Hoppers and Chutes

Continuing on the previous newsletter theme around guarding associated with crushing plants, this time we identify some of the key requirements for hoppers and chutes, including the hazards and risks and typical risk control measures used to manage the risks.

The following information only provides a brief overview, for more detailed information, please refer to the applicable approved codes of practice and the relevant Australian Standard guidance material.

Australian Standard 1755 - Conveyors - Safety Requirements, identifies some of the following requirements for hoppers and chutes.

- All openings to hoppers and chutes shall be suitably guarded where there is a risk of contact with dangerous parts or of personnel falling into the opening
- The sides of open hoppers or chutes shall be high enough to prevent material falling into working areas below and open chutes should be provided with plates at the point where conveyors discharge into them to prevent materials from bouncing out of the chute.

When addressing falling into the opening of a hopper or chute, the person conducting business or undertaking (PCBU) must also take into account the requirements of the Code of Practice - Managing Risks of Falls at Workplaces.

The code identifies specific areas that must be considered when identifying fall hazards. These areas include, where a worker or other person is:

- in or on plant or a structure that is at an elevated level
- in or on plant that is being used to gain access to an elevated level
- in the vicinity of an opening through which a person could fall
- in the vicinity of an edge over which a person could fall
- on or near the vicinity of a slippery, sloping or unstable surface.

Hoppers and Chutes

A PCBU should review all means of access around hoppers and chutes, to identify hazards that could give rise to a risk of a fall into the opening of a hopper or chute. This includes but not limited to, stairways, walkways, landings, platforms and loading ramps.

Hazards may be in the form of unprotected edges, unprotected openings in floors, unsecured or loose railings, incorrect (low or high) railing heights, damaged or incomplete accessible structures, and material build-up.

Australian Standard 1657 - Fixed platforms, walkways, stairways and ladders, requires guardrailing on all edges of accessible walkways and platforms, and handrailing on the edges of stairways to prevent the risk of a fall.

The top railing height, measured vertically above the floor, walkway surface, or the nosing of a stair tread, shall be not less than 900mm, or greater than 1100mm, with an intermediate rail (knee rail) section of 450mm above the toe board.

Ladders and ladder landings must also be considered when identifying areas where there is a risk of fall into a hopper or chute opening.

AS 1657 requires a ladder cage to be provided where a person could fall more than 6m from a rung-type ladder, irrespective of landings.

Consideration should also be given to installing a ladder cage for fall heights of less than 6m where there is a risk of injury, providing there is sufficient room to install a cage.

Where it is too short for a ladder cage to be installed, a permanently fixed distance guard (barrier) may be required between two levels, to prevent a worker or other person from falling into the opening of a hopper or chute. Where a ladder cage is provided, the cage shall extend not less than 1000mm or to the height of the guardrail (if provided) above the top of the platform landing.

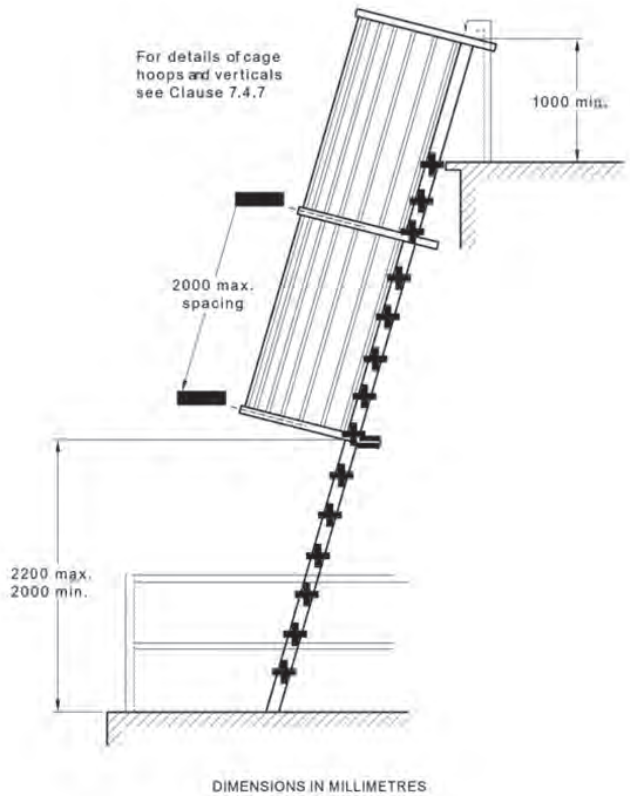

FIGURE 7.8 TYPICAL LADDER CAGE DIMENSIONS

The bottom of the cage shall terminate not less than 2000mm or more than 2200mm above the base of the ladder. When climbing up or coming down ladders, ensure 3 points of contact are maintained at all times.

