizada e que são capazes de levantar, baixar, transportar e empurrar cargas.

Os empilhadores podem ser eléctricos ou com motor de combustão interna (a gás ou gasolina / diesel).

A correcta utilização dos empilhadores é fundamental para prevenir acidentes que, neste caso, são habitualmente graves.

Os acidentes no trabalho com empilhadores podem ter diversas causas:

- Queda de objectos ou cargas:
  - Queda de cargas em transporte;
  - Queda de elementos de grande porte;
  - Queda de elementos pequenos e queda de objectos armazenados.
- Queda do condutor.
- Queda, basculamento e tombo do empilhador.
- Colisões ou choques.
- Compressão por um objecto ou entre objectos.
- Exposição ao ruído.
- Exposição a vibrações.
- Incêndio e explosão.
- Inalação de gases, poeiras ou vapores de substâncias nocivas.

Para evitar a ocorrência de acidentes, o condutor de empilhadores deve:

- Verificar se não existe ninguém à sua volta, antes de colocar o empilhador em funcionamento;
- Conduzir com velocidade moderada, prudência e atenção, mantendo o empilhador na máxima visibilidade (se a carga impossibilitar a visibilidade para a frente, o condutor deve conduzir o empilhador em marcha à ré e a uma velocidade lenta);
- Fazer uma deslocação lenta nas rampas, descendo em marcha à ré e subindo em marcha para a frente;
- Circular com os garfos na parte inferior, mas a uma altura do solo de cerca de 15 cm para evitar o risco de colisões ou choques contra obstáculos no piso;
- Respeitar os caminhos definidos para a circulação do empilhador, os quais deverão ser sólidos, lisos e, se possível, horizontais;

Fig. 1 – O condutor de empilhadores deve conduzir com velocidade moderada, prudência e atenção, mantendo os garfos a uma altura de, aproximadamente, 15 cm do solo e respeitando as vias de circulação definidas para os veículos.

Fig. 2 – Os caminhos definidos para a circulação dos empilhadores não se devem cruzar com caminhos para circulação de peões. Se isso tiver de acontecer, ambos devem estar devidamente sinalizados.

- Não se aproximar em demasia dos bordos dos cais de carga ou descarga, nem dos locais onde exista o risco de queda em altura;
- Evitar as mudanças bruscas de direcção;
- Evitar as viragens de pouco raio, bem como as viragens bruscas na parte baixa de uma rampa, depois de ter feito uma descida rápida;
- Verificar se há uma boa visibilidade e iluminação ao longo do trajecto de transporte e não circular à noite, sem iluminação suficiente;

Fig. 3 – As mudanças bruscas de iluminação entre o exterior e o interior, podem provocar dificuldades de adaptação da visão e consequentemente a ocorrência de acidentes.

- Utilizar o cinto de segurança;
- Impedir o transporte de outros trabalhadores (salvo se o equipamento estiver especialmente apetrechado para essa condição e nas mesmas condições de segurança do condutor);
- Proibir o transporte e/ou a deslocação vertical de pessoas sobre os garfos do empilhador;

Fig. 4 – É expressamente proibida a deslocação vertical de pessoas sobre os garfos do empilhador.

- Estacionar o empilhador em locais com piso horizontal e com os garfos apoiados no chão;
- Utilizar plataformas de apoio ou paletes de dimensões adequadas às cargas;
- Organizar o empilhar a carga de modo a que esta fique solidária, bem distribuída pela totalidade da superfície de apoio e que o seu peso fique centrado;

Fig. 5 – O bom estivamento e a utilização de paletes facilitam a distribuição do peso da carga, contribuindo para uma maior estabilidade do empilhador.

Fig. 6 – O tipo de acondicionamento da carga permite, neste caso, a deslocação da carga sem o recurso a plataformas ou paletes.

