Reducing risk in the premixed concrete industry

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EPA VICTORIA

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CEMENT CONCRETE & AGGREGATES AUSTRALIA

CMPA

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Wording of the performance outcomes (section 4) has been modelled on the *General environmental duty Code of practice for the concrete batching industry* (August 2014) to assist industry in following a national risk-based approach to preventing harm to human health and the environment.

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1. About this guideline

Originally published in 1998, EPA's *Environmental guidelines for the concrete batching industry* (publication 628) were intended to support the industry to operate without causing adverse environmental impacts. Until 2007, concrete batching sites were defined as 'scheduled premises' – meaning occupiers were required to obtain an EPA works approval and/or licence, and/or provide a financial assurance.

The focus of this updated guideline is to support operators of concrete batching plants and pre-cast concrete manufacturing plants to manage the risk of harm to human health and the environment through good industry practice.

In publishing this guideline, EPA Victoria reinforces that it is the responsibility of operators to identify, manage and control the risks that pollution or waste from their activities may pose to human health and the environment.

1.1. What does it cover?

This guideline covers:

- a summary of the concrete batching process
- how to assess, manage and control risks on your site
- practical performance outcomes
- examples of controls you can put in place, that can help you minimise risk of harm.

1.2. Why is it important?

As an industry operator, it is your responsibility to manage your business to reduce risk to human health and the environment. This guideline provides suggested controls to assist you in achieving the performance outcomes outlined in section 4, by reducing or eliminating potential risks to air, water, soil and noise.

Reducing or eliminating risk is important because the materials used, and the size of the industry, have the potential to create considerable harm. Unless risks are well managed, industry activities could:

- impact surrounding residential communities
- generate dust releases to air
- generate high volumes of alkaline and contaminated washwater for disposal, accumulate sediment and block drains
- pollute water through stored chemicals and fuel
- generate waste concrete to landfill
- generate excess noise.

Assessing and controlling risk in a structured way will help you to:

- prevent harm to human health and the environment
- comply with your legal obligations
- meet community expectations.

Industry guidance: supporting you to comply with the general environmental duty
(EPA publication 1741)

1.3. How to use this guideline

This guideline follows a risk-based approach to preventing harm. It has been informed by EPA's guide to assessing and controlling risk (publication 1695). Any hazards not specifically identified in this guideline that arise in relation to operational activities can be assessed and controlled by applying the principles set out in publication 1695.

Assessing and controlling risk: a guide for business (EPA publication 1695)

Symbols used in this guideline:	
	Key message.
	Further information.
	Performance outcomes and examples of controls that may assist you to achieve them.
	Focus on additional definitions, explanations and examples.

2. About the concrete batching process

The premixed concrete industry manufactures many products. These include:

- concrete for residential housing
- high-tensile concrete for major infrastructure projects
- specialist concrete products
- concrete slurry
- dry-mix concrete
- mortar.

Concrete is a mixture of cement (highly alkaline), sand, rock aggregate (graded per size and character), and high volumes of water (e.g. >100L per m^3 of concrete). It may also include fly-ash – a highly alkaline by-product of coal combustion – or other supplementary cementitious material (SCM) such as slag, or silica fume.

Components of concrete include calcium, alumina, magnesia, iron and sulphur oxides.

Specialist concrete products may include additives such as crushed glass, decorative pebbles, and chemical admixtures that modify concrete properties and setting rates.

Premixed concrete is a perishable product. It is made, or “batched”, near the end-user and typically delivered within the hour to construction sites, often close to residential areas.

The batching process involves weighing ingredients in weigh hoppers, transferring them to agitator trucks, and mixing with water inside the barrels of the trucks. The loads are slumped, inspected, and immediately transported to the end user. Figure 1 (overleaf) shows an example concrete batching process flow.

For the purpose of environmental regulations, concrete batching plants are considered:

- commercial
- industrial
- trade premises.

This guideline refers to two types of concrete batching plants.

2.1. Overhead bin batching plants

Overhead bin batching plants, with underground storage, are highly automated high capacity plants. They typically dispatch ≥300-700 m^3 of concrete a day.

At these plants:

- sand and aggregate are stored in underground (drive-over) storage bins
- weigh hoppers (roofed or otherwise enclosed) are situated beneath the overhead storage hoppers
- feed pipes, valves, filters, and all materials withstand silo pressures and the corrosive nature of products
- raw materials and additives are weighed, and correct proportions transferred to overhead hoppers by conveyors and dropped into agitator trucks in loading bays below
- cement, fly-ash and other SCM are stored in overhead silos, weighed in overhead weigh hoppers and added
- ingredients are mixed and wetted inside the agitators
- agitator trucks then move to slumping stations, where loads are ‘slumped,’ inspected, and trucks washed down, prior to dispatch.

2.2. Front-end loader batching plants

Front-end loader batching plants, with ground level storage, are small to medium plants dispatching ≤300m^3 of concrete a day.

At these plants the process outlined for overhead batching plants is modified by using front-end loaders to transfer sand and dampened aggregate to roofed (or otherwise enclosed) weigh hoppers. This is done through covered conveyer belts from ground-level storage bays.

