

READY MIXED CONCRETE DRIVER PUMP SAFETY GUIDELINES



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1.0 CONCRETE PUMP OVERVIEW

Concrete pumping is a very common and practical method used by contractors to place large volumes of concrete in an efficient and effective manner throughout North America.

At a most basic level, a concrete pump is a piece of construction equipment that consists of the following key items:

- A receiving hopper that holds the concrete prior to pumping
- A concrete pump that pressurizes the concrete to push it to the desired location over significant distances
- Discharge lines that are used to transport the concrete to its final point of discharge



The three basic types of concrete pumps that you will see on jobsites include:

TYPE 1 - TRAILER MOUNTED LINE PUMPS

This type of concrete pump is typically transported to the jobsite on a trailer or on the back of a truck. The concrete pump discharges concrete on the jobsite using a combination of metal and rubber pump lines, and is typically used for smaller concrete pours or in locations where a boom pump can't obtain safe access.



TYPE 2 - MOBILE BOOM PUMPS

This type of concrete pump consists of a large truck frame with both a concrete pump, and a folding boom with a reach in the range of 20 to 60 metres. This type of concrete placing equipment always includes outriggers, on the front and back of the vehicle to ensure a stable and level operating platform.



TYPE 3 - STATIONARY TOWER PUMPING BOOMS

This type of concrete pump consists of a concrete placement boom that is similar to a jobsite tower crane, but is just dedicated to operating the concrete placement boom. The actual mechanical components of the unit are similar to a trailer mounted pump, that is located at ground level.

While there are some significant differences in how these types of equipment operate, there are standard safety protocols that must be taken for all concrete pumping operations, and equipment specific protocols that should be followed based on the type of equipment being used on the jobsite.



2.0 PERSONAL PROTECTIVE EQUIPMENT












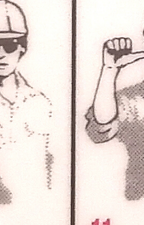



The Standard personal protective equipment required by all concrete producers at plant locations and for use on construction sites also applies to any activities around concrete pumping. Concrete delivery professional should always follow their company specific health and safety requirements.



3.0 CONCRETE PUMPING HAND SIGNALS

Being able to effectively communicate with the operator of the concrete pump, is a critical safety requirement for concrete delivery professionals. The concrete driver has specific safety responsibilities regarding the concrete pumping operations, and must be able to communicate with both the contractor and the concrete pump operator throughout the pour.

The specific hand signals used by the concrete pump operator are shown below:

CONSIGNES DE SÉCURITÉ				SAFETY INSTRUCTIONS		
 Recommended hand signals Signaux de main recommandés						
 1. START PUMP SPEED UP	 2. SLOW PUMP DOWN	 3. STOP PUMP	 4. LITTLE BIT	 (2 coups) (2 taps) 5. RELIEVE PRESSURE	 6. ADD WATER 4 GALLONS	 7. ALL DONE CLEAN UP
1. DÉMARRER LA POMPE ACCÉLÉRER	2. RALENTIR LA POMPE	3. ARRÊTER LA POMPE	4. UN PEU	5. LIBÉRER PRESSION	6. AJOUTER 4 GALONS	7. TERMINÉ NETTOYER
 8. BOOM UP	 9. BOOM DOWN	 10. BOOM LEFT	 11. BOOM RIGHT	 12. OPEN OR EXTEND BOOM	 13. CLOSE OR RETRACT BOOM	 14. STOP BOOM
8. FLÈCHE VERS LE HAUT	9. FLÈCHE VERS LE BAS	10. FLÈCHE VERS LA GAUCHE	11. FLÈCHE VERS LA DROITE	12. OUVRIR OU ÉTENDRE LA FLÈCHE	13. FERMER OU RÉTRACTER LA FLÈCHE	14. ARRÊTER LA FLÈCHE

4.0 JOBSITE SETUP SAFETY CONSIDERATIONS

While the responsibility for the safe set-up and operation of a concrete pump lies primarily with the concrete pump operator and general contractor, all workers on a jobsite have a personal responsibility to assess safety situations that directly impact them and the concrete truck they are responsible for.