- Verificar se o afastamento dos garfos é o maior que a plataforma de carga admite. Quanto maior for o espaçamento entre garfos, tanto maior é a estabilidade da carga;

- Utilizar contentores adaptados quando transportar materiais de pequena dimensão;
- Certificar-se que não existem elementos soltos da carga;
- Ter em atenção o bom estivamento da mercadoria nos locais de armazenamento, através da constituição de pilhas estáveis, de altura razoável e em locais horizontais e resistentes;
- Vigiar o domínio exterior do empilhador, de modo a que as suas partes salientes (garfos, porta garfos, mastro, etc.), não se encaixem nos elementos a empilhar, nem nas estantes ou outros suportes.

Fig. 7 – A aplicação de batentes junto aos locais de carga, evita que o empilhador ultrapasse o limite ideal para elevação da carga.

- Não transportar cargas que ultrapassem os limites dimensionais do empilhador (largura e/ou altura);

Fig. 8 – O tamanho (largura e altura) da carga deve ser adequado aos limites do empilhador.

- Evitar inclinar-se para o exterior, nem mesmo nas situações de fraca visibilidade, pois pode perder o equilíbrio e cair;
- Verificar o estado de conservação e estabilidade do equipamento;
- Não elevar uma carga que exceda a capacidade nominal do equipamento (o diagrama de cargas que, obrigatoriamente, se encontra aposto no empilhador, deve informar sobre a capacidade nominal em condições normais e a sua variação em função do deslocamento do centro de gravidade da carga). Se desconhecer o peso de uma carga e tendo dúvida quanto à capacidade do empilhador conseguir levantar e movimentar a carga em segurança, convém fazer previamente um simples teste para analisar se é seguro ou não, movimentar a carga. Para tal, deve levantar a carga do chão, até cerca de 5 cm. Com a carga levantada, a esta altura, o empilhador deve conservar-se estável e com as rodas traseiras em contacto firme com o chão. Se se verificar que tudo está operacional e se a direcção estiver normal, então a carga pode ser movimentada. Caso contrário, se se verificar que existe esforço na direcção e que a parte traseira da máquina levanta do chão, então deve baixar-se lentamente a carga e não se deve proceder à sua movimentação;
- Não levantar a carga quando o empilhador se encontrar num plano inclinado;
- Assegurar-se que não existem obstruções superiores à passagem da carga (falta de espaço até ao tecto, iluminação, tubagem, sistemas de ventilação, equipamentos, etc.);
- Nunca permanecer ou passar, nem permitir a passagem a quem quer que seja, por baixo dos garfos elevados, quer estejam ou não com uma carga;
- Verificar as protecções dos órgãos mecânicos em movimento no equipamento, em especial o sistema de movimentação vertical do porta garfos e do mastro.
- Abastecer os empilhadores a gasolina ou diesel ao ar livre ou em locais bem ventilados;
- Proceder ao carregamento das baterias dos empilhadores em local ventilado;
- Não fumar durante o trabalho;
- Realizar exercícios de fortalecimento muscular.

SEGURANÇA NA CONDUÇÃO DE EMPILHADORES

Os empilhadores devem estar equipados com os seguintes dispositivos relativos à segurança:

- Sinalização luminosa rotativa de presença;
- Sinalização luminosa de marcha à ré;
- Cinto de segurança no assento;
- Botão de paragem de emergência;
- Grade para apoio de cargas, protectora do condutor;
- Pórtico de protecção do posto de condução e placa apoia cargas, situada no porta garfos (contra quedas de objectos de grande porte);
- Freio de imobilização;
- Dispositivo de encravamento por chave;
- Extintor;
- Placas indicadoras de:
  - Identificação e dados do fabricante;
  - Diagrama de cargas;
  - Dados técnicos do equipamento;
  - Pressão hidráulica (no caso de equipamentos accionados hidraulicamente);
  - Pressão de ar dos pneus (no caso de pneumáticos).

