Concrete pumping Code of Practice 2019 comparative table

2005 Code section	Concrete pumping Code of Practice 2019 and explanation of changes
Introduction	The introduction has been updated and restructured to be consistent with other codes of practice. A foreword has been added to provide an overview of the *Concrete pumping Code of Practice 2019* (the code) and explain how codes of practice operate. A new 'Scope and Application' section has also been added to explain to readers how to use the code of practice. This section specifies that the word 'should' is used in the code to indicate a recommended course of action, while 'may' is used to indicate an optional course of action. The words 'must', 'requires' or 'mandatory' indicate that a legal requirement exists and must be complied with. The Introduction now comprises of the following sub-sections: 1.1 What is concrete pumping? 1.2 Who has health and safety duties in relation to concrete pumping work? 1.3 What is involved in managing risks associated with concrete pumping? 1.4 Safe work method statements 1.5 Information, training, instruction and supervision. **1.1 What is concrete pumping?** This sub-section sets out that concrete pumping work involves the delivery of the concrete to the concrete pump by a concrete truck. The concrete is then pressurised and pushed through pipework to the location of the concrete pour. This involves the use of line pumps, mobile concrete placing booms or satellite placing booms. Due to the high concrete pressures and pulsating motion of the pump there are a large range of safety issues that need to be addressed when pumping concrete. Concrete pumping is generally construction work as defined and may involve high risk construction work for which a safe work method statement is required as set out in Section 1.4 of the code. **1.2 Who has health and safety duties in relation to concrete pumping?** Previous content has been used as a separate sub-section and updated to clearly identify the duties applicable to relevant persons involved in concrete pumping, including:

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	• a person conducting a business or undertaking (PCBU) • designers, manufacturers, suppliers and importers • officers such as company directors • workers and other people at the workplace. A PCBU has the primary duty to ensure, so far as is reasonably practicable, that workers and other persons are not exposed to health and safety risks arising from the business or undertaking. They also have a duty to ensure the provision and maintenance of safe plant including concrete pumping plant, and the safe use, handling, storage and transport of concrete pumping plant. Designers, manufacturers, suppliers and importers of plant must ensure, so far as is reasonably practicable, the plant they design, manufacture, import or supply is without risks to health and safety. This includes carrying out analysis, testing or an examination and providing specific information about the plant. Suppliers must provide a purchaser of a concrete placing boom, which requires plant design registration, with the design registration number. People installing, constructing or commissioning plant must ensure, so far as is reasonably practicable, all workplace activity relating to the plant including its installation, use, decommissioning or dismantling is without risks to health or safety. Officers, such as company directors, have a duty to exercise due diligence to ensure that the business or undertaking complies with the *Work Health and Safety Act 2011* (WHS Act) and *Work Health and Safety Regulation 2011* (WHS Regulation). Workers and other people at the workplace must take reasonable care for their own health and safety, cooperate with reasonable policies, procedures and instructions and not adversely affect other people's health and safety. **1.3 What is involved in managing risks associated with concrete pumping?** Legislative references for managing risks generally and in construction work have been included in a text box and previous content from *Section 2 Risks associated with concrete pumping plant* has been included that provides a list of ways that concrete pumping operations can present a risk of injury to people, including plant and equipment, concrete pumping tasks and by products for example noise and fumes. The section also outlines the duty to consult workers and other duty holders before making decisions on health and safety matters.

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	1.4 Safe Work Method Statements This sub-section outlines the duty to ensure that a Safe Work Method Statement (SWMS) is prepared for high risk construction work before the work starts. SWMSs must identify the type of high risk construction work being done, specify the health and safety hazards and risks arising from the work, describe how the risks will be controlled and describe how control measures will be implemented, monitored and reviewed. **1.5 Information, training, instruction and supervision** This section has been added to the Code of Practice to provide an overview of the general requirements associated with the provision of information, training, instruction and supervision to workers. Previous content from section 7, which sets what should be covered in training and instruction for concrete pumping work, has been moved into this sub-section.
1 Managing the risks from concrete pumping **2 Risks associated with concrete pumping plant**	The information under these sections has been incorporated into the new Section 1 'Introduction', as noted above.

N/A	A new Section 2 *'*Design*'* has been added to the Code of Practice incorporating the following sub-sections: *2.1 Design of satellite concrete placing boom installations* *2.2 Design registration of concrete placing booms* The introduction to Section 2 'Design' sets out the duties of designers and describes how designers of structures and concrete pumping plant can eliminate or minimise risks through the design process. Safe design means the integration of control measures early in the design process to eliminate or, if this is not reasonable practicable, minimise risks to health and safety throughout the life of the structure being designed. Designers should identify potential hazards and design solutions as concrete pumping plant is manufactured, transported, installed, commissioned, used, maintained, repaired, de-commissioned, dismantled, disposed of or recycled. The new section *2.1 Design of satellite concrete placing boom installations* sets out that satellite concrete placing boom installations must be designed by an engineer in accordance with engineering principles or relevant technical standards. Information is included on factors that should be considered for footings and foundations of satellite concrete placing boom installations, staging the satellite concrete placing boom and installation of satellite concrete placing booms on a jump form. The section sets out that workers involved in jumping a satellite boom (i.e. raising the tower height as the building height increases) are to be trained in the manufacturer's instructions and need to have received documented familiarisation training for climbing the make and model of satellite boom to ensure they are competent to do the work. The new section *2.2 Design registration of concrete placing booms* sets out that concrete placing booms must be designed by an engineer in accordance with acceptable engineering principles and relevant technical standards, to ensure the concrete placing boom is without risk to health and safety. The section also sets out the requirement under the WHS Regulation 2011 for concrete placing booms to be design registered. Concrete placing booms were not required to be design registered under the WHS Regulation in force when the original Concrete pumping Code of Practice was written.

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3 Planning and preparation	This section has been renamed *Planning and preparation for concrete pumping operations* and amended to provide guidance about planning for concrete pumping operations. Advice is provided that planning for concrete pumping operations should commence as early as possible in the project and the need to consult with all duty holders involved in the work to identify ways to protect workers directly involved in the concrete pumping work and other workers at the workplace. The section has been amended to include information on issues that should be considered when planning concrete pumping operations. This includes: • liaising with electrical entities regarding the safe supply of electricity and control measures for working around existing power supply • consideration of proximity to overhead powerlines, eliminating electrical risks if possible or using appropriate control measures to minimise risks such as exclusion zones (refer to Section 4.2.3). The concrete placing boom manufacturer may specify instructions for operating near power lines which should be followed when planning concrete pumping operations • determining concrete pumping requirements, including concrete pump selection, concrete delivery and site access, at the project design stage • determining traffic control requirements • ensuring that an emergency plan has been prepared for each workplace where concrete pumping work will be undertaken • consideration of additional safety observers depending on the size and complexity of the work. The section has also been amended to provide advice on planning requirements when concrete placing booms and cranes will be operating near each other. This includes: • the need to maintain adequate clearances to minimise the risk of contact between parts of the cranes, crane loads and concrete placing booms • that negotiations should be conducted between worksites, when cranes and concrete placing booms operate on adjacent sites and share the same air space, to formulate systems of work to ensure sufficient clearances are maintained between the concrete placing booms and the cranes. The inclusion of these issues and advice ensures the section reflects appropriate safety standards and is in line with current industry practice.