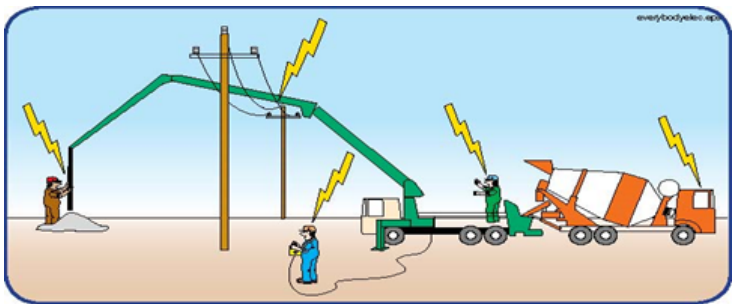
All concrete delivery professionals should be conducting their own safety evaluation of the concrete pumping set-up, and any safety concerns should be raised directly with the concrete pump operator. If the operator is not able, or willing, to address any identified safety concerns contact your supervisor regarding how to proceed (follow your company-specific safety requirements).

Specific issues that the concrete delivery professional should asses at every concrete pump placement include, but are not limited to:

A) OVERHEAD WIRES

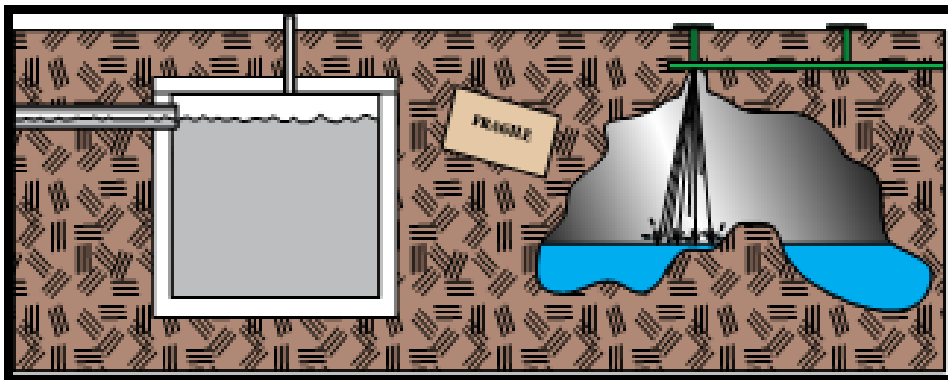
While all equipment operators must be aware of the dangers posed by overhead electrical wires, concrete pump placement using boom pumps require additional safety considerations, depending on the length of the concrete placing boom. The concrete placing boom should not ever come within 3 metres of an electrical line. If the minimum safety distance cannot be met, then the electrical services should be temporarily discontinued and a representative from the electrical authority should be on-site to verify that the power is off. These setback requirements apply to all phases of the concrete pumping operation, even if there are no electrical lines in the concrete placement area, as safety issues can still exist during boom extension, retraction, and washout operations.

Item	Column 1 Nominal phase-to-phase voltage rating	Column 2 Minimum distance
1.	750 or more volts, but no more than 150,000 volts	3 m
2.	more than 150,000 volts, but no more than 250,000 volts	4.5 m
3.	more than 250,000 volts	6 m



B) UNDERGROUND SERVICES

Since concrete pumps can exert significant ground pressure during operation, they should not be set-up over underground services, unless an engineer has confirmed that the structure can support the load. Unfortunately, not all underground services are easily identifiable, but questions should be raised when manhole covers, or other obvious underground elements, are located in the work area. Additionally, concerns should be raised when significant earthwork has taken place on the site, and there are obvious signs of improper compaction (for example tire rutting). The primary issue with poor compaction is the potential for the ground to compress or collapse under the concrete pump during operation, causing dangerous stability issues.



C) SAFE ACCESS TO THE CONCRETE PUMP

Do not make the assumption that since the concrete pump was able to access the jobsite and set-up, that the concrete delivery vehicles should be able to do the same. Ready-mix drivers should ensure that the access paths and ramps are clear and properly constructed to support the weight of a fully-loaded concrete truck. The contractor must provide the necessary signal person(s) to allow the truck to safely back up to the concrete pump, without striking adjacent construction elements (pole bases, catch basins, curbs, etc.).



D) MINIMUM CONCRETE TRUCK SEPARATION DISTANCE

Due to site congestion, the contractor may be inclined to create the minimum sized stable work area. The concrete delivery professional must ensure there is sufficient space for both the concrete pump and 1 or 2 concrete trucks to safely operate in the designated work area. The ready-mix driver must be able to access their truck safely, and maintain a minimum separation distance between adjacent trucks. The concrete industry recommends that a 1-metre space be maintained between concrete trucks that are accessing the pump hopper.