O condutor de empilhadores e de acordo com as condições individuais de trabalho, deverá usar os seguintes equipamentos de protecção individual:

Vestuário de trabalho

Calçado de segurança

Capacete de segurança

Protectores Auriculares

CIMPOR

FICHA PRÁTICA DE SEGURANÇA

N.º 8

SEGURANÇA EM TRABALHOS DE SOLDADURA

SISTEMA INTEGRADO DE SAÚDE OCUPACIONAL

SEGURANÇA EM TRABALHOS DE SOLDADURA

Soldadura – é a operação que permite ligar dois ou mais elementos (metálicos ou plásticos), quer por aquecimento quer por pressão, ou em simultâneo, com ou sem adição de material complementar ou de adição.

Fig. 1 – O trabalho de soldadura é por vezes muito difícultado pela exiguidade do espaço.

PROCESSOS DE SOLDADURA

Estão definidos cerca de 40 processos de soldadura, no entanto, os mais utilizados são:

- **Soldadura oxi-acetilénica** – é o processo que junta duas partes metálicas pelo calor de um maçarico a gás, alimentado por acetileno e oxigénio em determinadas proporções.
  Quando o trabalho exige metal de enchimento, o soldador mantém o bastão de solda com uma das mãos e dirige a chama do maçarico para a peça onde foi aplicado previamente um fundente ao metal;
- **Soldadura a Arco Eléctrico Revestido** – une metais por meio do calor produzido por um arco eléctrico (circuito eléctrico fechado), estabelecido entre o eléctrodo revestido com determinadas substâncias e o material a soldar, para fundir o material de base e o eléctrodo, originando assim o material de adição;
- **TIG** *(Tungsten Inert Gas)*, é um processo de soldadura de alta qualidade realizado através de um arco eléctrico estabelecido entre um eléctrodo

de tungsténio infusível (não se funde com o calor do processo) e a peça, no seio de uma atmosfera de gás inerte, o Árgon ou o Hélio. O arco assim estabelecido fornece o calor necessário para fundir o material de adição (um fio nu com características apropriadas), o que pode ser feito manual ou mecanicamente;

- **Soldadura semi-automática MIG/MAG**, são processos de soldadura por arco eléctrico que utilizam fios eléctrodos contínuos, nus ou fluxados, na extremidade dos quais se estabelece o arco eléctrico e uma atmosfera protectora.

  MIG – quando se utiliza um gás inerte (Árgon, Hélio ou misturas).

  MAG – quando se utiliza um gás activo (Dióxido de Carbono ou misturas).

  Denominam-se processos semi-automáticos devido ao facto de a alimentação do fio eléctrodo ser efectuada automaticamente pela máquina, ficando a cargo do soldador as restantes operações;

- **Soldadura por pontos**, baseia-se no aproveitamento da resistência que determinados materiais oferecem à passagem da corrente eléctrica, transformando-a em calor que funde os materiais, em função da duração da passagem dessa corrente. Com a aplicação de uma pressão adequada, eles soldam;

- **Soldadura de Estanho/Chumbo**, é um processo normalmente utilizado em operações complementares de acabamento, devido às suas possibilidades serem mais amplas nesse domínio e não tanto para assegurar a soldadura de peças propriamente ditas. O material de adição utilizado é uma liga de estanho/chumbo fundido (a temperaturas entre 190 e 250 °C), através do calor libertado numa combustão de gás butano na presença de oxigénio, sobre a chapa de aço;

- **Soldadura de Materiais Plásticos**, união de duas peças de materiais iguais ou parecidos, sob a acção do calor e da pressão.

Durante o processo de soldadura o colaborador é exposto a diversos agentes químicos e físicos prejudiciais.

Os materiais usados nos processos de soldadura representam perigos potenciais para a saúde humana e ambiental. Os metais de adição, os revestimentos dos eléctrodos, os revestimentos dos materiais a serem soldados, a limpeza dos materiais que intervêm no processo de soldadura, etc., são fontes de contaminação atmosférica dado que emanam para o ambiente de trabalho inúmeros agentes perigosos (metais e óxidos de metais, carbonatos, materiais fibrosos, etc.).