Material build-up creates uneven surfaces and potential trip hazards on stairways, walkways and platforms. When stood upon, it reduces the effectiveness of the guardrail or handrail, and places a person at risk of falling over the railing, due to the reduced railing height.

A PCBU can identify and address the root causes of material spillage and build-up, through regular plant inspection and monitoring, maintenance and housekeeping activities.

On fixed crushing plants, loading material into the main hopper is generally undertaken with dump trucks, or front end loaders. One of the dangers identified with this process, is that mobile plant could unintentionally travel (driven or reversed) into the hopper opening when loading the hopper.

A common approach to control the risk, is to install a physical barrier (guard), across the loading point of the hopper to act as a bump stop for the mobile plant and a position indicator for the plant operators.

The barrier, generally constructed of reinforced concrete or heavy duty steel beams, is positioned as high as possible, without interfering with the mobile plant loading the hopper.

On mobile crushing plants, it is unlikely that front end loaders would travel into the hopper opening on a primary jaw, due to the difference in plant design.

Nevertheless, the areas on and immediate surrounding mobile crushing plants, should still be reviewed to identify any hazards and risks associated with falling into the opening of a hopper or chute.

Circumstances where material could escape over the sides of a hopper or chute and fall into work areas below, must be identified and eliminated, or risk controls implemented to manage the risks.

Design is one of the areas that can contribute to material escaping and falling into work areas below. The sides of a hopper or chute, should be of equal height to control and maintain a specific level of material.

The main hopper on a fixed crushing plant, should also have barriers (guards) located on either side of the hopper, to contain any material that may roll out of the loading point, or that may fall from the bucket or tray during the loading process.

The barrier should be made of materials such as a reinforced concrete barrier (wall), or heavy duty steel plating to withstand forces that may be placed against it during clean up.

Overloading hoppers and chutes is another area that can contribute to material escaping and falling. On a fixed crushing plant, the control room operator (where appointed), should be the designated person responsible for managing the loading process.

Control room operators should have a clear view of material inside the main hopper (and other critical areas around the plant), in order to appropriately manage the amount of material in the hopper and crushing plant circuit.

A direct line of sight from the control room is the most practicable way from the control room.

Where vision is restricted, closed circuit television (CCTV) cameras positioned around the hopper and crushing plant, with display monitors located in the control room, provide a good alternative.

Measures must also be in place to communicate with the mobile plant operators who are loading the hopper. Signal lighting positioned at the hopper loading point, and the use of two way radio communications, are effective means to communicate and control how much material is to be loaded.

Other controls such as steel plating, chains / links may also need to be installed on the exiting side of the hopper, in order to prevent material from rolling out of the hopper, over the sides of the exiting chute and onto walkways and work areas below.

Where a foreseeable risk of being struck by falling material still remains, steps must be taken to prevent all personnel from entering an area (danger zone) where they could be struck by falling material.

Controls in the form of fixed distance guards and lockable gates or timed interlocked systems should be considered to prevent access into the danger zone.

A safe systems of work must also be established which include conditions of entry into the danger zone areas, and warning signage should be displayed to alert others of the dangers and entry requirements.

Hopper Loading Ramps

Risk controls should be in place to prevent any person from entering a hopper loading ramp area on foot, whilst the crushing plant and ramp area are in operation.

From a dump truck, front end loader cabin, it can be difficult for an operator to see a person who may have entered their work area, and this places that person at significant risk of being struck by the operating mobile plant.

Exclusion zones should be established with physical barriers such as fencing/ gates, and signage to prevent workers and other persons from entering a loading ramp area from crushing plant stairway or walkway.

Hot seat changeovers, should only occur in designated parking areas, away from a hopper loading ramps and trafficable areas, where mobile plant are fundamentally stable and the area is safe to conduct the changeover.

Edge protection for mobile plant can range from, but not limited to, earthen formed safety banks, to heavy duty steel guard railing.