Note: It may be necessary to unfold your ladder before backing into position

E) CONCRETE PUMP STABILITY CONSIDERATIONS

While the concrete pump operator is responsible for safely setting up their equipment, the concrete delivery professional should observe the following:

- The pump has been set up in a level condition
- The outriggers on the concrete pump are fully extended and are providing adequate support to the concrete pump
- The work area has been properly cleared and leveled

While it is possible to operate a concrete pump in a **“short rigged”** position (where the outriggers are not fully extended on one side of the pump), there are significant limitations to where the concrete boom can operate in this condition. Everyone should be aware that the stability of the concrete pump has been reduced and proper operational guidelines must be followed.



F) JOBSITE SIGNALER REQUIREMENTS

Regardless of whether you operate a front discharge or rear discharge concrete truck, a signaler is required to safely back up the truck to the concrete pump or to back the truck away from the concrete pump set-up. Typically, the general contractor is responsible for providing signal person(s) to assist in safely backing up on their jobsite and ensuring they have the necessary training.



5.0 DELIVERING READY MIXED CONCRETE TO A CONCRETE PUMP

A concrete delivery professional's main responsibility is to ensure a steady supply of concrete is maintained in the concrete hopper, throughout the pumping process.

The primary safety concern related to the level of concrete in the hopper, is if air is pulled through the concrete pump, the pressurization process can cause a violent whipping action at the discharge end of the hose. This results in concrete exiting the hose at extreme velocity and can severely injure the workers placing the concrete at the end of the pump line.



Some of the specific issues that the concrete delivery professional should be aware of include, but are not limited to:

A) MINIMUM AND MAXIMUM CONCRETE LEVELS

During the concrete pumping process, the ready-mix driver is responsible for maintaining an acceptable level of concrete in the hopper.

- **The minimum level of concrete:**

is the level of concrete required to just cover the shaft of the agitator arm in the concrete pump. If the level of the concrete drops below the agitator, air can be pulled into the concrete pump resulting in hose whipping, which is an extreme safety concern. If the concrete level drops below the agitator bar and the concrete pump operator is not present, **press the emergency stop button** to alert the pump operator of the impending safety issue.



- **The maximum level of concrete:**

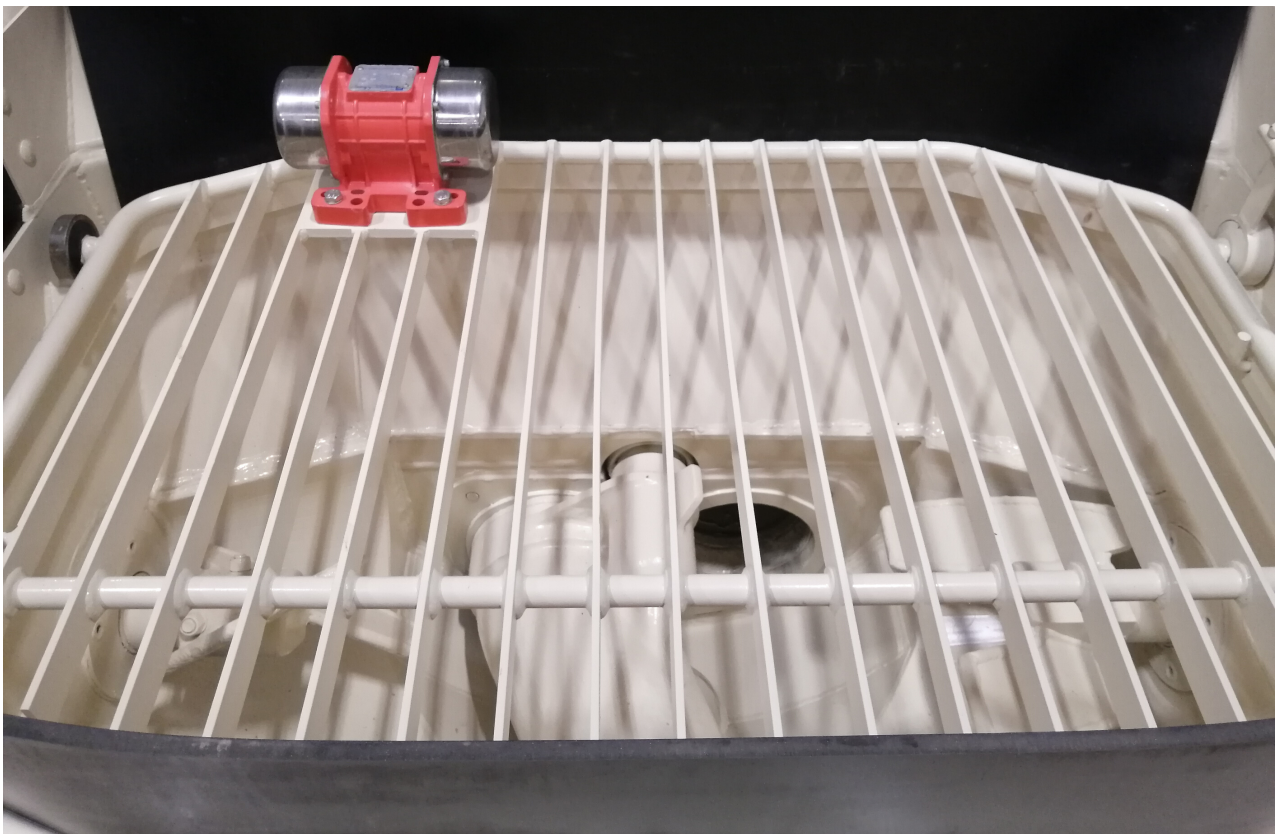
is the level of concrete required to just cover the grating on the concrete pump hopper. Exceeding the maximum level results in overfilling and concrete spilling on the ground and on the concrete pump.