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N/A	A new section *3.1 Roles and responsibilities associated with concrete pumping operations* has been included. The section includes subsections on various duty holders who have responsibilities for concrete pumping operations. This includes: • *3.1.1 Person conducting a business or undertaking* The section refers to the general role and responsibilities of a PCBU in section 1.2 and advises that there are specific duties under the WHS Regulation for PCBUs with management or control of plant, powered mobile plant and plant that lifts or suspends loads. Advice is provided that as a principal contractor is a PCBU, these duties can also apply to principal contractors. Advice is provided that persons who own, hire or lease concrete pumping equipment have duties to eliminate or minimise risks associated with the concrete pumping plant, so far as is reasonably practicable. This includes ensuring that maintenance, inspection and testing of the concrete pumping plant is carried out by a competent person. • *3.1.2 Concrete pump owner* This section provides advice that the owner of concrete pumping equipment has duties as a person with management or control of plant. Advice is provided that this includes taking all reasonable steps to ensure that all health and safety features and warning devices of the plant are used in accordance with the relevant instructions and training. Advice is provided that the owner of concrete pumping equipment: • must ensure that all information obtained from the manufacturer of the concrete pumping plant is supplied and readily available to those who need it • should also ensure that concrete pump operators and line hands are trained and competent • should ensure the design, maintenance records and all inspection reports of the plant are all available and signed off before deployment of the concrete pumping plant for use • should ensure that the pads and/or timbers supplied with the concrete pumping equipment will adequately support the plant. The owner may need to seek the advice of a competent person when selecting appropriate materials to support the outrigger feet • must ensure that the maintenance, inspection and testing of the plant is carried out by a competent person. The maintenance, inspection and testing must be carried out in accordance with the manufacturer's recommendations, or if this is not reasonably practicable, the competent persons recommendations. • *3.1.3 Concrete pumping equipment operator*

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	The section provides advice about the concrete pumping equipment operator's responsibilities to ensure the safe operation of the concrete pumping equipment. Advice is provided that in order to operate the equipment safely concrete pump operators are required to know: ▪ the particular model of plant to be operated, its characteristics, functions and limitations ▪ the information in the concrete pumping equipment's operating manual ▪ proper inspection and maintenance procedures to be followed in accordance with the guidelines of the manufacturer and owner ▪ any site conditions that may affect concrete pump operations, including the presence of overhead powerlines, nearby structures and plant, for example cranes. Advice is provided that the concrete pump operator must: ▪ check unauthorised persons are not present in the concrete pumping exclusion zone ▪ check each boom motion is safe and without risk ▪ complete the daily inspection checklist, including filling out the logbook ▪ for mobile concrete placing booms outriggers should be set according to the manufacturer's operating instructions for the specific type of mobile concrete pump ▪ monitor the safe use of the concrete pump, concrete delivery lines and boom (if fitted) Note: In the case of satellite concrete booms, the boom operator is responsible for the safe operation of the boom but will not be in a position to monitor the hopper – a separate pump operator located at the pump will perform this function ▪ in the case of mobile concrete placement booms, monitor the safe support of the carrier, including observing outrigger pads and the ground ▪ be in view of the line hand and monitor the safe delivery of concrete ▪ monitor the concrete hopper by being in view of it The section clarifies that the concrete pump operator is not to carry out the task of the line hand located at the end of the concrete delivery line so that they can fulfil their responsibilities to ensure the safe operation of the concrete pumping equipment. The line hand is at the end of the concrete delivery hose and is not in a position to monitor the concrete pump operations including the stability of the concrete pump setup. The inclusion of this advice reflects duties in the WHS Act and WHS Regulation, reflects appropriate safety standards and is in line with current industry practice.

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3.1 Planning by the principal contractor or person in control of the workplace	This is now section 3.2 A minor amendment has been made to include advice that the principal contractor or person with management or control of the workplace should ensure appropriate traffic control systems are in place for concrete delivery e.g. single, multiple and continuous truck delivery. Advice is provided that further information on traffic control for concrete pumping operations is available in section 4.2.4.
3.2 Planning by the concrete pumper	This is now section 3.3 and has been renamed *Planning by the concrete pumping PCBU*. Throughout the Code of Practice 'concrete pumper' has been replaced by 'concrete pumping PCBU' or 'concrete pump operator' as appropriate, based on advice that 'concrete pumper' is not a term commonly used in Australia, but is used in North America. Amendments have been made to clarify that when planning concrete pumping work, the concrete pumping PCBU should consider: • whether enough workers are available to safely pump concrete and to operate the emergency shut down system, in case of line failure or other events that require the pump to be shutoff. **The likelihood of hose whip from air being sucked into the concrete line is reduced** where the concrete pump is provided with an automatic system that effectively and reliably shuts down the pump **when a low concrete level is detected in the hopper. However, the concrete pumping PCBU is still required to monitor the safe operation of the pump and, in the case of mobile concrete placing booms, this includes monitoring the outrigger feet and pads (bolded text is new information in this section).** • the concrete mix design and ensure, in consultation with the concrete mix supplier, that the mix is pumpable • in ground and above ground services, including powerlines • environmental factors, including wind conditions • the provision of safe egress in addition to safe access
N/A	A new section *3.3.1 Concrete pump selection* has been included to provide advice on selection of concrete pumping equipment. Information is included on the three main types of concrete pumping equipment: • mobile line pumps without a concrete placing boom • mobile pumps with a concrete placing boom • satellite concrete placing booms on buildings or structures where the pump is at ground level. Advice is provided that when selecting the type of pump for a particular operation consideration should be given to the following: • the amount of concrete required

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	• concrete mix design • the delivery height and distance from pour area • access to required location for concrete delivery • clean out and waste disposal • site access and condition • construction methods and sequencing. Further advice is provided that particular attention should also be given to the equipment location and citing hazards including: • location of access and egress to the site • location of underground and above ground services • latent and inclement ground conditions • environmental factors i.e. storm water contamination, ground contamination, erosion and sediment control. • management and reduction of hazardous manual tasks. The additional information reflects appropriate safety standards and is in line with current industry practice.
4 Risk controls for concrete pumping plant **4.1 Plant and equipment**	Heading of section 4 has been amended *to Risk controls for concrete pumping plant and equipment* No changes have been made to 4.1
4.1.1 Concrete placing booms	A minor amendment has been made to remove the reference to *Australian Standard 2550.15 Cranes – Safe Use – Concrete placing equipment* and to advise that further information on inspection and maintenance of concrete placing booms can be found in section 5 of the code.
4.1.2 Pump gauges	No changes have been made to this section.
4.1.3 Concrete pipelines and restraint equipment	A minor amendment has been made to clarify that the purpose of identifying and checking all metal pipes and pipeline components is to ensure they are not damaged and are within the specifications of the pipeline. References to AS 2550.15 have been removed.

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	An additional Figure has been included as Figure 2 to show an example of acceptable marking on pipe clamps.
4.1.4 Hose whip	This section has been amended to include advice on additional risks for hose whip and the appropriate risk controls. This includes controls for the following risks: • that the mix is not a pumpable mix/ poor quality • concrete left in the lines for a long duration/ segregation of slurry • moving the boom pump with concrete in the lines • air in the lines • foreign objects in the mix • start-up of pump. The additional information reflects appropriate safety standards and is in line with current industry practice.
4.2 Placement of plant and equipment **4.2.1 Setting-up on site**	This section has been updated to include current legislative requirements for: • maintaining the work place to allow for safe access and movement around the workplace • hazardous manual tasks. Original text retained with the addition of information on: • ensuring there is clear access for the safe movement of plant, equipment and persons and that a second access way should be put in place when concrete pumping is occurring on or near an access way • the risk of hazardous manual tasks when handling the concrete delivery hose. Advice is provided that there should be one line hand for every 10 metres of workable hose where the pipe diameter is 76.2 milometers (3 inches) or more and every 20 metres of workable hose where the pipe diameter is less than 76.2 milometers (3 inches) • mesh should be installed over stressing bands to reduce the musculoskeletal strain when pulling the hose over the stressing bands • drops or rises on the deck exceeding 400mm height, should be covered with re-enforcement mesh or another suitable product for the concrete line hands to walk on • the mesh should be of a size where a worker's foot cannot become caught • concrete placing booms should not be set-up or operated in the following situations: ▪ over designated worker access ways without a 10kPa gantry above the access way