Os principais impactes ao nível da saúde resultam da exposição às emanações (intoxicação, danos na pele, nos sistemas respiratório, nervoso e cardiovascular e efeitos carcinogénicos); da exposição às radiações (visão) e das queimaduras.

Fig. 1 – Nesta imagem são bem visíveis as emanações decorrentes do processo de soldadura

Os riscos variam com o processo de soldadura, no entanto, os mais comuns são:

- Incêndio e explosão;
- Contacto com a corrente eléctrica;
- Exposição a vários tipos de radiação;
- Contacto cutâneo ou inalação de poeiras, gases ou vapores nocivos;
- Exposição ao ruído;
- Pancada por objectos móveis incluindo fragmentos projectados;
- Projecção de material incandescente.

PREVENÇÃO

As estratégias de prevenção diferem com o processo de soldadura utilizado, embora algumas acções preventivas sejam comuns, assim:

- As operações de soldadura devem ser efectuadas, orientadas e controladas apenas por colaboradores com formação adequada;
- A exaustão localizada de fumos deve ser garantida;
- Nas operações de soldadura com atmosfera protectora, a extracção deve ser acoplada à própria pistola de soldadura;
- Deve existir um extintor adequado em todos os locais onde se efectuem operações de soldadura. Estas operações podem desencadear fogos do tipo A, B e também do tipo C (de gases, como o acetileno), recomendando-se por isso, a utilização de extintores de pó químico ABC e extintores de CO_2 (alternativos), na proporção: 1 extintor de 6kg para cobrir um raio de 10 metros;
- O espaço onde se desenvolve a soldadura deve estar arrumado e limpo;
- Devem ser limpas e eliminadas, previamente, as pinturas, óleos, massas, dissolventes, etc., que possam existir nas peças a soldar (analisar a sua combustibilidade, prevenindo incêndios e evitando a formação de emanações mais perigosas);
- Devem ser tomadas medidas de precaução em relação aos locais adjacentes às operações de soldadura e respectivos trabalhadores;
- Nunca soldar um recipiente ou uma canalização sem conhecer os produtos que possam ter tido;
- Lavar e desgaseificar os recipientes a soldar que tenham contido produtos combustíveis. Na lavagem não se deve utilizar somente água, mas também lixívia e vapor de água. Caso estes meios não estejam disponíveis, trabalhar com o recipiente cheio de água, neutralizar a atmosfera com gás inerte, ou com gás não combustível, ventilando o posto;
- Utilizar aparelhos de posicionamento da peça de soldar, pois estes ajudam na orientação, definição da linha de soldadura e na adopção da posição mais favorável à execução de um bom trabalho, reduzindo as manipulações da peça a soldar;

Fig. 3 - O facto de as peças estarem no chão obriga o trabalhador a adoptar uma postura incorrecta

- Verificar o estado geral do equipamento, no início de cada período de trabalho;
- Não utilizar roupa de trabalho excessivamente manchada com gorduras, óleos ou combustível em geral.

POSTO DE TRABALHO

- Os **postos de trabalho fixos** devem apresentar as seguintes características:
  - Área mínima de 2 m² e uma cubagem de 11,5 m³, por trabalhador;
  - Não devem ser implantados na proximidade de materiais combustíveis ou instalações susceptíveis de libertar poeiras, vapores ou gases explosivos ou inflamáveis;
  - Devem estar limitados por paredes ou anteparos, com altura mínima de 2m, que impeçam que as radiações nocivas, calor ou chispas, atinjam outros locais de trabalho e outros trabalhadores;
  - A entrada, do local destinado à soldadura, deve ser orientada de modo a não comunicar com outros postos de trabalho e trabalhadores;

- A entrada deve estar protegida por uma porta ou por tecido ignífugado;
- As paredes devem estar pintadas de cores escuras para evitar as reflexões;
- Deve existir um interruptor automático, fusíveis para ligação entre o posto e a rede eléctrica, sendo que a caixa dos fusíveis deve ser blindada de modo a evitar as projecções de partículas, caso estes se queimem;
- Estes locais de trabalho devem estar dotados de sistemas de extracção/aspiração de gases e fumos, que poderão ser sistemas fixos ou móveis.