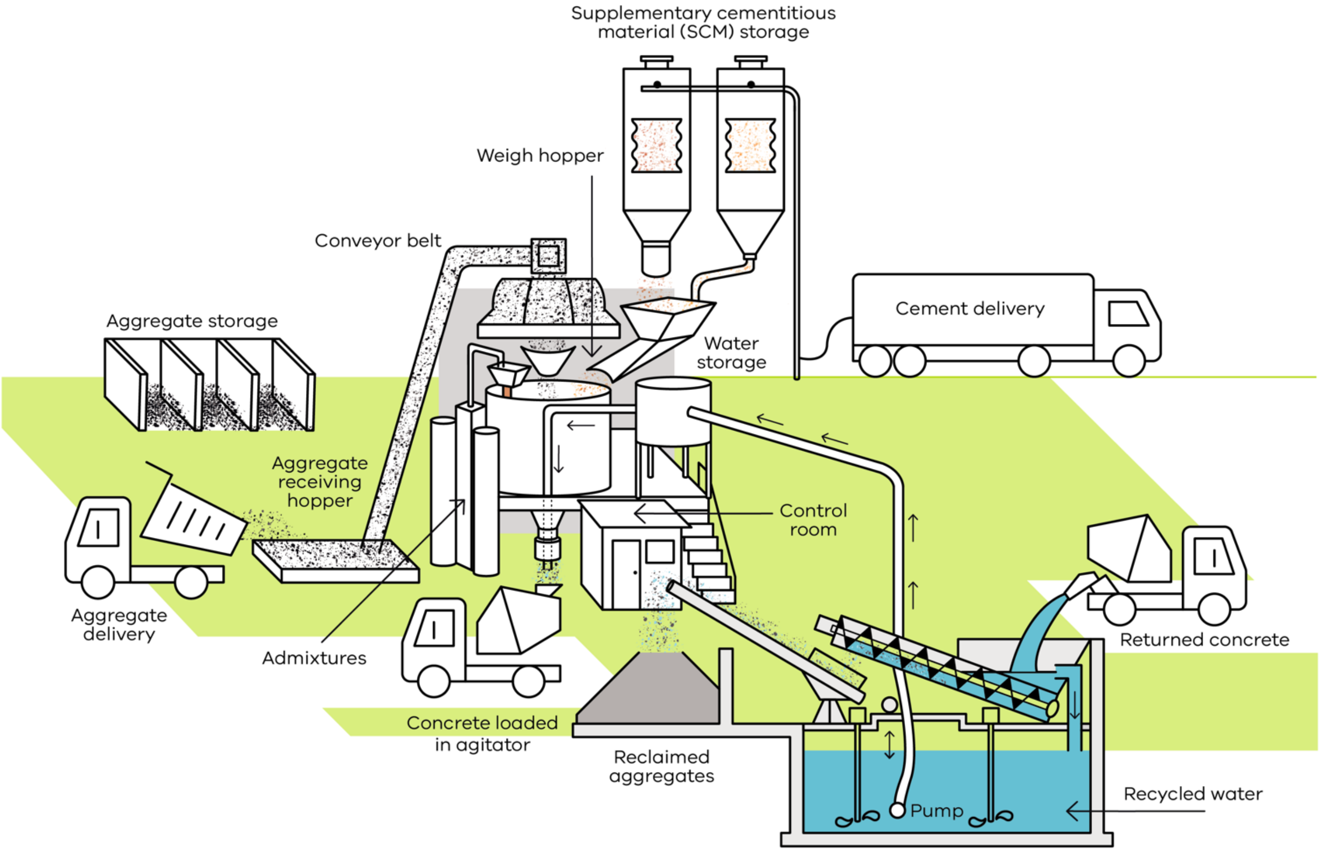

Figure 1. A flow-chart illustrating the concrete batching process. Adapted from Dr. Adel El Kordi, CVLE 519 Concrete Technology.

Guidelines for Delivery of Bulk Cementitious Products to Premixed Concrete Plants
Cement Concrete and Aggregates Australia, March 2018

3. How to manage risk

You need to know how activities in the premixed concrete industry can create hazards and pose a risk of harm to human health and the environment.

A hazard is something that has the potential to cause harm. Risk is the likelihood and consequence of that hazard to human health or the environment.

It is your responsibility to understand and assess the risks. This includes understanding how concrete batching activities can harm air, water, land, and cause harm from waste and excess noise.

You also need to manage those risks onsite by taking reasonable steps to put appropriate controls in place.

Figure 2 is an example of a risk-based approach you can use to manage risk at your site. This suggested approach is made up of four connected simple steps.

Figure 2. Four-step process for controlling hazards and risks.

The actions you take at each step in this process may differ depending on the scale of your operations, the circumstances of your plant and the nature of the risk. You may decide to use a different risk management approach that is more appropriate for your operations.

You need to regularly review these steps to manage risk effectively.

Assessing and controlling risk: a guide for business (EPA publication 1695)

There are many resources on general risk management for businesses. These include Australian/New Zealand or International Standards, such as ISO 31000 *Risk Management*.

3.1. Step one: identify hazards

This step is about identifying hazards in your business activities. A hazard is something that might cause harm, for example through the air, water or soil. Record and document these in a *hazard and risk register*.

Some ways you can identify hazards include meeting with your employees and stakeholders to discuss aspects of your work that might present a hazard, as well as walking around your workplace to review physical structures and work systems and procedures.

