



Chipping Out the Drum: Safe Work Practices

Produced by “Georgia Tech’s Safety and Health
Consultation Program

An OSHA Susan Harwood 2004 Training Grant Project

Con Traducción en Español

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WORKER SUMMARY

This Worker Summary reviews the most important safety training points that you need to understand before beginning this work. The Worker Summary should always be used in combination with the information contained in the training movie which accompanies this booklet.

Controlling Air Contaminants

The dust that is released by chipping concrete contains crystalline silica and is dangerous to breathe. You should ALWAYS plan to use at least the following dust control measures:

- Open the lower access port – NEVER enter a drum without opening this port
- Ventilate the drum. Connect the inlet hood for the ventilation system to the lower access port.
- Connect the hood and ductwork to an exhaust blower.

Respirators

IN ADDITION TO dust controls, respiratory protection must ALWAYS be worn when chipping out concrete. Possible respirators suitable for this work include:

- Half-mask respirator with particulate filtering cartridges. *This type of respirator can provide sufficient protection only if dust levels are first reduced through ventilation, or other control measures.*
- Powered air purifying respirator. This respirator uses a portable battery powered blower to supply air to the respirator.
- Supplied air hood. *When using an oil-lubricated industrial compressor to supply breathing air, appropriate filters and a carbon monoxide monitor must be used.*

Hearing Protection

It is essential to wear hearing protection when conducting this type of work. There are two basic types of hearing protection:

- Insert protectors
- Ear muffs

Whenever possible use both ear muffs and ear plugs.

Other Personal Protective Equipment

- Hard hat
- Safety glasses
- Skin protection: *long sleeved shirt and pants or protective coverall suit*
- Steel toe/steel shank safety footwear
- Leather gloves

Lockout

Before you enter a drum to chipout, control all hazards using lockout procedures.

- Remove bolts to open all lower entry ports on the drums. NEVER ENTER TO CHIP OUT A DRUM BY THE UPPER CHARGE CHUTE IF YOU HAVE NOT OPENED THESE LOWER PORTS.
- Visually inspect the inside of the drum to look for any areas of excessive concrete buildup or cracks in the concrete.
- Park the truck, set the parking brake, and chock the wheels.
- Remove the ignition key, and keep the key in your possession.
- Secure the door to the cab of the truck using a “tie-down” and a locking hasp.
- Secure the drum to prevent movement using tie-downs which are tightened to the frame of the truck and locked in the closed position.

Heat Stress

During hot weather, be aware of the dangers of heat stress, including:

- Heat cramps
- Heat exhaustion
- Heat stroke

Drink extra water before and during this work. Take a break from this work if you feel overheated, are getting a headache, or feel dizzy. An air cooling vortex tube is highly recommended when a supplied air respirator is used.

Entry/Declassification Certificate

To make sure that all of the safety measures described in this training have been completed, and for compliance with OSHA's Permit Required Confined Space standard, a "declassification certificate" must be completed prior to entry. It is recommended that your supervisor be the one to complete this certificate. An example declassification certificate has been provided in Appendix B of this manual.

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TRANSCRIPT

Introduction

This training session will cover the safety practices which should be followed when chipping out hardened concrete from the inside of drums on ready mixed concrete trucks. Many of these safety practices can also be used when chipping out the drums at central mix plants. When concrete has set up on the inside of the mixing drum, a worker must enter to chip it out. The worker may be the driver, another worker assigned to this job, or a subcontractor. Regardless of who the worker is, the hazards they face are the same and ALL workers should be protected equally. The hazards of this work include:

- high levels of silica dust,
- high levels of noise,
- mechanical hazards from the turning drum, and
- working in a confined space.

In some times of year, heat stress may also present a serious challenge. This training session will demonstrate safe methods to reduce the risk of these hazards. These methods should be followed, whether you are an employee of the company OR you are a subcontractor. Remember, ALL workers must be equally protected.