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	▪ over site sheds (including worker amenities, lunchrooms, or any other site sheds where workers are located) without a 10kPa gantry above the site sheds The live loading of 10kPa is the design benchmark specified for gantries, other than for light duty work, in section 315K of the WHS Regulation. The gantry is to safely withstand at least 10kPa loading, in addition to any materials that may be located on top of the gantry.
N/A	A new section *4.2.2 Maintaining stability of mobile concrete placing booms* has been included. Ground conditions can vary dramatically from one workplace to another, and even within the one workplace. Failure to address poor ground conditions to ensure stability of the mobile concrete placing boom may cause the plant to overturn and result in serious injury to the concrete pump operator and other people in the vicinity of the plant. A new section *4.2.2.1 Ground factors* provides information on ground factors that can effect the stability of the plant including: • the presence of water • the type of ground • back-filled ground that was previously an excavation or trench • cavities or penetrations in the ground that have been covered but still exist • continued operation of the concrete pump in one location. Advice is provided that generally, rock provides the most stable supporting surface for mobile plant however how far rock extends below the surface should be considered. Care must also be taken with ground that has a 'crust' on its surface as the surface of this type of ground is usually firmer than the ground underneath. The firm surface may give the perception that the ground is more stable than it is. A new section *4.2.2.2 Plant proximity to excavations and trenches* has been included to provide advice that when mobile plant is set up close to excavations or trenches there is an increased risk of the sides of the excavation or trench wall collapsing, causing the plant to overturn. Advice is provided that generally, the following principles should be applied when setting up mobile plant near excavations: • where the ground is compact and non-friable (i.e. not crumbling), the distance of any part of the outrigger support timbers from the excavation should be at least equal to the depth of the excavation (1:1 rule) • where the ground is loose or backfilled (i.e. crumbling), the distance of any part of the outrigger support timbers from the excavation should be at least twice the depth of the excavation (2:1 rule).

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	A new section *4.2.2.3 Timbers, pads and bog mats* has been included to provide information on the variety of materials that can be used to distribute the mass of the mobile plant to the ground. Wherever possible, timbers, pads and steel plate should be of dimensions and materials as specified by the concrete pump manufacturer. If the manufacturer has not provided this information, a competent person such as an engineer should specify the minimum size of the material to be used. Generally, the following principles should be applied to timbers, pads, steel plates and bog mats: • timbers should have a minimum width of 200mm and minimum thickness of 75mm • timbers should be laid together so that the width of the timber pad is wider than the outrigger foot with no gaps between timbers • pads should have a minimum thickness of 75mm • the risk of outrigger feet sliding off plastic pads or steel should be identified and controlled (i.e. when the plant is set up on a gradient). A new section *4.2.2.4 Calculating ground pressure and outrigger pad area* has been included as the ground bearing capacity must be greater than the maximum pressure applied by the mobile plant to the ground to ensure the plant does not sink and/or overturn. If not, then appropriate control measures, such as increasing the area of the outrigger pads or carrying out earthworks to increase the ground's bearing capacity are to be implemented. Advice is provided that some concrete placing boom manufacturers provide information on the maximum force applied by outriggers and the minimum area of outrigger pads to be used. Advice is provided that different ground types will have different ground bearing capacities. Generally, harder ground, such as rock, is capable of withstanding higher ground pressures than softer ground, such as dry sand. Where the ground consists of a combination of ground types, the poorer ground type should be used for determining the maximum ground pressure that can be applied to the ground when the concrete pump is set up on outriggers. Information and examples on how to calculate the 1) pressure applied by the outrigger, 2) the force applied by the outrigger and 3) the minimum area of timers required, is provided. A table has been included that identifies the maximum permissible ground pressure according to the ground type. A new section *4.2.2.5 Short legging* has been included. Short legging refers to the use of mobile plant when one or more of the outrigger legs is only partially extended or deployed. Advice is provided that short legging is a practice that should be avoided wherever practicable, due to the increased risk of overturning the mobile plant. To avoid the need for shortlegging, builders,

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	designers and specialist contractors should consider, at the design and construction stages, that adequate space is available so that mobile plant required as part of the building process, can be safely set up and packed up. Advice is provided that a person with management or control of a worksite, including principal contractors, should ensure that adequate room is available to enable a mobile placing boom to be set up and packed up safely. This includes, both operation of the mobile plant and ancillary activities, such as cleaning out concrete lines. It may also include obtaining road or footpath closures from the relevant authority. Advice is provided that if a mobile concrete placing boom is short legged, it is preferable that the unit is fitted with a slew limiting device that prevents the boom or counterweight from slewing into the zone where there is risk of the plant overturning. If the mobile boom is provided with this feature, the operator is to be trained in the use and limitations of the slew limiting device. When short legging advice is provided to ensure: • the manufacturer's operating manual for the mobile plant states that short legging is permitted and the manufacturer's operating instructions for short legging are followed • the outriggers are marked with an indicator that shows the extent of the short legging • a work method statement has been prepared that shows the operating conditions under which short legging can be used • the stability of any concrete placing boom is to be maintained during: ▪ set up ▪ operation ▪ pack up ▪ pipeline cleaning. The additional information reflects appropriate safety standards and is in line with current industry practice.
4.2.2 Setting-up near powerlines or electrical equipment	This section is renumbered 4.2.3 and renamed *Working near overhead powerlines*. A new section *4.2.3.1 Electrical safety laws* has been included that sets out the legislation and codes of practice that apply to electrical safety for concrete pumping activities. A new section *4.2.3.2 Planning for work near overhead powerlines* has been included and provides advice that due to the risk of electric shock or electrocution concrete placing booms should not be operated over the top of energised powerlines. This is for the following reasons: • the shape and height of the boom does not allow for a large separation distance from the powerlines

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	• boom movement due to pumping motion, wind and 'bounce' as the boom is moved • it can be extremely difficult for spotters observing from the ground to judge distances and determine clearance from the powerlines. Advice is provided that: • before setting up a concrete placing boom near overhead powerlines, the PCBU should conduct an inspection to identify the presence of overhead powerlines that may pose a risk • once the risks associated with overhead powerlines have been identified and assessed, appropriate control measures must be put in place. Advice is provided that the most effective way to eliminate any risk of electric shock is by turning off the power. The person conducting a business or undertaking (PCBU), principal contractor (PC) and the concrete pumping PCBU should discuss options for de-energising or re-routing the electricity supply with the relevant electricity entity. These options are the most effective control measures and should be considered before anything else. De-energising or re-routing powerlines should be arranged with the electricity entity as quickly as possible as this can take some time to arrange. Where overhead powerlines have been de-energised, written confirmation should be sought from the person in control of the powerline before undertaking any work. Information on exclusion zones has been updated and included in a new section *4.2.3.3 Exclusion zones for operating a concrete placing boom near overhead powerlines*. The section includes information on the legislative requirements for exclusion zones under the *Electrical Safety Regulation 2013*. Advice is provided that if it is not reasonably practicable to turn off the power or re-route the electricity, the most effective control measure to reduce the risk is to establish "exclusion zones" that prevent people, plant, equipment and materials from coming close enough to energised overhead powerlines for direct contact or flash-over to occur. Advice is provided that PCBUs should ensure that workers and the concrete placing boom (and/or the drop hose) stay at least 3 metres away from overhead powerlines, for voltages up to 132kV, with greater distances applying for voltages above that. These distances apply to any part of the concrete placing boom and/or the drop hose. This can be achieved in a number of ways, such as: • setting up the concrete placing boom in a position that keeps it outside the exclusion zone • erecting a physical barrier, made of non-conductive materials, to prevent any part of the concrete placing boom or person entering an unsafe distance. This may require isolating the electricity supply while the barrier is installed.