Some examples of hazards include:

- excessive dust
  - Where premises are unsealed, dust from vehicle movement, poor management of raw materials, and dust/cement tracking by vehicles could combine to spread dust around the local environment.
- alkaline water and sediment
  - Agitator trucks deliver concrete to construction sites, therefore alkaline water and sediment discharges at point of delivery could also occur if trucks were rinsed away from home-base after unloading and rinsate-capture and recycling were lacking.
- excessive noise.
  - Typical noise emissions from concrete batching plants can be disruptive to surrounding residential communities, unless these emissions are adequately managed. Disturbing effects of noise depend on the level and character of the sound, such as pitch, tone, intermittency, and frequency.

Noise emission assessments can be used to identify risk areas. Assessments can be only be done by suitably qualified acoustic technicians.

Ongoing (or periodic) noise monitoring can assist in building a baseline understanding of compliance against regulatory noise limits.

How to record and document hazards

Assessing and controlling risk: a guide for business (EPA publication 1695) provides an example hazard and risk register.

You may need to adjust this register to better suit the complexity of your hazards and risks.

- Noise guidance for businesses (EPA website)
- Engaging consultants (EPA website and publication 1702)

3.2. Step two: assess risks

This step is about assessing how the risks associated with each hazard you identified in step one could lead to harm, how severe that harm could be, and the likelihood of it occurring.

Risk is the threat that a hazard poses to human health or the environment.

In assessing risk, consider likelihood and consequence of the hazard causing harm. You can refer to information you may have about previous occurrences. Think about how pollution and waste from your operations may travel offsite, causing harm to human health and the environment.

Risk can be acute, or ongoing and cumulative.

The biggest potential *acute risk* to surrounding communities, stormwater and air quality is posed by a potential catastrophic equipment failure. This could lead to silo overfill, filter blow-out and corrosive highly alkaline cement and toxic fly-ash being released into the local environment.

Fly-ash is a by-product of high temperature coal combustion. It contains heavy metals, including arsenic, cadmium, lead, mercury, and nickel. Depending on the size fraction of the particle it may, when inhaled, penetrate the blood stream, lungs and other body organs.

The biggest potential *ongoing and cumulative risk* is posed to stormwater by alkaline, and contaminated washwater and sediment.

Conditions of pH >8.5 cause severe disturbance to most fish, reducing biodiversity and abundance of zooplankton. This may lead to flow-on biodiversity losses.

Without effective segregation (see box below) an entire site could be classified as polluted. Preventing this requires daily action.

Managing stormwater pollution

Sites may be segregated into three areas according to risk to stormwater:

- ‘**Polluted area’** – stormwater runoff is at high risk of contamination by high pH cementitious components (concrete washwater; liquid washout/slurry; solid washout), and chemical admixtures.
- **‘Dirty area’** – stormwater runoff is at high risk of contamination from sand and aggregate storage and handling, and at a lower risk from cementitious components.
- **‘Clean area’** – typically offices and passenger vehicle carparks where stormwater runoff is of lowest risk of contamination by concrete pollutants.

- *Guidelines for Delivery of Bulk Cementitious Products to Premixed Concrete Plants* Cement Concrete and Aggregates Australia, March 2018
- *Liquid storage and handling guidelines* (EPA publication 1698)
- *Reducing stormwater pollution from concreting operations* (EPA publication 982)
- *First flush and water management systems: Guide and principles* Cement Concrete and Aggregates Australia, August 2013
- Noise guidance for businesses (EPA website)

3.3. Step three: implement controls

This step is about how you can control the hazards and risks you have identified.

A control prevents harmful events from happening in the first place (preventative controls) or limits the consequence or damage from a harmful event (mitigating controls).

Applying the hierarchy of controlling hazards and risks (figure 3) can help you understand how effective your controls of hazards and risks are.

When assessing how to eliminate or mitigate hazards and risks, it is important to consider your site holistically, and design areas and zones for set activities. This reduces both the risk of harm and the cost of preventing it.

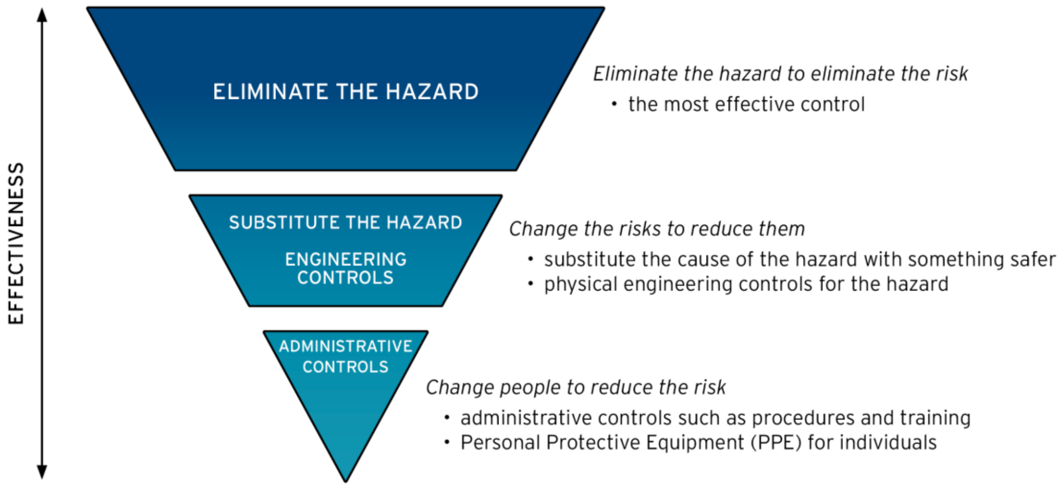

Figure 3. Hierarchy of controlling hazards and risks.