It should be place or installed on the edges of a loading ramp or roadway, where there is a risk injury to a person or damage to plant, as a result of mobile plant travelling over an unprotected edge.

Spilled material on the floor of a fixed crushing plant loading ramp, can increase the floor height, and the risk of mobile plant travelling over a barrier (bump stop) and into the hopper opening.

Conducting regular inspection and cleaning of the loading ramp floor, will maintain the correct floor height.

Dangerous Parts

A PCBU must identify and suitably guard hoppers and chutes openings where a worker or other person is at risk of coming into contact with dangerous parts.

Where access to a dangerous part is not necessary during the operation, maintenance or cleaning of the plant, guards must be in the form of a permanently fixed physical barrier.

Where access is required, the guards must be an interlocked physical barrier. Where it is not reasonably practicable to use permanently fixed or interlocked guards, then guards must be of a physical barrier type that can only be altered or removed by the use of a tool.

Wherever a person has access to a loading, unloading, work station, transfer, or discharge point, guards in the form of guard-rails, fences, or close fitting guards shall be installed to prevent injury to that person.

AS 1755 - Conveyors and AS 4024.1 - Safety of Machinery detail specific requirements that must be complied with when designing and building guards that prevent persons from encroaching into a danger zone on plant.

Some examples of specific requirements relate to ergonomic data and specific measurements range from reaching over protective structures, reaching around with limitations of movement, and reaching in and through regular openings.

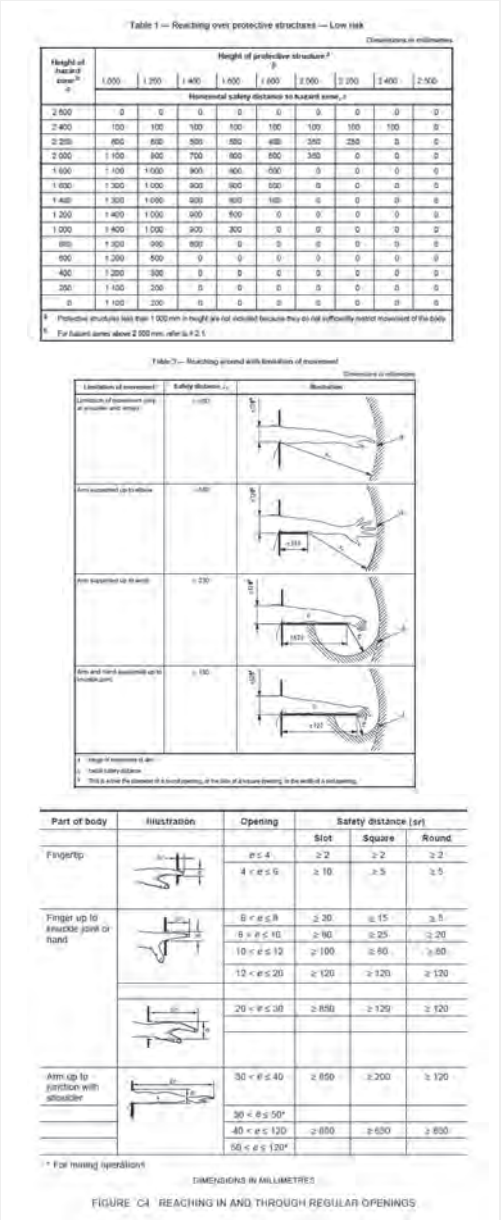

FIGURE C4 REACHING IN AND THROUGH REGULAR OPENINGS

MAQOHSC Support

Under the Work Health and Safety Act 2012 (SA), The person with management or control of fixtures, fittings or plant at a workplace" (the PCBU) "must ensure, so far as is reasonably practicable, that the fixtures, fittings and plant are without risks to the health and safety of any person".

The Approved Code of Practice - Managing the risks of plant in the workplace, provides practical guidance on how to manage health and safety risks of plant once plant is in the workplace, from plant installation, commissioning and use through to decommissioning and dismantling. Other approved codes of practice on various types of plant may also be referenced.

MAQOHSC Work Health and Safety (WHS) Specialists can provide onsite support and guidance around the requirements of the South Australian Work Health and Safety Legislation, Approved Codes of Practice and Australian Standard guidance material.

If you would like one of our WHS Specialists to assist you in this area, or any other matter of workplace health and safety, please feel free to contact us via or phone 8204 9842 to arrange a time for one to attend your site.