The concrete delivery professional should position themselves in a location where they can effectively monitor the concrete level in the hopper. It is not recommended that the driver stand on the rear working platform, as it is difficult to maintain three point contact at all times in this position.

B) HOPPER SAFETY GRATING

Since the concrete pump hopper includes an agitator to keep the concrete from segregating at the inlet ports, there are significant safety concerns for workers that enter this area. As a precaution, every concrete pump (trailer, boom and fixed placement) must have a manufacturer installed safety grate over the hopper. When the safety grate is raised to service the equipment, the safety controls on the concrete pump must prevent the agitator from turning and the concrete pump from operating, as significant crushing hazards exist. The concrete delivery professional should only discharge concrete into the hopper when the concrete grate is in place. If the concrete pump is operating with the safety grate up, the equipment is either damaged or has been tampered with, and concrete delivery should be refused due to unsafe practices.



C) EMERGENCY STOPS

Since concrete pumps have both wired and wireless remotes, that allow the operator to utilize the equipment from varying distances, the manufacturer is required to include an emergency stop button that must be located within 2 metres of the concrete hopper. The concrete delivery professional should locate the emergency stop button prior to discharging concrete. The emergency stop button can be pressed by anyone on the jobsite that identifies a safety issue that the concrete pump operator may not be aware of. If possible, obtain the pump operator's attention first by hitting the horn button.

Emergency situations could include, but are not limited to:

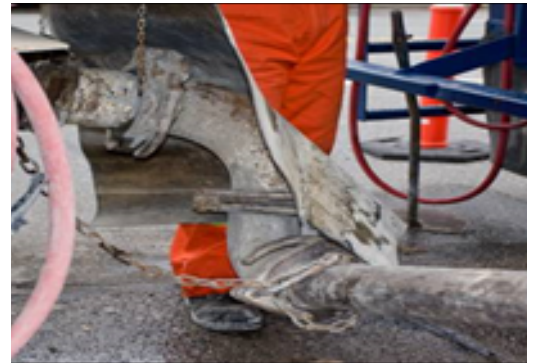
- Running out of concrete to the point where the agitating bar is now exposed, and air may be pulled into the system
- Witnessing foreign material falling into the concrete pump hopper (cement balls, hand tools, etc.)
- Observing significant settlement of the concrete pumping equipment during the placing operation (to the point where the equipment is no longer within the 3-degree level requirement of the equipment manufacturer)