Examples of controls from concrete batching include:

- At front end loader batching plants, raw materials are used and replenished multiple times a day, often in confined spaces. This poses a challenge to managing the risk of dust emissions, especially on hot and/or windy days. The risk may be managed by installation of roofed bays, increasing the height of walls, installation of ‘do not overfill’ signs, and/or over and above water sprays.
- Sites with ground level bays may manage dust using water sprinklers and capturing and reusing water. Risks may be reduced by storing materials underground.
- Alkaline washwater discharges to stormwater drains may be eliminated by isolating drains from concrete production. Sediment load may be reduced by installing a triple interceptor system (or equivalent).

Controls you can put in place

Section 4 provides examples of controls you can put in place at overhead and front-end loader batching plants.

The controls you put in place will depend on the circumstances of your plant and the nature of the risk.

The most effective control is to eliminate the hazard.

3.4. Step four: check controls

This step is about making sure the controls you put in place to prevent or mitigate hazards or risks are effective.

Regularly checking whether controls have been properly implemented and effective can help you identify potential failures, as well as continuous improvement opportunities.

You can check the effectiveness of your controls by:

- reviewing your environmental monitoring data in the areas of air, water, waste and noise
- using the checklists for control options in section 4 to identify whether controls have been implemented
- regular maintenance, inspection or testing of controls to ensure effectiveness
- record reviews of control implementation and effectiveness in your risk register
- review incidents and near misses to ascertain whether the controls have been adequate.

How to check controls

Assessing and controlling risk: a guide for business (EPA publication 1695) includes a list of things you can put in place to maintain your controls and ensure they remain effective.

4. Control options for minimising risk of harm

This section provides examples of control options you can put in place to achieve the performance outcomes below. These outcomes can help you focus your efforts to eliminate or reduce the risk of harm to human health and the environment.

☑	**Air**	Dust and particulate matter associated with all concrete batching activities is controlled to minimise risk of harm to air.
☑	**Water**	Stormwater and washwater is managed to prevent release of contaminants off-site and to soil, surface water and groundwater.
		All chemicals (including fuels and waste) are managed, stored and handled to prevent releases off-site and to groundwater.
☑	**Waste**	Waste generation and disposal is minimised. Any waste generated is managed to prevent harm to human health and the environment.
☑	**Noise**	Industrial noise emissions are minimised to comply with regulatory noise limits and prevent harm to sensitive receptors.

Following the four-step process to manage risk (section 3), you should regularly assess your controls to ensure their effectiveness. It is a good idea to make this part of your business-wide risk management process.

Depending on the circumstances of your plant and the nature of the risk, you may not need to put all control options in place. *They are suggestions only*.

You can put in place other control options that may be more effective at your plant, so long as you still meet that performance outcome.

4.1. Performance outcome: air

☑	**Air**	Dust and particulate matter associated with all concrete batching activities is controlled to minimise risk of harm to air.

Control options checklist

Transport of raw materials	
☐	Transport sand and aggregate in trucks with enclosed top covers.
☐	Transport damp sand and aggregate or wet on receipt, to avoid dust dispersal during unloading.
☐	Transport SCM in fully enclosed containment systems.
Storage and transfers of raw materials (sand and aggregate)	
Underground storage	
☐	Underground storage optimised for moisture levels, to avoid dust dispersal during transfers.
☐	'Do-not-overfill' management procedures in place and enforced.
Ground level storage	
☐	Storage bays enclosed on three sides by solid walls (figure 4).
☐	Storage bays fitted with additional screening over and above wall height as required (e.g. shade cloth).
☐	Storage bays fitted with functional, well-maintained sprinkler systems.
☐	Storage bay stockpiles kept damp to maintain adequate moisture levels to prevent dust dispersal.
☐	Storage bay stockpiles kept at least: (i) 0.5m below the top of panels (ii) 0.5m inside open end of bays.
☐	Storage bay panel walls clearly indicate maximum fill height level and "Do not overfill" warnings.
☐	Other 'do-not-overfill' management procedures in place and enforced.
Overhead silos (cement and SCM storage)	
☐	Fitted with fully enclosed pneumatic transfers.
☐	Fitted with emergency pressure alert and automatic cut-out overfill protection.
☐	Fitted with back-up over-fill protection.
☐	Fitted with high quality dust filters.
☐	Burst-bag detector system ducted to approximately 1m above ground-level adjacent to filling pipe.
☐	Emergency pressure alert/overfill protection systems well maintained.
☐	Filter type ensures maximum performance such as reverse pulse filters.
☐	Filters routinely maintained and replaced, and maintenance records kept.
☐	Emergency management plan, procedures for cement and SCM recovery and lawful disposal in place to prevent air emissions and stormwater contamination in the event of catastrophic equipment failure resulting in silo 'blow-out'.