• Os **postos de trabalho móveis** podem localizar-se ao ar livre, em ambientes fechados e até em espaços confinados ou de difícil acesso, por isso, dependendo dos casos, devem apresentar características diferentes.

Postos de trabalho móveis em locais ao ar livre:

- Sempre que possível e dependendo de acessibilidade do local, devem ser colocados biombos de cor escura e incombustíveis, para limitar a zona de soldadura, de modo a proteger os outros trabalhadores;
- Não devem ser executadas soldaduras no mesmo local onde decorram trabalhos em andaimes, gruas, etc., efectuados por outros trabalhadores.

Postos de trabalho móveis em ambientes fechados:

- Deve ser garantida a existência de ventilação adequada e de entradas de ar suficientes para prevenir a falta de oxigénio. Mesmo existindo ventilação natural, se esta não for suficiente, torna-se necessário um sistema de ventilação adequado, uma captação localizada de fumos e por vezes a utilização de uma máscara com alimentação de ar;
- Nunca utilizar oxigénio para ventilar espaços fechados ou roupas, dado o alto risco de inflamação expontânea deste gás;
- Deve verificar-se a existência de produtos susceptíveis de provocar incêndios e explosões.

SISTEMAS DE EXTRACÇÃO/ASPIRAÇÃO

• **Sistemas de extracção/aspiração fixos** – quando a soldadura se efectua ao nível da mesa de trabalho, o sistema de aspiração fixo permite uma captação mais eficaz dos fumos de soldadura. O caudal de aspiração recomendado para este tipo de mesas é de 2000 m³/h por metro de comprimento da mesa e a velocidade do ar no sistema de aspiração deve ser no mínimo de 5m/s. A eficácia deste sistema diminui muito se a largura da mesa for superior a 800/700 mm, podendo ser melhorada com a colocação de bandas nos extremos da mesa, o que também serve de protecção contra a emissão de radiações, calor e eventuais chispas para outros trabalhadores no posto de trabalho.

• **Sistemas de extracção/aspiração móveis** – quando o soldador precisa de se deslocar durante o trabalho, não é possível o emprego de mesas de soldadura, pelo que deve recorrer ao uso de pequenas bocas de aspiração móveis. O caudal de aspiração necessário, neste caso, depende em grande medida da distância entre a boca de aspiração e o ponto de soldadura (fonte de fumo), condição que deve ser analisada, tendo em conta que a velocidade da corrente de ar criada por qualquer mecanismo de aspiração no ponto de soldadura diminui rapidamente ao aumentar a distância da boca da aspiração a esse ponto.

• **Extracção/aspiração incorporadas na pistola de soldadura** – é normalmente utilizada nas operações de soldadura com atmosfera protectora. Nestes casos, o caudal necessário é mais reduzido.

EQUIPAMENTO DE PROTECÇÃO INDIVIDUAL

Estando esgotadas todas as medidas técnicas e organizativas tendentes a eliminar ou controlar os riscos e para proteger o trabalhador contra riscos residuais, devem utilizar-se EPI's. Estes devem ser seleccionados tendo em conta os riscos a que o trabalhador está exposto, as condições em que o

trabalho vai ser efectuado e as partes do corpo que se pretende proteger.

Assim, devem ser cumpridas as seguintes regras gerais:

- Os EPI's têm de se adequar ao processo de soldadura e às características pessoais do colaborador;
- Deve ser verificado o seu estado de conservação;
- Em casos de absoluta necessidade, as operações de soldadura, efectuadas em locais molhados ou húmidos, poderão ser autorizadas com precauções e equipamento especial (os cabos da máquina não podem ter quaisquer juntas, nem apresentar deficiências de isolamento e os soldadores são obrigados a usar botas e luvas isolantes);
- A roupa de trabalho deve permitir total liberdade de movimentos, sendo justa na cintura, com punhos justos aos pulsos;
- O ajudante de soldador tem de dispor de EPI's adequados;

Fig. 4 - O ajudante do soldador deveria utilizar equipamento de protecção equivalente ao do soldador.