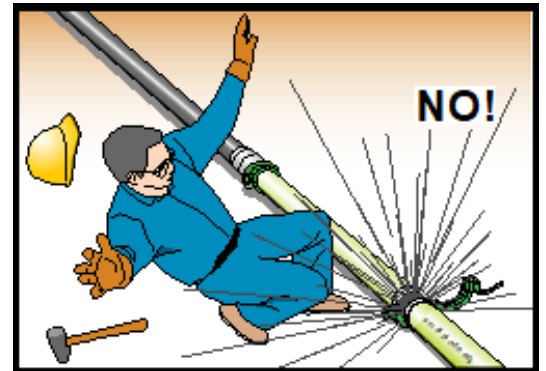
D) PRESSURIZED ELBOWS, LINES, AND CONNECTOR FAILURES

Pumping a concrete mix that consists of up to 70% aggregate requires significant pressure to move the material through various lines, over large distances and changes in elevation. Average concrete pumping pressures are in the 500 to 1,500 PSI range, and while pump operators are required to conduct routine inspections on all wear items, failures are most likely to occur at high-pressure points and connectors.

For the concrete delivery professional, one of the points of highest concerns is the first elbow coming off the concrete pump, typically located below the hopper. This point has the highest pump pressure and receives the most wear, causing abrasions and thinning of the metal in the elbow joint, resulting in ruptures that could cause serious injuries to the ready-mix driver's feet and legs.



Other areas of concern, include all rigid pipe connectors. These items can undergo wear and the mechanical safety pins installed to prevent the connectors from opening, can unintentionally be knocked out by adjacent construction activities.



E) REVERSING THE CONCRETE PUMP DIRECTION

In the event that air is pulled into the concrete pump, the pump operator must “reverse” the direction of the concrete pump in order to expel the air before it reaches the flexible end of the pump line. During this process, the ready-mix driver must maintain a safe distance from the concrete hopper, as compressed air can blow the existing concrete in the hopper back towards the ready-mix truck.

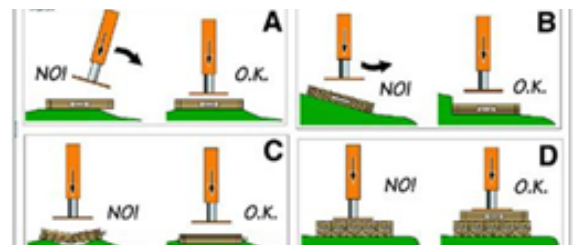


6.0 STABILITY CONSIDERATIONS FOR MOBILE BOOM PUMPS

One of the most significant challenges for mobile boom pumps is ensuring adequate support and stability, on active construction sites with highly variable site conditions.

While the safe operation of the concrete pump remains the primary responsibility of the concrete pump operator, everyone on site should ensure the following:

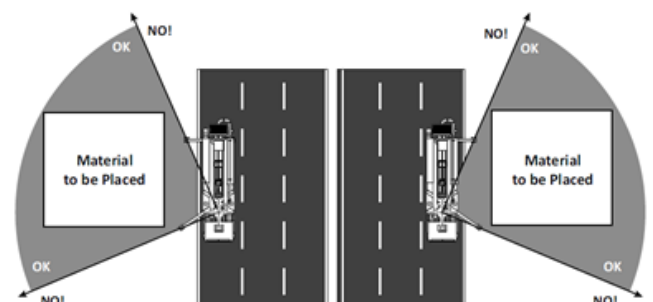
- A level space has been cleared of all construction materials for both the concrete pump and the concrete truck unloading
- The concrete pump has its outriggers fully extended (or is set up in proper **“short rigging”** position) and is operating in a level condition
- Properly prepared access roads and a designated signal person(s) are available to back up trucks to the concrete pump



A) SHORT RIGGING OF THE CONCRETE PUMP

Short rigging is the process of not fully extending the outriggers on a concrete pump, on one side of the equipment. Short rigging is only allowed when authorized in the equipment manual and when all the safety conditions outlined in the manual have been met.