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	Advice is provided that when implementing a system to maintain the exclusion zone a number of factors must be considered which include: • identifying the minimum clearance distance from the closest part of the concrete placing boom to the powerline, the 'exclusion zone' • allowing for sway or sag of the powerlines (sway is usually caused by wind, while sag may vary as the temperature of the line varies) • ensuring that people, plant and vehicles stay outside the 'exclusion zone' at all times • using a safety observer (commonly known as a 'spotter') who observes the operation of the concrete placing boom if the plant could enter into the exclusion zone. The identified minimum clearance distance may need to be greater than the prescribed exclusion zone distance to ensure there is no breach of the exclusion zone. The electricity entity may also specify a greater distance than the smaller exclusion zones provided in Schedule 2 of the *Electrical Safety Regulation 2013*, if they consider the risk warrants it. Information is provided on the use of a safety observer or 'spotter who is trained and competent to observe and advise the pump operator if the line or any part of the pump is likely to come within an exclusion zone of an overhead powerline and to advise if the vehicle or pump is likely to come in contact with persons or moving plant. The safety observer or 'spotter' should: • have knowledge about working safety around moving plant, including the understanding of escape routes and maintaining visibility • understand the relevant traffic management guidelines for the site, including any site specific traffic management plan or moving plant plan, the *Manual of Uniform Traffic Control Devices* (MUTCD) and the *Traffic management for construction or maintenance work Code of Practice*. • have an understanding of exclusion zones and knowledge about how the concrete pump operates and the limits of its movements and extensions in order to understand the potential of the equipment to encroach on exclusion zones or contact people, structures or plant. The additional information reflects electrical safety legislative requirements, appropriate safety standards and is in line with current industry practice.
4.2.3 Traffic control	This section is renumbered 4.2.4 and additional information has been included on traffic control requirements.

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	Concrete pumping operations are often carried out in busy built-up areas and are often set up on the road or road related areas. Motorists, cyclists, pedestrians, delivery truck drivers and workers all interact with concrete pumping plant as it arrives and sets up in the designated concrete pumping area. Concrete pumping requires traffic control systems to ensure the safe and continuous supply of concrete trucks and the safe setup of mobile pumps. The section has been amended to include information on the WHS Regulations that apply to traffic control, including section 315M which sets out the requirement for principal contractors to, before construction commences, obtain written approval from the relevant authority or person who controls the adjoining area (e.g. local government) and use any measures for the closure required by the authority (such as physical barriers, signs, traffic controllers). Information has also been included on regulations that apply to powered mobile plant. Advice is provided that where concrete pumping involves multiple truck deliveries there should be a person, separate from any traffic controllers in place, who is responsible for controlling the delivery of the concrete trucks. This section sets out that a SWMS prepared for the concrete pumping work should ensure that: • people not involved in concrete pumping (workers and members of the public) are excluded from the work area • the spotter stays in view of the concrete truck driver while the truck is moving. When the spotter is out of the view of the truck driver the driver is to stop the vehicle • people in the concrete delivery area should always wear high visibility vests • concrete trucks must have audible reversing alarms and flashing amber lights • permits must be obtained from the relevant authority where concrete pumps are set up on, or adjacent to public roads • lane closures on roads, signs, speed restriction signing and protective barriers for work on, or adjacent to public roads must comply with the MUTCD • any necessary barriers and signage is in place, no matter how brief the occupation of the site for the: ▪ protection of workers ▪ provision of adequate warning of changes in surface condition, and the presence of personnel or plant engaged in work on the road ▪ adequate instruction of road users and their safe guidance through, around or past the worksite, and ▪ safe access and egress to and from the worksite. Advice is provided that where concrete pumping involves the use of a satellite concrete placing boom the concrete pump will usually be located at ground level within the confines of the project. Where this is the case the concrete delivery area should be

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	provided with demarcation barriers on all sides except the entry side for the concrete truck. Signs should be placed on each side of the barricades that state 'Concrete Delivery Area – Stay Out' or words to that effect. The *Traffic management for construction or maintenance work Code of Practice* is referenced for further information on traffic control. The additional information reflects work health and safety legislative requirements, appropriate safety standards and is in line with current industry practice.
4.3 Tasks **4.3.1 Concrete delivery**	In this section a minor amendment has been made: • *If more than one concrete delivery truck is required to approach the receiving hopper at any one time the person in control of the relevant workplace area should ensure:* ▪ *a spotter or traffic controller is on hand to safely direct the movement of the trucks* ▪ *there is adequate room for the concrete delivery truck driver to operate the concrete delivery truck safely ~~and in the event of an emergency have clear access to operate the concrete pump emergency shut down device~~.* *…* • *the emergency stop button should be accessible to ~~by~~ the concrete pump operator ~~and the concrete delivery truck driver.~~* The concrete pump operator is responsible for safe operation of the concrete pump and, in the case of concrete placing booms, has a high risk work licence. While, in some situations, it may be industry practice for the delivery truck operator to assist in safe operation of the concrete pump by being able to activate an E-stop on the pump hopper this practice cannot be included in the code. The concrete delivery truck driver may agree to activate a pump E-stop in an emergency but would need to sign a safe work procedure that stated that they shared responsibility for safe operation of the pump.
4.3.2 Pump and boom operation	In this section there is a minor addition to note that operators of concrete placing booms must hold the relevant high risk work licence.
N/A	A new section *4.3.3 Wind loading* has been included. This section clarifies that mobile and satellite concrete placing booms are not to be operated in winds exceeding that specified by the manufacturer. The maximum permissible wind speed should be available on site where the placing boom is being operated. The information should be either on the manufacturer's identification plate on the unit or in the operating manual for the unit.

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4.3.3 Concrete pouring	This section has been renumbered 4.3.4 and renamed *Concrete pumping*. A new point has been included that clarifies which workers can be directly under the concrete placing boom during concrete pumping operations as follows: • *to be able to effectively move the drop hose on a concrete placing boom, the line hand needs to be located under the boom. In addition, concreters involved in the concrete pour will, at times, be located under the boom. All other workers are not to be directly under the placing boom.* Hydraulic cylinders on concrete placing booms are fitted with burst protection valves that will lock the boom in place in the event of a hydraulic hose failure. However there have been a number of catastrophic failures of both the concrete placement booms and outrigger boxes in Australia over past years that have caused the boom to drop. The restriction of workers under the boom, other than the line hand and concreters involved in pouring the deck, is a reflection of this issue. A further point has been amended as follows: • *Ensure the delivery hose fitting on a boom pump is secured in position by a safety chain, sling or other retaining device ~~in accordance with AS 1418.15 Cranes (including hoists and winches) – Concrete placing equipment~~.*
N/A	A new section *4.3.5 Concrete line blockages* has been included. Information has been included on the risk of concrete line blockages including the following causes: • mix design deficiencies • pipeline and joint deficiencies • excessive component wear in parts of the concrete pump • kinking of the discharge hose • worn discharged hose • foreign matter in the concrete • in twin wall pipes, fracture of part of the inner wall • pumping the concrete too quickly • delays between concrete delivery trucks can cause materials in the mix to separate.

2005 Code section	Concrete pumping Code of Practice 2019 and explanation of changes
	The following advice is provided on how to control the risk of concrete line blockages: • *Ensure the concrete mix is not too stiff or too wet. A mix that is too stiff can't be pumped because it will not fill the pumping cylinders and the pumping pressures will be excessive. A mix that is too wet can cause the mix components to segregate by allowing heavier materials to settle.* • *where recycled or remanufactured aggregate is used an additive may be required to assist with binding the mix together.* • *The system must be sized or designed properly for the pump capacity in order to ensure the pumping pressure is sufficient to move the concrete over the full length of the pipeline. There is a maximum aggregate size in the concrete for the pipeline diameter. The line diameter should be three to four times greater than the maximum aggregate size.* • *It is important to note that the friction and resulting resistance to pump concrete through a rubber hose will be significantly higher than through the same length of steel pipeline. In some cases the pumping effort required to pump concrete through only one metre of rubber hose will be the same as pumping concrete through at least three or more metres of steel pipeline. For this reason, blockages are much more likely to occur in rubber hose than steel lines of the same diameter.* • *Ensure adequate priming and lubrication of the pipeline prior to commencing the concrete pumping operation.* • *Minimise the number of bends and short bends in the pipe or hose as they will increase the concrete pumping pressure. Likewise, if the reducer, connecting the concrete pump to the pipeline system, is too abrupt the pumping pressure can increase to such an extent that a blockage results.* • *Avoid sudden variations in pipeline diameter, either through short reducers or mismatched inside diameters of system components as they can cause blockages or rock (aggregate) jams because the concrete can't be pushed through the smaller line diameter.* • *Pipelines and hoses should be cleaned properly to avoid blockages caused by the setting of old concrete.* • *Replace damaged or defective couplings, gaskets, or weld collars as excessive component wear in parts of the concrete pump can cause segregation of the concrete mix and lead to blockages.* Advice is also provided on clearing blockages: *If the pumping system has a blockage, the pump pressure gauge will likely show that line resistance is rising. The most common place for a blockage to occur is in the reducer connecting the concrete pump to the pipeline system.* *Pressure-gauge readings can give a good indication of the blockage location. If the pressure builds up very quickly before the jam occurs, the blockage is likely to be in the area of the pump. A slower build-up of pressure indicates the blockage is somewhere in the pipeline, possibly near the delivery end.*