Transfer of sand and aggregate	
☐	Front-end loader transfers prevent dust emissions by adequate moisture levels.
☐	Hoppers and dusty transfer points – all screened (or otherwise sheltered) from wind.
☐	Dry dust extraction systems fitted around hoppers; open sides of enclosure.
☐	Conveyor belts fully enclosed.
☐	Conveyor belt spill trays capture spillage fitted, to contain spillage and accumulated dust.
☐	Conveyor belts routinely maintained, and maintenance records kept.
☐	Spills from conveyor belts and other equipment monitored and promptly cleaned.
Hardstand (paved/sealed) surfaces	
☐	Hardstand installed across entire site.
☐	Hardstand installed, as a minimum, in key production areas: • Internal roads used by agitator trucks. • Underneath silos (fly-ash /cement storage areas). • Concrete-mix loading bays. • Slumping stations. • Truck wash areas. • All areas of water recycling system. • All areas of concrete recycling system. • Reclaimed water storage tanks area. • Truck maintenance areas. • Chemical storage areas. • Other areas as required.
☐	Hardstand appropriately designed, contoured and bunded.
☐	Hardstand adequately maintained by regular sweeping to prevent tracking out.
☐	Hardstand management process in place to: • prevent and promptly clean spillages • prevent dust accumulation on driveways, internal roads, along property boundaries, etc.
☐	Significant cracks promptly repaired.
☐	Speed limit on internal unsealed roads enforced (to ‘drop dust’).
Agitator truck loading and wash down	
☐	Loading bays roofed or otherwise enclosed.
☐	Loading bays and slump stations fitted with grated floors to capture washwater/sediment.
☐	Loading bays fitted with dry dust extraction systems *or* water spray bar for dust suppression.
☐	Trucks washed with water to remove all dust on dispatch and prevent tracking outside premises. Focus includes, as applicable: • draw bar • wheels • tailgate • chutes • barrel • spill tray.

Agitator trucks and plant machinery	
☐	All diesel vehicles and machinery fitted with diesel particulate filters (DPF).
☐	DPF filters routinely replaced, with records kept.
☐	Fuels, waste oils and diesel exhaust fluids to be handled and stored according to liquid storage and handling guidelines.
☐	Agitator trucks routinely maintained, and maintenance records kept.
☐	Plant equipment routinely maintained, and maintenance records kept.
☐	Emission-control equipment routinely maintained, and maintenance records kept.
Boundary screening	
☐	Additional screening at boundaries of premises and around dust-generating areas.

- *Liquid storage and handling guidelines* (EPA publication 1698)
- *Guidelines for Delivery of Bulk Cementitious Products to Premixed Concrete Plants*. Cement Concrete & Aggregates Australia, March 2018

Figure 4. Ground level storage bays. *Source: Cement Concrete and Aggregates Australia (CCAA).*

✓ Storage bays enclosed on three sides by solid walls, with a sprinkler system installed.

✗ Bays are filled to the top and beyond the front end of the bay.

Performance outcomes: water

4.2.1. Stormwater and washwater

☑	**Water**	Stormwater and washwater is managed to prevent release of contaminants off-site and to soil, surface water and groundwater.

Control options checklist

Washwater (process water) capture and recycling	
☐	Plants operate to a well-developed and documented water management plan.
☐	All washwater from concrete manufacture recycled back into production via a fully integrated system including, collection, reclamation, capacity storage, and re-use.
☐	Washwater recycling system is fully isolated from stormwater drains.
☐	Truck and equipment wash areas drain to water collection and recycling pits.
☐	Reclaimed process water storage tank volume able to retain all process water.
Stormwater capture onsite (first flush capture)	
☐	Stormwater management plan documented and regularly reviewed.
☐	Stormwater is directed to a sump to be recycled and does not divert to offsite stormwater drains.
☐	Tank storage capacity includes provision for first flush, contaminated water capture following rain events.
☐	First flush storm water capture in place.
☐	First flush system size: system contains and re-uses runoff from the first 20mm of rain over a 24 hour period.
☐	First flush storage size calculated based on surface area that generates polluted run-off: *storage capacity* (m^3) = 0.02 (m) x *catchment area* (m^2)
Hardstand surfaces	
☐	Installed as per Environmental performance outcome: air.
☐	Incorporated into washwater reclamation and recycling systems by being contoured and bunded.
☐	Contoured and bunded to: • direct all washwater onsite to front-end loader accessible settling pits (wedge pits) • intercept washwater at site entrance/exit points (to prevent tracking out) • intercept all stormwater drains and direct washwater away from drains to sediment-settling pits • direct washwater from slumping stations to sediment-settling pits • direct all washwater from truck-wash stations to sediment-settling pits.
☐	Drainage system servicing hardstand areas in place. Routine maintenance ensures drains and recycling systems do not become blocked with sediment.
☐	Bunded along the edge of premises to contain washwater and stormwater (figure 5).
☐	Maintained by regular sweeping to prevent sediment build-up and tracking out.

Load slumping and truck wash on dispatch	
☐	Slumping uses recycled water or rainwater.
☐	Truck washing uses clean water (preferably rainwater).
☐	Washwater directed to sediment settling pits.
☐	Slump stations/truck wash areas fitted with grated floors to direct run-off to sediment settlement pits (figure 6).
☐	Grated floors system routinely maintained to prevent blockage.
Stormwater drains	
☐	No discharges of process water to stormwater drains (concrete production fully isolated from drains) ‘emergency-only’ discharges, and neutralised/sediment settled.
☐	Triple interceptor (or equivalent) in place for water treatment prior to discharge.
☐	Triple interceptor (or equivalent) routinely maintained.
☐	Triple interceptor (or equivalent) final water monitored and within discharge limits, with records kept.
☐	Plant segregated into three areas to minimise risk of contamination of stormwater: (1) ‘Polluted’ area (2) ‘Dirty’ area (3) ‘Clean’ area and proactive controls implemented to prevent cross contamination by cementitious components into areas (2) and (3).

