

# **PART IX. RELATED SITE PRACTICES**

## **OCCUPATIONAL HEALTH & SAFETY**



**CEMENT CONCRETE  
& AGGREGATES AUSTRALIA**

This Section describes important aspects of the nature, manufacture and use of concrete in relation to associated Occupational Health & Safety (OH&S) issues. Growing emphasis on the rights of workers and the reasonable expectation of being able to go home after a day's work in the same health condition as they arrived has led to a vast improvement in OH&S conditions at work sites and a much improved understanding of the properties of the materials people use during their work day. These good intentions have been supported by improved workplace laws which impose on both workers and employees quite substantial responsibilities for the management of worker and site safety in all workplaces. Employers and employees alike bear the responsibility for keeping workers safe and serious Court-imposed penalties await those who breach their 'duty-of-care'. Genuine OH&S is an issue that, it might be argued, was ignored for a long time. This is no longer the case.

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## 1. INTRODUCTION

As an important element of the construction industry, the concrete industry needs to have a high level of awareness of OH&S issues that apply in the industry and must have all industry players contributing to improved understanding and more rigorous processes to ensure worker safety.

Both Federal and State laws cover OH&S requirements and the growing tendency for litigation means that all players – employers, unions and workers – must have awareness of their rights and responsibilities in relation to OH&S. These rights and responsibilities are underpinned by a basic requirement known as a 'Duty-of-Care'.

### Duty-of-Care:

- Is a legal obligation on an individual;
- Requires adherence to a reasonable standard of care when performing acts that might cause harm to others;
- Includes carrying out acts or omitting to carry out acts that may result in injury or harm;
- Requires the level of care provided to be commensurate with the potential risk.

It might be asked whether every worker and every employer need to be aware of their legal obligations in relation to all applicable Federal and State laws. That would not be a 'reasonable' expectation. However, employers might be reasonably expected to have prepared policies and procedures (that recognise the legal requirements) for their business, and that workers might reasonably be expected to have read those policies and procedures and to be following them.

The reality is that the cost of OH&S incidents is huge. There are financial costs to businesses, emotional and financial costs to those injured and to their families, and costs to the community more generally from having to supplement the income of families of the injured (or killed). There are no winners from poor OH&S practices – only losers.

## 2. CONCRETE INDUSTRY OH&S ISSUES

The concrete industry is one that handles high volumes of corrosive products that are produced in mechanised plants, and then transports these large volumes over public roads and onto job sites where they are

subjected to a variety of manual processes. OH&S risks exist at all stages of the concrete 'journey' and these need to be examined separately. The areas that will be examined are:

- Materials issues;
- Concrete plants;
- Transporting concrete;
- Site issues.

### 3. MATERIALS ISSUES

Concrete is comprised of a number of raw materials – some of which have inherent OH&S risks. The physical and chemical characteristics of plastic concrete create a separate set of risks, and if not treated correctly, hardened concrete can also be hazardous. There are a number of commonalities in the relevant risks. To assist those using hazardous materials to understand the nature of associated OH&S risks requires the creation of a Safety Data Sheet and for this document to be made available to workers.

#### 3.1 SAFETY DATA SHEETS (SDS)

It is a legal requirement that workplaces have SDS for all hazardous chemicals used in that workplace.

**NOTE:** *Non-hazardous chemicals do not require SDS.*

SDS for all relevant site chemicals should also be compiled and made available in marked locations for workers to access. Workers also need to be aware of safety issues for all chemicals that they use when carrying out their duties.

SDS are required to be prepared in a specific format containing 16 sections as described by Safe Work Australia. SDS must be reviewed at least every five years and each SDS must contain a review date. The information contained within SDS includes naming the chemical(s) and describing any associated hazards; describing the physical and chemical properties of the chemical(s); defining first aid and firefighting measures; providing toxicological and ecological information; noting

transport limitations (e.g. if there is a Dangerous Goods classification) and defining disposal requirements.

SDS must also provide full contact details for the manufacturer and contact details where medical advice about treatment protocols can be obtained in the event of an emergency (e.g. contact details for a Poisons Information Centre).

#### 3.2 CONCRETE RAW MATERIALS

Typically, concrete is composed of cement + SCM's + aggregates + water + admixtures. Within this group of raw materials, the cement and SCM's pose the highest OH&S risks. 'Portland' cement is a fine powder composed of a set of highly alkaline minerals. If the dry cement powder comes into contact with water or (moist) mucous membranes it releases strong alkalinity that will damage the mucous membranes in the mouth, eyes and nose and with persistent contact, can damage normal skin.

If plastic concrete comes into contact with mucous membranes it can cause serious ulceration, and if the eyes are affected, then eyesight can be lost. Persistent contact of cement containing moisture or plastic mortar or concrete with the skin can result in rashes and potentially lead to the development of dermatitis.