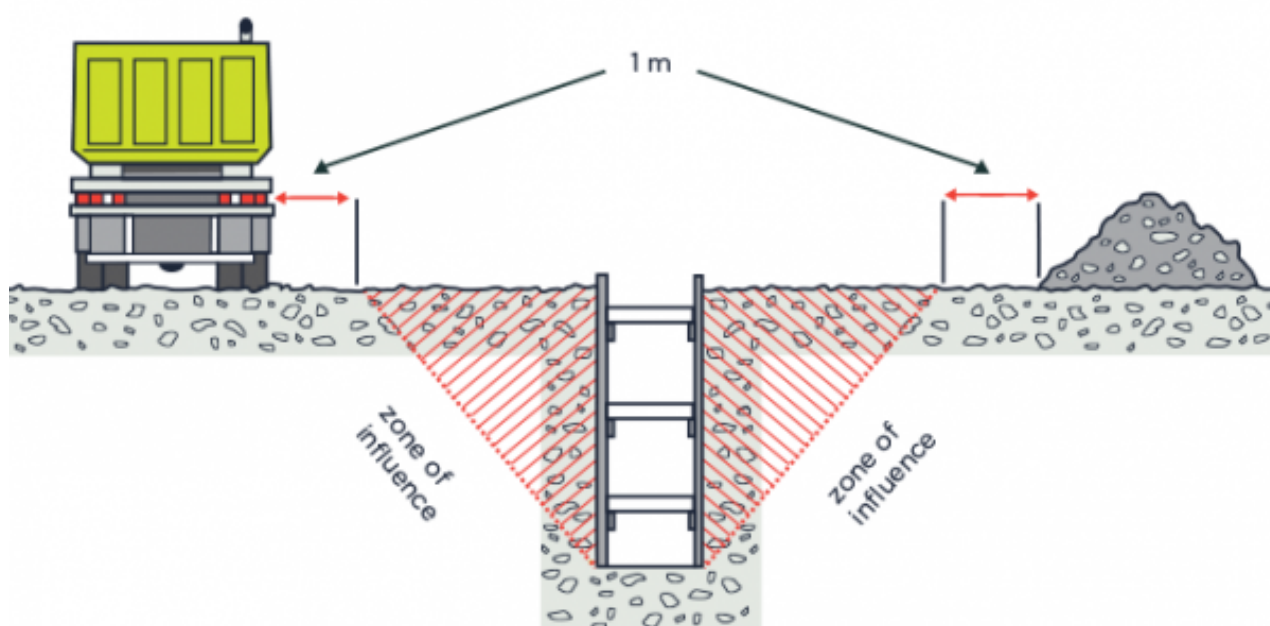
When the concrete pump is short rigged, the boom can only operate in the quadrant that is located between the outriggers that are fully extended. If the boom operates in any other quadrant, the machine may become unstable and tipping becomes a significant hazard.



B) MINIMUM SETBACKS FROM EXCAVATIONS

When setting up a mobile boom pump on an active construction site with open excavations, the concrete pump must be a minimum of 1 metre away from the edge of the excavation. The extended outriggers should not be based in the zone of influence, to ensure adequate support and stability.

Ready-mix trucks and all materials must be kept a safe distance away from the opening.



7.0 COMPANY & DRIVER RESPONSIBILITIES AS PER CSA Z151

CSA Z151 “Concrete Pumps and Placing Booms” was updated in 2017 for use in all Canadian Provinces. While this specific CSA standard is not referenced in the 2019 Ontario Occupational Health and Safety Act (OHSA), this document does represent the industry best practices regarding concrete pump safety. CSA Z151 includes a detailed “Responsibilities” section that outlines the safety responsibilities of everyone involved in the concrete pumping industry, from the manufactures of the equipment to the construction crews placing the concrete.

CSA Z151-17 outlines the following responsibilities for the concrete industry:

Ready Mixed Concrete Supplier (Company) shall:

- a) Provide a mix consisting of the material components or performance properties specified;
- b) Deliver the material according to the specified time criteria; and
- c) Train the ready-mixed concrete drivers on the duties and hazards of working with concrete pumps.

Ready Mixed Concrete Supplier Driver shall:

- a) Deliver material into the hopper at a rate sufficient to prevent air from being introduced into the concrete pump;
- b) Notify the concrete pump operator:
 - a. when their truck is empty;
 - b. if air has entered the concrete pump; and
 - c. if foreign material is discharged with the mix into the hopper; and
- c) Activate the concrete pump emergency stop if unable to communicate with the concrete pump operator and air or foreign material has entered the hopper or when the truck is empty.

Source: Ready Mixed Concrete Supplier/Driver, **CSA Z151-17 Concrete pumps and placing booms**. © 2017 CSA Group

8.0 REFERENCES

- [CSA Z151-17](#)
- [CSA A23.1/2](#)
- [BC Construction Safety Alliance-Certified Concrete Pump Operator](#)
- [RMCAO Guidelines for Delivering to Concrete Pumps](#)