- *Liquid storage and handling guidelines* (EPA publication 1698)
- *First flush and water management systems: Guide and principles* Cement Concrete and Aggregates Australia, August 2013

Figure 5. Roofed truck washout station. *Source: Cement Concrete and Aggregates Australia (CCAA).*

✓ Bunded concrete hardstand and boundary barrier prevent washwater from leaving the site.

Figure 6. Slump station with grated floor to capture washwater for recycling back into production. *Source: Cement Concrete and Aggregates Australia (CCAA).*

✓ ‘Tracking-out’ of cementitious material on trays and wheels is prevented.

4.2.2. Chemicals

Water	All chemicals (including fuels and waste) are managed, stored and handled to prevent releases off-site and to groundwater.

Control options checklist

	Ensure systems are in place to ensure only clean water leaves site
☐	First flush system in place.
☐	Triple interceptor system (or equivalent) in place.
☐	Oil/water separator systems in place.
☐	Uncontaminated storm water diverted away from all areas where contaminants may occur.
☐	Dedicated roofed chemical storage area in place.
☐	Located within bunded or secondary containment areas: • Chemical delivery and dispatch. • Chemical storage. • Piping and transfer areas. • Process tanks areas. • Vehicle/equipment cleaning areas. • Fuel, fuel additives, lubricants and oil storage areas. • Derived liquid waste.
	Chemical and liquid storage area (incl. chemical waste storage)
☐	Dedicated well lit, roofed impervious solid-walled area (bunded or a compound, refer figure 7).
☐	Isolated from stormwater to prevent rain entry, pollutant overflow, rusting of metal drums and stormwater contamination.
☐	Well-ventilated (e.g. vents in walls, ceiling, or open windows to cool, and prevent fume build-up).
☐	Bund, or secondary containment area, holds: • 110% volume of largest tank or 25% maximum drum inventory, whichever greater • 110% of combined volume of all tanks, where tanks are connected.
☐	Containers and tanks set back from edge of bund or secondary containment area.
☐	Drain valves and pump-out valves locked in closed position.
☐	Materials stored are: • segregated – keep apart materials that cannot be stored safely together • clearly labelled • displaying relevant warning signs.
☐	Routinely inspected and maintained (whole area and bunding) to ensure free from cracks.
☐	Chemical spill kits onsite are: • strategically positioned • prominently labelled • service-ready. All staff are trained in correct use.
☐	Secured against unauthorised access.

Acceptable types of temporary bunding or other secondary containment	
☐	Temporary bunds must not replace chemical storage requirements (above). They are: • non-combustible • resistant to chemicals stored, and • positioned to prevent flow out of bund.
☐	Commercial pallet bunding units may be used for minor temporary chemical storage.
☐	Splash shields may be used to deflect leaks within a bunded area.
Chemical management and handling (including waste chemicals)	
☐	Minimise use of toxic wash chemicals and detergents.
☐	Chemicals ordered in smallest quantity practicable to reduce storage needs.
☐	Surplus chemicals are not accumulated.
☐	Up-to-date records of chemicals and volumes stored.
☐	Safety Data Sheets (SDS) onsite are: • up-to-date • accessible • applied to practice.
☐	Containers are labelled and display hazard ratings from point of entry to correct disposal.
☐	Staff adequately trained in chemical use and safety.
☐	Staff read and understand chemical labels and SDS of products they use.
☐	Emergency management plan is in place to manage spills.
☐	Chemical spills/leaks cleaned-up promptly. None leave site and escape to the environment.
☐	Additional storage requirements for acids, flammable chemicals, and some other liquids in place.
Stormwater drains	
	Practices to avoid all discharges of all chemicals to stormwater drains in place: • Secondary containment of chemical storage and handling areas (incl. concrete admixtures). • Secondary containment of fuel, fuel additives, lubricants, oils storage area. • Secondary containment of all derived liquid wastes. • Other means of achieving this.