2005 Code section	Concrete pumping Code of Practice 2019 and explanation of changes
	The pump operator may be able to break an aggregate jam loose by alternately reversing the pump and resuming pumping a few times. Though a minor blockage can be cleared in this way, no amount of pressure will clear a major blockage. Do not continue the reversing process for more than a few attempts because it can make the blockage even tighter. *If reversing the pump does not work, an alternative method needs to be carried out to locate the blockage.* *Leaking pipe joints in the system indicate grout loss and possibly the location of a blockage.* *Standing on the rubber delivery hose can provide an indication of whether the blockage is in the rubber hose or in the steel line. If the worker's weight compresses the hose then the blockage is likely to be in the delivery line.* *On pipelines other than on high rise installations, movement between relative parts of the pipeline may provide an indication of where the blockage is. As the pump is stroking, some vibration or movement may be evident at each joint. When there is a blockage, its location can be determined by observing the joints while the operator alternately reverses the pump and resumes pumping. If no line movement is noted after a particular joint, the jam is likely to be between the pump and that joint.* *When attempting to clear a blocked concrete delivery line:* • *All persons should be excluded from the pipeline area except for those workers involved in clearing the line.* • *After locating a blockage or rock jam, always make sure the line is no longer under pressure before attempting to clear it. Reverse the pump to reduce the pressure.* • *Never straddle a horizontal line when opening a coupling; stand to one side. Lift the line so that all the free flowing concrete runs out. Bend the hose or tap on the pipeline in the area of the jam and shake out loose particles.* • *If pressurisation of the line is used to clear the blockage, particular care needs to be taken to exclude all persons from the vicinity of the line and, in particular, the delivery hose, in case of hose whip. The hose is to be restrained from movement and a catchment device or properly designed receptacle should be attached to the discharge end of the pipeline to safely catch any projectiles, while still allowing concrete to flow. Workers must never try and restrain the hose.* The additional information reflects appropriate safety standards for the significant risks arising from concrete line blockages and is in line with current industry practice.
4.3.4 Line cleaning (on site)	This section has been renumbered 4.3.6. No change to content.

2005 Code section	Concrete pumping Code of Practice 2019 and explanation of changes
4.3.5 Pump cleaning (on site)	This section has been renumbered 4.3.7. No change to content.
4.3.6 Preparation for road travel	This section has been renumbered 4.3.8. No change to content.
4.4 By-products **4.4.1 Noise**	The section has been amended to include information on section 57 of the WHS Regulation that a PCBU must manage the risk of hearing loss associated with noise at the workplace and that the noise a worker is exposed to must not exceed the exposure standard. Information has been provided on the exposure standard for noise in relation to hearing loss which is defined in the WHS Regulation as an LAeq,8h of 85 dB(A) or an LC, peak of 140 dB(C). There are two parts to the exposure standard for noise because noise can either cause gradual hearing loss over a period of time or be so loud that it causes immediate hearing loss. Advice is provided that exposure to high noise levels can cause permanent hearing loss. Concrete pumps can generate various noise levels that may cause workers to be exposed to noise that exceeds the exposure standard. Before pumping equipment is set-up consultation should be undertaken between the principal contractor or person in control of the workplace and the concrete pumping PCBU, regarding the risk of excessive noise. Existing text referencing the *Managing noise and preventing hearing loss at work Code of Practice* is retained.
4.4.2 Fumes	The section has been amended to include information from the section 51 of the WHS Regulation that a PCBU must manage the risks to health and safety associated with a hazardous atmosphere. An atmosphere is hazardous if it does not have safe oxygen level or if the concentration of flammable gas, vapour, mist or fumes exceeds 5% of the Lower Explosive Limit for that gas, vapour, mist or fumes. Existing text on the risk of fumes is retained. Information on risk controls has been amended to include the following: *Risk control* *If possible place the truck in a position that will eliminate or reduce the build-up of exhaust gas. If it is necessary to place the truck in an enclosed area ensure that:* • *an adequate level of ventilation is maintained to prevent the build-up of hazardous exhaust gases, or* • *exhaust gases are vented to open air.*

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	The PCBU should disperse fumes if the concentration level is likely to exceed safe levels, particularly when working in enclosed spaces.
5. Inspection and maintenance **5.1 General**	This section has been amended to remove the requirement for inspection and maintenance to be done in accordance with Australian Standards AS 2550.15 and the requirement for three monthly inspection and maintenance has been removed. Amended text is as follows: *Appropriate 'planned inspections' and 'preventative maintenance programs' are essential for safety and efficiency in the operation of concrete pumps and booms ~~and should be carried out in accordance with the manufacturer's recommendations and AS 2550.15~~. These inspections and routine maintenance* ***are to be carried out at intervals specified by the manufacturer and*** *should be carried out:* • *daily before commencement of work* • *weekly* • *monthly* • ~~*three monthly*~~ • *yearly, and* • *six yearly ~~strip downs~~ major inspection*.
5.2 Compliance plates and certification	The text is this section has been amended to make minor clarifications as follows: *All equipment associated with concrete pumping must have ~~fixed compliance plates, and/or appropriate certification for their use~~ the following verification:* • *cab and chassis – by the state transport authority in which the unit is registered, with a fixed motor vehicle modification plate showing the appropriate modification codes* • *concrete placing boom and outriggers:* ▪ *by the manufacturer, with a fixed plate showing date of manufacture, serial number, maximum recommended working pressure, maximum recommended length of end (or drop hose), recommended maximum size of delivery pipe/hose* ~~in accordance with AS1418.15 Cranes (including hoists and winches) - Concrete placing equipment.~~ ▪ ~~***For the annual safety inspection, a signed safety certificate and list of the items inspected.***~~

2005 Code section	Concrete pumping Code of Practice 2019 and explanation of changes
	▪ following each six year major inspection, ~~by a professional engineer whose area of competence includes the type of work being undertaken~~ an inspection certificate completed and signed by the engineer overseeing the inspection along with a comprehensive inspection report. ~~with a fixed plate setting out the details of the annual inspection and six yearly strip down *and inspection dates, in accordance with AS 2550.15 Cranes – safe use- Concrete placing equipment.*~~ • *concrete pump – by the manufacturer, with a fixed plate showing date of manufacture and serial number* • *maximum recommended working pressures for hydraulics and concrete etc*, ~~in accordance with AS 1418.15 Cranes (including hoists and winches) – Concrete placing equipment and~~ • *Over Length and Overweight Permits must be obtained, kept current, and in the vehicle **for the vehicle to be driven on a public road.*** *Note: refer to Transport and Main Roads laws.* *Any pump, boom, prime mover and/or associated equipment not having such a compliance plate or ~~permit~~ **documentation**, should be removed from service immediately, until such certification is* in place ~~effected~~.
5.3 Pre-operational inspections	Minor amendment to a point as follows: • b*efore the start of each work period, all concrete pumping/placing equipment should be given a visual inspection and function test – in accordance with the manufacturer's instructions and recommendations ~~and AS2550.15 Cranes – safe use- Concrete placing equipment~~.*
5.4 Routine maintenance inspections	Minor amendment to a point as follows: • *the ~~owner~~ PCBU should establish an appropriate program of weekly **and** monthly ~~and quarterly~~ preventative maintenance inspections of all equipment in accordance with the manufacturer's recommendations ~~and AS2550.15 Cranes – safe use- Concrete placing equipment~~, which is based on the equipment's working environment and the severity of use of the equipment.*
5.5 Annual inspections	The opening paragraph has been amended as follows: *All concrete placing booms, pumps and all other associated equipment, should be inspected ~~once a~~ **at intervals not exceeding one** year by a **competent person** ~~assessor~~, for the suitability of continued service, in accordance with the manufacturers specifications ~~and AS2550.15 cranes – safe use – Concrete placing equipment~~.*