**NOTE:** *Some alkali-activated or other alternative binders may have even higher levels of alkalinity than 'Portland' cement and potentially pose a higher risk of damage to skin and mucous membranes.*

Cement and the SCM's are fine powders with up to 50% of their mass being 'respirable' – i.e. <10 µm in diameter. For some SCM's (e.g. fly ash and silica fume) there may also be a small proportion of crystalline silica in the materials which increases the risks from breathing the fine dusts. Reduction and removal of risk should be carried out by mechanical means (e.g. dust extraction systems) where needed rather than relying on PPE (Personal Protective Equipment) (e.g. dust masks) for worker protection. There is growing awareness of the effects of prolonged exposure to fine siliceous dusts and action needs to be taken to

(a) limit exposure to levels required to meet statutory requirements and (b) protect the health of workers.

Concrete aggregates, both coarse and fine aggregates, pose risks related to dust generation during production, transport and storage at concrete plants. These dusts can contain fine siliceous material which can fall into the categories of either (a) 'nuisance' dust (which may cause minor respiratory distress), and/or (b) respirable dust which can have greater consequences as previously noted. Using water to manage dusty aggregates is the most common approach.

Admixtures are generally quite benign but Safety Instructions in admixture SDS should be understood and adhered to.

#### 4. CONCRETE PLANTS

Concrete plants are multi-faceted operations. They (a) contain storage facilities for cementitious materials and aggregates, (b) facilitate concrete production via either dry batching or wet batching processes and (c) have considerable and continuous vehicle movement occurring within their boundaries. All these activities create OH&S risks in one form or another. Section 9 of this Guide provides more detail about the nature and extent of these activities.

As with any manufacturing operation, the primary means of controlling OH&S risks include (a) having clearly documented procedures for all activities, and (b) a high level of training of plant staff. In addition to these fundamentals, mechanical systems for guarding of moving systems (e.g. guards and trip switches on conveyors and bucket elevators); warning systems to alert staff of plant operational status (e.g. silo-full alarms); traffic management plans; and use of properly qualified technicians (e.g. electricians) are critical to achieving a 'safe site'. A site safety committee should be in place and meet regularly to review plant operational activities and any resultant OH&S issues. Tool-box talks should be used to keep staff apprised of any operational changes and any other issues that might affect their safety.

The use of mechanical devices for lifting should be in place where needed, and attention to the risk of 'falls from height' are two additional and relevant OH&S concerns in concrete manufacturing operations.

Wearing of PPE should be mandated and managed closely for plant staff and visitors.

Visitor entry to the site needs to be formalised and well managed. Visitors should 'sign-in' and 'sign-out' of the site, and no visitors should move around the site unless accompanied by a member of the plant staff.

Housekeeping, which is often a good indicator of overall approaches to site safety, should be actively assessed and managed.

Traffic management – for both vehicles and foot-traffic – should occur only in designated and marked areas. Site speed limits should be signed and rigorously enforced. To control the amount of traffic movement on site it may be appropriate to, where possible, have raw material deliveries made outside concrete production 'peak-periods'.

#### 5. TRANSPORTING CONCRETE

Plastic concrete is a perishable product and must be transported to the job site with some haste to (a) meet requirements of Standards and specifications that limit the time between mixing and placement, and (b) allow placers sufficient time to place and finish the concrete.

While other options do exist, by far the most common method of transporting plastic concrete is by 'agitator' or 'transit mixer' – these being a common sight on our roads today. Concrete trucks carry a heavy and mobile load – mobile in the sense that the plastic concrete is being continually mixed in the revolving barrel, with this movement having the potential to impact on the stability of the truck as it drives along the road, and particularly as it turns around corners or roundabouts.

The risks related to transporting concrete in this manner have led to the industry developing specific Agitator Roll-Over Prevention training in which drivers are educated about the risks

associated with driving concrete trucks and techniques for preventing accidents (see [ccaa.com.au/training](http://ccaa.com.au/training)).

As well as preventing accidents, it is important that transporting concrete on public roads does not result in spillage from the back of the barrel which may create hazards for other road users.

## 6. SITE ISSUES

From a concrete industry perspective, there are a number of areas of potential OH&S risk at any job site where concrete is being delivered and placed.

At any job site – whether a major inner-city project or a domestic house slab – there is the need for proper management of concrete truck movements. For an inner-city job this may mean proper traffic management at points of ingress and egress at the site using trained traffic management personnel. For a domestic house slab this may mean proper management of the placement of concrete trucks and pumps to allow local traffic to move around the job in an efficient and safe manner.

In addition, the stability of any site is critical if the very heavy concrete trucks are to safely move through or around the site without becoming bogged or tipping. Spotters and other site safety people play a role in managing the safety of the truck at the point of delivery. If a truck has to back up to a pump to unload this process needs to be managed from outside the truck by site safety people or other trained personnel.

Unloading at a pump creates its own issues, particularly if more than one truck at a time is involved. A minimum clearance distance of 600 mm is required between two trucks at a pump, and a spotter should be used to guide the truck movements. Sufficient space for testers to safely carry out their work is also required at the unloading point.

Concrete pumps create their own set of risks. These high pressure, high volume devices need to be the appropriate device for the job and should be well maintained and operated by trained and capable people. As well as ensuring the timely delivery of the concrete to

the job the pump operators also play an important role in ensuring site safety. Pump lines need to be properly primed and cleaned and line connectors need to be appropriate and well fitted and maintained.