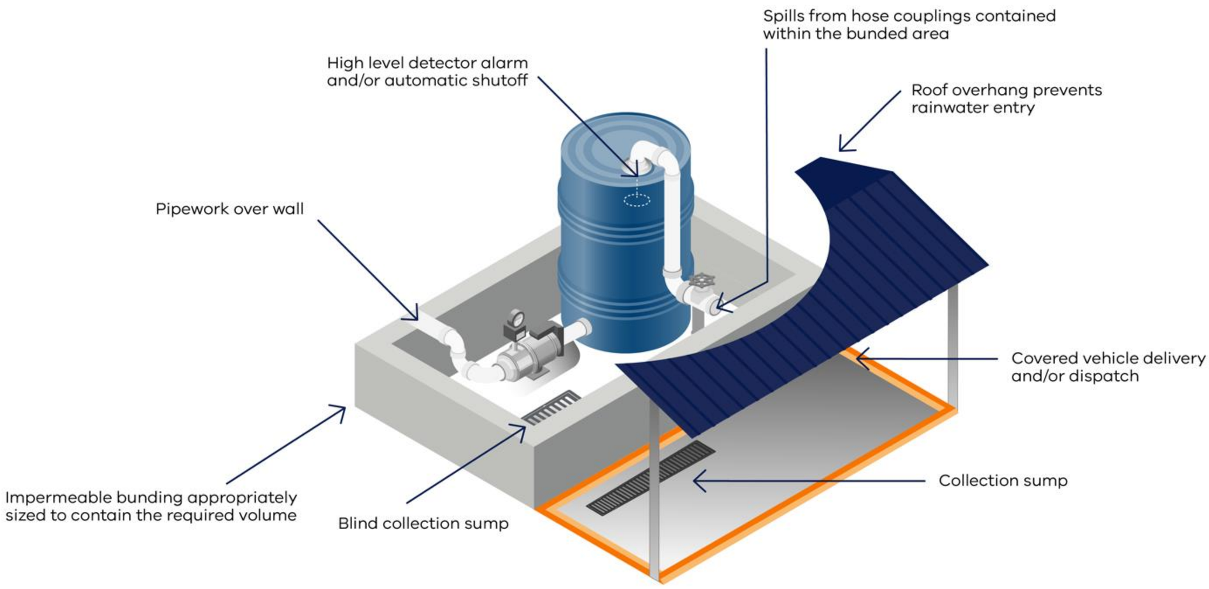

Figure 7. Chemical storage bunding at a glance.

- *Australian Standard AS1940: 2017- The storage and handling of flammable and combustible liquids*
- *Liquid storage and handling guidelines* (EPA publication 1698)
- *Solid storage and handling guideline* (EPA publication 1730)
- *A step by step guide for managing chemicals in the workplace*. WorkSafe Victoria, June 2017

4.2. Performance outcome: waste

☑	**Waste**	Waste generation and disposal is minimised. Any waste generated is managed to prevent harm to human health and the environment.

Control options checklist

Waste management hierarchy	

☐	Hierarchy (from most to least preferred) implemented for all wastes:
	• Avoid producing waste.
	• Minimise waste production.
	  o Minimise generation of excess product by careful planning and execution of concrete production.
	  o Truck capacity is effectively managed; overfilled trucks do not leave the plant. Any spills that occur while in transit are cleaned up promptly.
	  o Reduce the volume of water used during washouts.
	  o Promote waste reduction, resource recovery and resource efficiency.
	• Reuse remaining waste.
	  o All excess-order concrete is returned to point of origin for reclamation, incorporated into future deliveries (figure 8), or delivered to a third party recycler.
	• Recycle remaining waste.
	  o Delivery contractors not forced to dispose of waste concrete in landfill or on construction sites, instead:
	    ▪ Recycle wet-waste concrete back into production as much as feasible.
	    ▪ Recycle wet-waste concrete into other production (e.g. concrete manufacture of low strength concrete products by third parties).
	    ▪ Reduce solid concrete recycling by above processes as much as feasible, to reduce energy inputs required to crush solid concrete into re-usable aggregate.
	    ▪ Recycle remaining solid waste concrete back into production as aggregate.
	• Disposal to landfill as a last resort.
	  o All waste disposed of in accordance with waste regulations.
	  o Solids must be inert.
	  o Ensure illegal dumping of waste concrete is prevented.

Agitator truck wash-out management after delivery	
☐	Agitator truck rinsing after concrete delivery back at batching plant.
☐	Agitators rinsed with recycled washwater/rainwater and wash-out re-claimed into production (refer figures 9 and 10).
☐	Washwater from wash stations directed to sediment settling pits and recycled.
☐	Wet concrete mix recycled and waste concrete dried and recycled by third party contractors as aggregate by crushing.

Producing waste has environmental impacts from resource extraction to point of disposal.

Disposal in landfill has significant environmental impacts due to transport, leachate, and greenhouse gas emissions.

Waste must always be transported safely and lawfully. Proportionate controls should be applied according to the type of waste.

Figure 8. Waste concrete returned to batching plant for reclamation and recycling. *Source: Cement Concrete and Aggregates Australia (CCAA).*

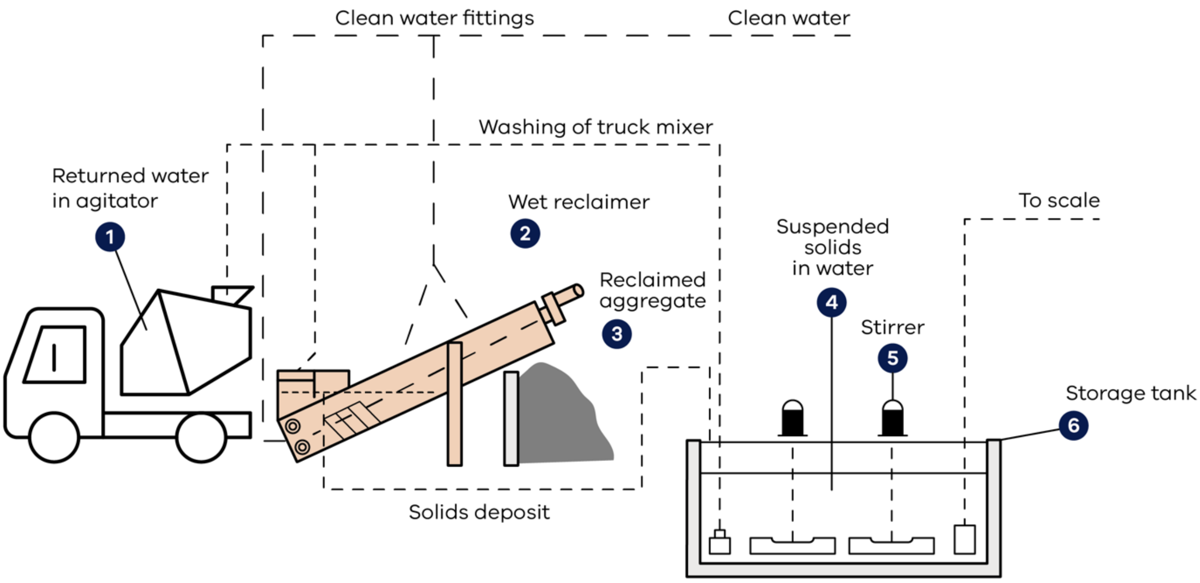

Figure 9. Example system for recycling washwater and aggregate recovery from fresh waste concrete. Adapted from*: Kien, Tong., Le Thành., and Pham, Lanh.* (2013). *Sustainability in the concrete industry for construction of mega cities.*