2005 Code section	Concrete pumping Code of Practice 2019 and explanation of changes
	Additional information has been included to clarify what should be included in an annual inspection as follows: *The annual safety inspection is to be a comprehensive visual inspection of the boom, its support structure and outriggers (where fitted). The annual inspection should include, but not be limited to, the following:* • a *function check for boom unfold/fold, slewing and outrigger deployment to ensure*: ▪ *unit is operating in accordance with manufacturer's specifications and all limits are functioning (e.g. boom rest, stowage, slew, boom fold/unfold)* ▪ *movement is unrestricted and that pivot points do not have excessive movement (play). Where significant play is evident, quantitative measurement should be carried out to determine tolerance is within manufacturer's specifications.* • c*heck to see that all joints have adequate lubrication* • c*heck of slew ring and bolts – to determine that all bolts are installed and intact (where the manufacturer specifies a specific test on the bolts, this is to be performed)* • v*isual inspection*: ▪ *of welds, boom sections (including wear plates), linkages, pins, outriggers and turret for cracks, corrosion and damage* ▪ *of all pin retainers and locking devices (e.g. cheek plates)* ▪ *for boom straightness in vertical and horizontal planes* ▪ *of all hydraulic lines, both flexible and fixed, for damage and leaks* ▪ *of hydraulic cylinders to include inspection of welds, leakage and hard chrome* ▪ *of pipe bracket connections to boom sections* • w*here cracking is observed, consideration of NDT examination of cracked areas and whether there is a need to dismantle parts of the plant for an enhanced inspection. The repair method statement should be sought from the boom manufacturer or, if unavailable from the manufacturer, from a suitably qualified engineer. Information in relation to any repairs should be retained with all future reports to assess further defects* • *NDT thickness testing where there is evidence that corrosion has reduced a member's wall thickness – followed by an assessment of whether the member requires replacement or repair* • e*xamination of concrete delivery pipeline that includes checking:*

2005 Code section	Concrete pumping Code of Practice 2019 and explanation of changes
	▪ *weight of the pipe and clamps fitted to the boom do not exceed the maximum allowable weight specified by the boom manufacturer* ▪ *pipe clamps for wear, damage and security and to determine they are the correct type.* ▪ *pipe clamps for identification Including manufacture, pressure rating and size* ▪ *bolts and wedges are appropriate and R-clips are inserted on quick release clamps* ▪ *pipelines to determine they are the correct specification for the pump pressure, minimum wall thickness is acceptable and they are free of damage* • w*here repairs have been made verification that the repairs have been made in accordance with the manufacturer's instructions or those of a suitably qualified professional engineer* • e*xamination of hopper area including hopper guard* • h*opper guard interlocks – safety switch is to isolate all energy sources, so that swing tube and hopper paddles will stop when grate is lifted (switch should dump accumulator pressure)* • c*hecking boom sections and outrigger legs for ingress of water.* The additional information reflects appropriate safety standards and is in line with current industry practice.
5.6 Assessment for service and continued use	This section has been renamed *Major inspection for concrete placing booms.* The information in this section has been expanded to provide advice on why it is important to carry out major inspections of concrete placing booms every six years, who should carry out a major inspection, inspection criteria, reassembly after a major inspection as well as advice on circumstances under which dismantling may not be required. The following content has been deleted. ~~All items of concrete placing equipment should also be additionally subjected to a major inspection for assessment of continued service of the concrete placing equipment in accordance with *AS 2550.15 Cranes – safe use – Concrete placing equipment*.~~ ~~These inspections should include a strip down of all high stress areas, including the boom, slew ring and outriggers.~~ ~~The inspection should be conducted by a professional engineer, with competence in this work, to assess the suitability of the equipment for continued service until the next major inspection. All inspections should be noted in the appropriate log book.~~

2005 Code section	Concrete pumping Code of Practice 2019 and explanation of changes
	~~All concrete placing equipment should be assessed for service and continued use six years after the date of manufacture and at each six year period thereafter.~~ New content on major inspections has been included as follows: *Concrete placing booms are subjected to cyclic loading and are generally constructed from high tensile steels. This combination can lead to cracks forming on the boom, boom connections and supporting structure. If undetected, the cracks will continue until catastrophic failure and collapse of the boom occurs. In addition, excessive wear of critical components can lead to failure.* *While periodical inspection, including the annual inspection, can highlight faults on the equipment, a number of critical components can only be thoroughly inspected when the unit is dismantled and the component is removed.* *The first major inspection is to be completed no later than 6 years after the concrete placing boom was first commissioned, or if that date is not available, 6 years from the date of manufacture. Subsequent major inspections are to be completed at intervals not exceeding 6 years.* *The major inspection is to be a comprehensive inspection that includes dismantling all high stress areas and components subject to wear, unless considered unnecessary by the certifying engineer, including those areas that normally cannot be readily accessed during periodical inspections.* *Potential damage and wear to a concrete placing boom can be caused over time, by the following factors:* • *normal operation of the placing boom in accordance with the boom manufacturer's instructions* *Note: The boom has a design life – when this is approached defects will start to appear even though the unit has been operated in accordance with the manufacturer's instructions.* • *possible misuse of the unit that exposes the boom to additional and more severe loading than the designer intended (i.e. suspending excessive hose from the end of the boom, using the boom as a crane, etc)* • *corrosion from water ingress or storage outdoors (particularly in coastal environments)* • *in the case of truck mounted booms, and satellite (fixed) placing booms that are transported over long distances, movement and vibration of the unit during road travel. This effect will be more severe over uneven roads and when the unit is not restrained correctly for road travel.* *For the reasons highlighted above, carrying out a major inspection after a set period is a more effective way of identifying and repairing faults on the unit rather than basing the inspection on hours of use as a pump alone.*

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	Completion of the six year major inspection does not guarantee that a concrete placing boom will be safe to operate for another 6 years. It does, however, demonstrate that the placing boom has achieved a minimum benchmark and the boom is safe for ongoing use provided continuing maintenance and inspection is carried out in accordance with the manufacturer's instructions. This maintenance and inspection program will include ongoing annual safety inspections. Should any periodical inspection highlight an unsafe item on the unit the particular fault is to be remedied immediately and not at the time of the next major inspection. *Major inspections should be carried out by a competent person. A competent person for major inspections means someone who complies with both of the following:* • *has acquired through training, qualification or experience, the knowledge and skills to carry out a major inspection of the concrete placing boom* • *is registered under a law that provides for the registration of professional engineers.* *A certification should be issued stating that the concrete placing boom has undergone a major inspection and is safe to operate. A sample major inspection certificate is at Appendix 3.* ***Non-destructive testing (NDT):*** *All NDT on the boom and associated parts is to be:* • *carried out by a competent person who has been accredited by NATA* • *in accordance with a testing procedure specified in an Australian Standard wherever practical* • *verifiable by means of a signed report that complies with NATA reporting requirements (this will include conditions of the test and a record of discontinuities found).* ***Removal of paint prior to NDT:*** *It is generally advisable to remove paint from parts prior to NDT, particularly in high stress areas. If the certifying engineer makes the decision to carry out NDT through paint, the test method is to comply with the relevant test method through paint (one of the conditions of such testing will be that the paint does not exceed a maximum thickness).* ***Inspection criteria:*** *The major inspection criteria in this Code is based on safety items to reduce the risk of boom collapse, boom overturn, falling objects, explosion, or operator injury from the hopper. The inspection criteria is based on the use of the placing boom to pump concrete and not on roadworthiness issues for road travel. Additional inspection requirements for road travel, are contained within road safety legislation.*