- Nunca efectuar operações de soldadura eléctrica a arco com eléctrodo revestido se usar lentes de contacto (quer tenha ou não protecção ocular);
- Não ingerir leite ou outro produto no caso de intoxicação.

Face aos riscos e às partes do corpo a proteger, devem ser seleccionados EPI's específicos.

Vestuário de trabalho

O vestuário de trabalho deve constituir uma protecção, pelo que, deve ser confeccionado em material não inflamável e não deve ser demasiado largo ou justo, para permitir amplitude de movimentos e conforto térmico. Também deve proteger o colaborador em circunstâncias como:

- Ambiente térmico agressivo (frio ou calor);
- Contacto com superfícies muito quentes;
- Presença de substâncias perigosas, sobretudo as de fácil penetração cutânea;
- Locais onde possam ocorrer agressões mecânicas (corte, projecção de materiais incandescentes, etc.).

Protecção da cabeça

A protecção mais adequada para o soldador é a boina de lã, que para além de ser pouco combustível, atenua a pressão exercida pelos óculos e pelas máscaras.

Se a execução do trabalho implicar risco de queda, de pessoas ou objectos, é aconselhável a utilização de capacete de protecção.

Protecção do ouvido

Normalmente adoptam-se os protectores auriculares que melhor se adaptarem ao colaborador, em função das avaliações de ruído no local.

Protecção dos olhos e face

Os EPI's para protecção dos olhos devem respeitar os seguintes princípios:

- não limitar o campo de visão;
- terem incorporadas lentes neutras;
- serem resistentes à corrosão, choques, abrasão e produtos químicos;
- permitir a incorporação de óculos de correcção.

As máscaras de soldadura recomendadas podem ser de mão ou de cabeça, podendo, a última, ser adaptada ao capacete.

Os vidros das máscaras podem ser de protecção, para proteger os olhos durante o período em que não é necessário o filtro (picar soldadura) ou de vidro filtro, para atenuar a intensidade da radiação incidente, num determinado comprimento de onda.

Os vidros estão incorporados no corpo da máscara, que é rígido e de forma semicilíndrica ou de caixa rectangular que protege simultaneamente a face. Os filtros devem ser escolhidos de acordo com as normas em vigor.

Protecção das vias respiratórias

Os aparelhos de protecção respiratória ou máscaras têm por objectivo a protecção dos trabalha-

dores contra agentes perigosos e a deficiência de oxigénio. A máscara é uma peça facial que cobre a boca, o nariz, os olhos e o queixo e subdivide-se em:

Existem vários tipos de filtro, que se utilizam de acordo com os agentes contaminantes.

Protecção das mãos e dos braços

Para as actividades de soldadura recomenda-se a utilização de luvas de couro pela sua resistência a altas temperaturas e por permitirem uma respiração cutânea adequada.

As luvas devem ter uma conservação adequada e serem substituídas assim que se deteriorem.

As luvas com protecção do antebraço ou mangas com protecção até ao ombro, em couro, são também recomendáveis, atendendo aos salpicos de material incandescente.

Protecção do tronco e do abdómen

Terão de ser utilizados aventais e/ou casacos de couro devido à emissão de material incandescente. Os casacos de couro devem ser utilizados sempre que o trabalho se efectue numa zona situada acima do nível dos ombros e onde haja probabilidade de desprendimento de materiais incandescentes.

Protecção dos pés e das pernas

Sempre que exista o perigo de queda de peças ou entalões provocados por equipamento recomendam-se as botas de biqueira de aço.

Para protecção das pernas devem usar-se polainas em couro para proteger dos eventuais salpicos de material em fusão e das chispas formadas.

CINAPOR