Figure 10. Washout pits being emptied. *Source: Cement Concrete and Aggregates Australia (CCAA).*

4.3. Performance outcome: noise

☑	**Noise**	Minimising industrial noise emissions to comply with regulatory noise limits and prevent harm to sensitive receptors.

Control options checklist

Design principles for new or redeveloped sites	
☐	Entrance and exits sited away from noise sensitive areas.
☐	Underground storage installed in preference to ground level bays.
☐	Noise-generating equipment located away from noise sensitive areas.
☐	Conveyor transfers in lieu of front-end loader work.
☐	Sirens located away from sensitive areas and used only in emergency.
Noise prevention plan - general principles	
☐	All individual sources of noise pollution onsite identified. Typical sources include: • Delivery and tipping of raw materials and unloading of cement. • General movement of heavy vehicles and machinery onsite (loaders, excavators, forklifts, tip trucks, fly-ash/cement-delivery trucks). • Agitator truck engine noise, air brakes, reverse-warning devices. • Agitator truck engine revving to turn heavy loads during concrete mixing. • Sand and aggregate transfers to storage bins and hoppers. • Front-end loader work, engine noise, reverse-warning devices. • Forklift engine noise, reverse-warning devices. • Swinging, scraping, loading devices. • Hydraulic pumps. • Air compressors. • Conveyors. • Pneumatic control air valves. • Filters. • Alarms, radios. • Pneumatic/electric vibrators.
☐	Overall site, noise prevention plan developed to minimise emissions from all sources.
☐	Plan for noise mitigation for each point source implemented.
☐	Natural topography and layout of the plant used to best advantage as noise barriers where possible.
☐	Quieter new equipment replacing old – new equipment policy acquisition.
☐	Alter or enclose equipment to *reduce noise at point source.*
☐	Acoustic shielding, barriers, enclosures of sound-absorbing materials to *isolate noise at point source* and *prevent noise travel over distance.*
☐	Use of equipment silencing and muffling devices.
Community liaison	
☐	Liaison with local community to prevent, and promptly respond and resolve issues (figure 11).
☐	System for capturing and addressing community complaints in place.

Individual control measures	
Surfaces	
☐	Hardstand surfaces.
☐	Internal roads sealed.
☐	Underground (drive over) aggregate storage.
Enclosure of noise (at point source)	
☐	All pumps enclosed.
☐	All compressors enclosed, where safe to do so without causing overheating.
☐	All pressure-operated equipment fitted with silencing devices.
☐	All engines fitted with efficient muffling devices.
Use of sound-absorbing materials (at point source)	
☐	Hoppers lined with sound-absorbing material (e.g. rubber).
Sound-barriers and buffers (prevention of noise travel over distance)	
☐	Buffers between plant and neighbours erected (screens, barriers, etc.).
☐	Noise-generating equipment located behind sound barriers or other absorbers.
Substituting quieter equipment	
☐	Visual alarms used in lieu of audible alarms, where appropriate and not contravening occupational health and safety requirements.
☐	Agitator truck reversing alarms are ‘squawker type’ rather than ‘beepers’.
Maintenance	
☐	Regular maintenance of all equipment, heavy machinery and trucks, with records kept.
☐	Regular maintenance of all sound-reducing equipment, with records kept.
Operating hours	
☐	Operating only within approved operating hours.
☐	Operation of trucks and heavy machinery to appropriate hours wherever practicable.
☐	If operating outside normal business hours, liaison with local community to prevent conflict.

- Noise guidance for businesses (EPA website)
- Engaging consultants (EPA website and publication 1702)
- *Recommended separation distances for industrial residual air emissions - guideline* (publication 1518)

Figure 11. Noise emissions from concrete batching plants may be disruptive to surrounding residential communities. Noise monitoring can assist you to understand your compliance against regulatory noise limits. Source: EPA Victoria

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Recognition statement

EPA acknowledges Victoria's First Nations peoples and their ongoing strength in practising the world's oldest living culture. We acknowledge the Traditional Owners of the land and water on which we live and work and pay our respect to their Elders past and present.

We acknowledge that:

- Land and water is of spiritual, cultural and economic importance to Aboriginal people.
- All places in Victoria exist on the traditional country of Aboriginal Victorians.
- Aboriginal interests, needs and aspirations are integral to EPA's core business.

In recognising and respecting thousands of years of environmental stewardship, Victorian Aboriginal peoples' and their culture is integral to EPA's regulatory remit to protect human health and environment from the harmful effects of pollution and waste. As part of our regulatory approach we seek to engage and work collaboratively to build a culturally safe and inclusive work environment that is inclusive of Aboriginal perspectives and values.

EPA encourages all Victorians to consider the ways in which they too can acknowledge, respect and protect Aboriginal cultural heritage.