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	Prior to dismantling the boom, it is advisable to carry out a load test on the boom in its extended position to determine if the boom or outriggers creep so that any defective hydraulic cylinders can be identified. *Where the concrete placing boom manufacturer provides written instructions for the major inspection, these instructions are to be followed by the certifying engineer. Where instructions on the major inspection do not exist, the certifying engineer is to develop the inspection criteria based on sound and proven analytical practice, inspection methods and pass/fail criteria. The inspection criteria used by the engineer should include but not be limited to the following items:* • *dismantling of boom sections, outrigger legs and king post (turret) or slew ring.* • *checking boom sections and outrigger legs for ingress of water and the associated internal corrosion.* • *measuring of boom sections for straightness in vertical and horizontal planes.* • *NDT examination of high stress areas on boom sections, linkages, outriggers and turret for signs of cracking.* *Note: Where there are signs of cracks, corrosion or excessive wear, the certifying engineer is to decide on whether the part is replaced with a new part or repaired. Where the part is repaired, the engineer is to prepare a repair procedure that specifies welding details, material types, and dimensions of the repair* • *removal and inspection of all boom linkages.* • *NDT thickness testing where there is evidence that corrosion has reduced a member's wall thickness.* • *removal of boom rest plates (doubler plates) where these plates conceal part of the boom.* • *removal of all boom pivot pins – tolerance checking of pin diameters and examination for cracks.* • *examination of pipe support brackets.* • *examination of concrete delivery pipeline that includes checking:* ▪ *pipe clamps for wear, damage and security and to determine they are the correct type. Checking that bolts and wedges are appropriate and R-clips are inserted on quick release clamps* ▪ *pipelines to determine they are the correct specification for the pump pressure, minimum wall thickness is acceptable and they are free of damage* • *examination of all hydraulic cylinders to include inspection of welds, leakage and hard chrome. NDT of rod and cylinder ends on hydraulic rams. Creep testing of hydraulic cylinders once the unit has been re-assembled. Replacement or repair of hydraulic cylinders where damage is observed or cylinders fail creep test* *Note: Where no visual faults are noted, hydraulic cylinders do not require strip down unless they fail a creep test* • *removal and replacement of slew ring bolts with bolts of the type specified by the boom manufacturer.* • *examination of hopper area including hopper guard*

2005 Code section	Concrete pumping Code of Practice 2019 and explanation of changes
	• *hopper guard interlocks – safety switch is to isolate all energy sources, so that swing tube and hopper paddles will stop when grate is lifted (switch should dump accumulator pressure).* ***Re-assembly:*** *Pins are to be installed using retaining (locking devices) specified by the boom manufacturer. After installation of all pins, the name and signature of the competent person(s) who has installed the pins is to be provided in the major inspection report. Bolts, including slew ring bolts, are to be tightened in accordance with the tightening sequence and torque specified by the boom manufacturer. The torque is to be appropriate for the bolting conditions (i.e. whether grease is used or not, the grease type, etc). Once the bolts have been installed, the name and signature of the person who has installed the bolts should be provided in the major inspection report. Once the boom has bene re-assembled, a function test of the boom is to be a carried out and the certifying engineer is to be satisfied with the operation of the boom.* ***When can the engineer decide not to dismantle a component?*** *Where there is documented evidence that the appropriate inspecting and testing has been carried out on a certain item within two years, this item does not have to be dismantled in the major inspection. However, the competent person must still inspect the safe operation of the item to certify that it is operating safely. The competent person is also to comment on future inspection requirements on the part that has not been dismantled. For example, the pins and bosses on one linkage have been replaced with new parts 18 months ago. The competent person carries out a function test, ascertains that the linkage is operating correctly and that tolerances are within manufacturer's specifications. The competent person notes that this part is to be periodically inspected and that it will require removal and checking within the next hour and a half years.* ***Circumstances under which dismantling of the plant may not be required*** *Under limited circumstances where the plant has had minimal use and has no adverse effects from its storage (e.g. has been stored indoors), the certifying engineer overseeing the major inspection may decide not to dismantle parts of the plant. When making this decision the certifying engineer is to base the decision on factors including the following:* • *the design life of the plant, where this is available for the manufacturer* • *a function test and load test to verify the unit is operating in accordance with manufacturer's specifications and all limits are functioning (e.g. boom rest, stowage, slew, boom fold/unfold)* • *the certifying engineer has a comprehensive knowledge of the specific make and model of plant - such that he or she is aware of where cracks and wear are likely to occur, and uses this knowledge to decide which parts of the plant do not require dismantling. This should be backed up by documentary evidence (e.g. previous case studies including photographs)*

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	• *documentation on the working history of the plant that details the operating frequency and duration. This information should be derived from detailed log books and maintenance records kept for the life of the plant and not be based on statements from the boom owner that the boom has had minimal use (note: some of the more sophisticated units may be fitted with data loggers that can supply some of the use information)* • *tolerance checking of critical connections (i.e. those where failure of the connection could result in collapse or overturning of the plant) to check these are within the manufacturer's specifications. Where the manufacturer specifies quantitative tolerances the tolerances should be measured quantitatively and recorded within the inspection report* • *visual verification and/or testing, by the certifying engineer, that the plant is in good condition, after the plant has been cleaned, outriggers deployed and the boom unfolded. This visual inspection should identify the absence of cracks, corrosion and damage to the plant. Where cracks exist and corrosion (other than surface corrosion) exist, it would be difficult for the certifying engineer to justify not dismantling the unit* • *in the case of mobile placing booms, the absence of damage or metal fatigue on the plant from road travel (i.e. even though a limited quantity of concrete has been pumped the unit may be showing signs of wear and damage from road travel – this may apply more to units operated in rural locations)* • *any information from the boom manufacturer that may affect the decision on whether the unit is dismantled (e.g has there been a safety recall on the unit that highlights failure and/or increased wear of critical components)* • *verifiable documentary evidence that a particular part of the plant has been dismantled and re-assembled to an acceptable standard recently (refer section "**When can the engineer decide not to dismantle a component**")* • *full documented history of any minor or major repairs and modifications that have been carried on the placing boom or support structure (photographic evidence and repair method statements should remain with plant for future reference).* *Where the certifying engineer has determined that dismantling of the plant is unnecessary, an inspection criteria should be developed by the engineer that includes any conditions associated with the ongoing safe use of the unit. For example, the engineer may specify more frequent inspection intervals or may state that the unit requires dismantling within a period of less than six years.* The new content reflects appropriate safety standards for the significant risks arising from cracks and excessive wear on the booms and supporting structure which if not detected can lead to catastrophic failure and collapse of the boom.
5.7 Inspection report	The information in this section has been expanded to clarify that before re-entering service a comprehensive inspection report is to be completed. Information is provided on what should be included in the report. Advice is also provided that if the engineer

2005 Code section	Concrete pumping Code of Practice 2019 and explanation of changes
	has made a decision not to dismantle the plant they are to document a rationale for the decision which include factors set out in the section "***Circumstances under which dismantling of the plant may not be required***". The following text has been deleted: ~~If repairs/replacements are required (as assessed in accordance with the manufacturer's recommendations and/or the requirements of *AS 2550.15 Cranes – safe use – Concrete placing equipment*), then the plant owner should ensure that a record of the repair/replacement action required, together with the reason, is recorded in the log book. If no action is taken, or the equipment continues to fail to meet the assessment criteria, then the inspector may order that the equipment be removed from service immediately.~~ The following text has been included: *Prior to the concrete placing boom re-entering service, a comprehensive inspection report is to be completed that includes the following:* • *a summary of the history of the boom prior to the major inspection being carried out, unless this is unavailable (if unavailable, the major inspection is likely to be more comprehensive)* • *where provided, a copy of the major inspection criteria specified by the boom manufacturer* • *extracts of the manufacturer's maintenance manual detailing wear tolerances, bolt torques and other relevant instructions followed during the inspection process* • *a list of work carried out on the boom* • *photographs of the unit during the inspection process including photos of damage, wear or cracking* • *if the decision has been made not to dismantle parts of the unit, reasons why this decision has been made based on sound engineering justification* • *list of competent persons carrying out work on the unit as part of the major inspection* • *signed statements from persons involved in the assembly process in relation to:* ▪ *slew ring bolts being installed correctly (taking into consideration bolt type, lubricant if used, and bolting sequence)* ▪ *pin and pin retainers installed correctly.* ▪ *hydraulics components installed correctly including a statement that replaced hydraulics components meet the manufacturer's specifications and that fittings have all been tightened to the correct torque* • *hydraulic cylinders have been creep tested and are satisfactory* • *a summary of parts replaced with copies of receipts for parts provided in the report appendices.*