As previously noted, plastic concrete is a corrosive, fluid material. Plastic concrete (and in these days that may mean a highly workable, flowing material) should not come into contact with bare skin or other parts of the body (particularly the eyes/nose/mouth), and if it does then appropriate action needs to be quickly taken to thoroughly remove it. Any delay in removing plastic concrete from the eyes may have severe, irreversible consequences. If such an event occurs, immediate first aid is required, followed by a formal medical assessment.

For hardened concrete, a primary concern is the generation of fine dust if the material is sawn or crushed in a way that generates dust. The fine dust will contain a proportion of crystalline silica and it is imperative that no prolonged exposure to such dust occurs.

There are a number of general site-related issues that should be managed to ensure the safety of site personnel during concrete construction, including:

- **Access to forms** – Properly guarded walkways should be provided around formed areas of suspended work so that other trades will have safe access to them before concreting commences, and a safe means of retreat once concreting progresses;
- **Clear areas** – When heavy loads (e.g. formwork, reinforcement, kibbles) are being hoisted by crane, the path over which the load travels should be kept clear of people. Adequate warning for people working in the area should be given before loads are lifted. Clear areas should also be maintained around the anchorages of prestressing tendons while stressing is in progress in case an anchorage failure occurs (also see Part I);
- **Loose objects** – Unfixed materials and hand tools should be kept well away from unguarded edges of suspended

formwork or openings through it or kept entirely within the forms to prevent them falling on people below;

- **Projecting reinforcement** – The cut ends of starter bars which project from construction joints in columns, walls and slabs can be a source of serious injury. As described in Part V, Section 11, (3 – ‘Fixing Steel Reinforcement’) of this Guide, there is a large amount of physical work involved in properly locating and fixing reinforcement on project sites and it is important that related safety issues be understood and any risks removed. One simple solution is the use of proprietary plastic caps (or other simple forms of protector) that can be used to protect workers from unintended contact with projecting reinforcing steel bars;
- **Prestressed concrete** – very high forces are used in both forms of prestressed concrete manufacture. A comprehensive review of the issues and methods used to manage safety concerns in these activities are discussed in Part V, Section 11 (6.6 – ‘Safety’ and 7 – ‘Addendum: Safety Precautions for Prestressing Operations’) of this Guide;
- **Electrical wiring** – Safe practices for temporary electrical installations are set out in AS 3012 and should be followed. Proper safeguards are most important where overhead powerlines cross or are close to work areas, and particularly where cranes are being used;
- **Use of PPE** – The wearing of appropriate PPE is mandated on all sites and subject to ongoing scrutiny by safety personnel and site management. Hi-visibility clothing, steel capped boots and safety helmets are the most fundamental PPE components. Other important parts of PPE kit include work gloves, safety goggles, earmuffs, face masks for dusty environments and sun protection. Two areas of poor practice over many years have been in relation to (a) sun protection and (b) hearing protection. In both cases, impacts on worker health may not be immediately apparent and

the effects in both cases are cumulative and severe;

- **Manual handling** – Modern building sites are far better equipped in relation to handling of heavy loads than once was the case. A common problem of high consequence is that of damage to the spine from workers lifting heavy loads – an issue so severe that in some cases it can prevent workers being able to undertake any type of ongoing employment at all. Wherever possible, mechanical devices should be used to lift or move heavy loads and as a minimum, multi-person lifts should be used to move heavy equipment.

## 7. SUMMARY

In industry in general, OH&S is an area that has come under strong focus for employers and employees alike over the last few decades. Unsafe activities and systems that were once tolerated or accepted on job sites are no longer considered to be acceptable. Laws relating to OH&S have been updated and upgraded in recent years and these laws impose strict requirements on employers and employees to ensure improved OH&S outcomes at all workplaces. Heavy fines and even gaol are likely consequences for those flouting OH&S laws.

The concrete industry is not immune from these changes and, given the quite high risks associated with a number of elements of concrete production and use, this is appropriate.

Concrete raw materials, concrete production, transport of concrete and the ultimate use of concrete on the job site all come with some level of OH&S risk. This Section has outlined the important risks associated with each part of the concrete ‘journey’.

## 8. SUPPORTING DOCUMENTS (AT CCAA.COM.AU)

- 1) *'Workplace health and safety guideline – Management of respirable crystalline silica in quarries'* (January 9, 2020)
- 2) *'Guideline for end tipper unloading exclusion zones'* (August 16, 2019)
- 3) *'Concrete pump delivery guidelines'* (May 6, 2019)
- 4) *'Safe Site Delivery Checklist'* (May 3, 2019)
- 5) *'Guideline for pedestrian and traffic management at concrete plants'* (November 22, 2018)
- 6) *'Guidelines for delivery of bulk cementitious products to premixed concrete plants'* (May 28, 2018)
- 7) *'Safety – it's no accident'* (July 21, 2009)
- 8) *'Working safely with wet concrete'* (July 1, 2004)

## 9. REFERENCES

- 1) Safe Work Australia – <https://www.safeworkaustralia.gov.au/>

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