2005 Code section	Concrete pumping Code of Practice 2019 and explanation of changes
	Where some of the work has been contracted to external parties a description of this work and copies of invoices provided in the appendices. *Where the certifying engineer has made the decision not to dismantle the plant, or parts of the plant, the engineer is to document a comprehensive rationale for their decision that includes a discussion of the factors included in, but not limited to, the section "**Circumstances under which dismantling of the plant may not be required**".* A comprehensive inspection report supports the appropriate safety standards required for major inspections of concrete placing booms.
5.8 Welding and other repairs	No change to this section.
5.9 Reporting defects	No change to this section.
N/A	A new section *5.10 Repair following an incident* has been included. Information has been included that in the event of an incident where structural failure has occurred or the unit has overturned, the unit is to be assessed by the boom manufacturer or an engineer and advice is provided on what measures should take place before the unit re-enters service. The following text has been inserted: *Failure of a component on a concrete placing boom can occur during normal operation or when the boom contacts another structure or item of plant. In addition, when a mobile placing boom overturns, damage to the boom and/or outriggers is likely to occur. In the event of an incident where structural failure has occurred or the unit has overturned, the unit is to be assessed by the boom manufacturer or an engineer. This assessment is to analyse the circumstances of the incident to determine the main contributing factors and possible reasons for the failure (i.e. soft ground, design abnormalities, normal wear, collision with other plant, etc). Where the unit is to re-enter service the following additional measures overseen by the manufacturer or engineer are to take place;* • *an assessment to determine components that may have been damaged as a result of the incident and that will need to be inspected* • *dismantling to the extent necessary to enable adequate inspection of potentially damaged components*

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	• *preferably, replacement of damaged components with new components1 that meet the design specifications of the manufacturer* • *function testing of the re-assembled boom that may include load testing if recommended by the manufacturer or engineer* • *preparation of a detailed report on the repair of the boom that includes a statement by the manufacturer's representative or the engineer that the placing boom is safe to operate.* ***Notes:*** *Loadings on concrete placing equipment can be severe and complex. For these reasons, it is usually a safer alternative to replace the damaged component with an original equipment part from the manufacturer. Where the decision is made to repair a component, the repair is not to adversely affect any other parts of the equipment and is to have a design life at least equivalent to the replaced component.* The new content reflects appropriate safety standards and is in line with current industry practice.
5.10 Log books and inspection record sheets	This section has been renumbered 5.11. A minor amendment to a point is made as follows: • *all log books and inspection record sheets are to show complete details of all inspections, tests, repairs, replacements and modifications carried out on* ***the*** *equipment~~, in accordance with AS 2550.15 Cranes – safe use – Concrete placing equipment~~*
5.11 Warning and safety signs	This section has been renumbered 5.12. A minor amendment is made as follows: *Ensure that all warning and safety signs/stickers are in good condition, legible and positioned on all equipment (after being inspected and found to be serviceable)~~, in accordance with AS 2550.15 Cranes – safe use – Concrete placing equipment~~.*
5.12 Pipe testing, identification and marking	This section has been renumbered 5.13. The following content has been deleted: *~~(a) Pipe wall thickness should be tested in accordance with AS 2550.15 Cranes – safe use – Concrete placing equipment.~~*

2005 Code section	Concrete pumping Code of Practice 2019 and explanation of changes
	~~*(b) Ultrasonic testing may not be appropriate for a twin wall pipeline. Other suitable testing methods should be adopted such as the use of thickness testing callipers, increased inspection and increased monitoring of use, in terms of volume and type of concrete pumped.*~~ ~~*(c) Piping with a wall thickness less than the recommended thickness for the pumping design pressure should not be used.*~~ ~~*(d) All pipeline segments should be clearly identified with a permanently fixed unique identification mark or number, prior to being placed in service, showing the details required in accordance with AS 1418.15 Cranes (including hoists and winches) – Concrete placing equipment.*~~ ~~*The pipe log book shall record wall thickness and pressure details, in accordance with AS 1418.15 Cranes (including hoists and winches) – Concrete placing equipment.*~~ The following content has been inserted: • *All pipeline segments should be clearly identified with a permanently fixed unique identification mark or number, prior to being placed in service* • *Pipe wall thickness should be monitored by inspection to ensure it exceeds the minimum thickness specified by the concrete pump manufacturer, for the specific type and grade of pipe used. Pipeline with a wall thickness less than that specified by the pump manufacturer should not be used.* • *In the case of single wall pipe, actual thickness readings should be taken and recorded in a log book at intervals not exceeding one month (i.e. using a calibrated ultrasonic thickness tester). The pipe log book should record wall thickness and pressure details.* • *Thickness of twin wall pipe cannot be easily checked unless pipe clamps are removed and an internal inspection is made. Wear rates on twin wall pipe may be less than single wall pipe, however a documented system to reduce the risk of pipeline failure should be implemented for any pipe. In the case of twin wall pipe, internal inspections should also be carried out to verify if the pipe is wearing at the predicted rate and a record of these inspections should be included in a log book.* • *The discard procedure for any concrete pumping pipe should not be based solely on assuming that a specific volume of concrete can be pumped through the pipe before it is removed and discarded.* There have been a number of incidents associated with the failure of concrete delivery pipelines therefore the content has been revised to reflect appropriate safety standards.
6 Safety equipment	Minor amendment to this section as follows:

2005 Code section	Concrete pumping Code of Practice 2019 and explanation of changes
6.1 Provision of personal protective equipment (PPE)	'concrete pump operator' replaced with '*concrete pumping PCBU*'
6.2 Additional equipment	For safety reasons concrete pump units should be equipped with a fire extinguisher Minor amendment to a point as follows: • fire extinguishers ~~(as appropriate)~~
7.0 Training and Supervision	This section, including content, has been moved to 1.5 and renamed 'Information, training, instruction and supervision'.
Appendix 1: Dictionary	Changes made to content of the Code are reflected in a number of minor amendments to definitions in Appendix 1 as follows: ***Competent person*** ~~*means a person who the concrete pumper ensures (prior to appointment), has current skills and knowledge through either training, qualification, or experience or a combination of those, who is industry based, and who may have obtained training certification from the appropriate manufacturer to have the knowledge and skill to enable that person to correctly perform the task required.*~~ *For the purpose of conducting major inspections under Section 5.6:* *means a person who has the skills, qualifications, competence and experience to inspect the plant; and is registered under a law that provides for the registration of professional engineers.* *For all other references in the code:* *means a person who has acquired through training, qualification or experience the knowledge and skills to carry out the task.* ~~***Concrete Pumper*** *means PCBU of a concrete pumping business engaged by a principal contractor, subcontractor or person in control of a workplace to pump concrete.~~ ~~***Professional engineer*** *means a person eligible for membership of the Institution of Engineers Australia or a Professional Engineer of Queensland.~~

2005 Code section	Concrete pumping Code of Practice 2019 and explanation of changes
	***'Engineer'**, in relation to the performance of a task means a person who–* • *is a registered professional engineer under the Professional Engineers Act 2002* • *is competent to perform the task.* *A person must not carry out professional engineering services in Queensland unless they are a registered professional engineer under the Professional Engineers Act 2002. For more information, refer to the Board of Professional Engineers of Queensland.*
N/A	A new *Appendix 2: Sample questions for concrete pump line hands* has been included that can be used as an indication of the knowledge and experience of concrete pump line hands.
N/A	A new *Appendix 3: Example – Concrete placing boom safety certificate – Major inspection* has been included.