Air Contaminants

Chipping out concrete is a dusty job. However, the dust that is released by this work is not merely a nuisance; it is also dangerous to breathe. The aggregate materials in concrete, mostly sand and gravel, contain a large amount of a mineral called crystalline silica. If crystalline silica gets into your lungs, it can cause a serious and sometimes fatal disease called silicosis. There is **no** cure for silicosis. To prevent the disease, you **must** prevent the exposure.

When chipping out concrete you should ALWAYS plan to use dust control measures. As we discuss the options for controlling silica dust, you should bear in mind that exposures during chip out work are so concentrated that

BOTH dust control measures AND respirators must be used.

Local exhaust ventilation can be effectively used to remove much of the contaminated air from the drum. Prepare the drum by opening the lower access port. NEVER enter a drum without opening this lower port. Connect the inlet hood for the ventilation to the lower access port. The hood connection should be easily attached or detached by the worker inside the drum. Do not bolt or permanently attach the hood. Use flexible ductwork to connect the hood to an exhaust blower. Position the ductwork so that the path to the exhaust fan is as straight as possible. The exhaust fan should have a capacity of approximately 3,000 cubic feet per minute. Exhausted air should be filtered and directed away from other workers.

Pedestal fans used to blow air into the drum or the use of an independent box fan, or a detachable pedestal fan placed at the top charge chute of the drum are not effective and are not recommended. Fans in these positions draw or push contaminated air through the worker's breathing zone. Additionally, the blades on this type of "propeller" fan lack the capacity to create the static pressure necessary to move a sufficient volume of air through the drum.

In some cases, water can be used in addition to, or in place of, exhaust ventilation. Chipping hammers can be retro-fitted with water spray nozzles that direct a fine mist at the point of chipping work. Water may also be supplied using a hand held mister to suppress dust. Pre-soaking the truck overnight prior to chipping work can also reduce dust.

Respirators

In addition to dust controls, respiratory protection should ALWAYS be worn when chipping out concrete. In combination with the use of dust control measures, respirators can provide effective breathing protection for workers. There are several types of respirators which can be used. All respirators must be approved by the National Institute for Occupational Safety and Health (or "NIOSH") for protection against particulates. Filtering facepiece respirators may be used and these are sometimes called disposable respirators, or even mistakenly referred to as "dust masks". However, regardless of the name used, always check the label to make sure

that the respirator is NIOSH approved, and if you do not see this approval, do not use the respirator. Half-mask respirators with molded facepieces and particulate filtering cartridges may also be used. Make sure that any cartridge or respirator used is intended for protection against particulates. The most common particulate filtering respirators will carry a designation of “N95” or “P100”. Cartridges intended for protection against chemical vapors and gases, or for combined protection against chemicals and particulates, should not be used.

When putting on either a molded respirator or a filtering facepiece respirator, adjust the respirator so that it fits firmly against your face. A worker with a beard cannot wear this type of negative pressure respirator. Each time that you put on the respirator you should check to make sure that the respirator is completely sealed to your face, and is not leaking. This is done by using the palm of your hand to seal the exhalation port of the respirator and attempting to breathe out, and then by covering the filter cartridges and attempting to breathe in. You should not feel any air leaking around the facepiece seal during these checks.

Respirators which supply air to the worker are often a good choice for this work. Because head protection is also needed, respirators which are combined with a hood or helmet are preferred. One style of respirator, called a powered air purifying respirator (PAPR) uses a battery powered blower attached to the worker’s belt to supply air to the respirator. A second style of respirator uses air from a compressor to supply breathing air. When using an oil-lubricated industrial compressor to supply breathing air, appropriate breathing air filters and a carbon monoxide monitor **MUST** be used. **NEVER** connect compressed airlines to your respirator without using these filters and monitors. The filters assure that oil mist, particulates, and excess moisture are removed from the air supply. Carbon monoxide, however, cannot be filtered out. For this reason a carbon monoxide monitor must be installed to make sure that the air supply does not contain this poisonous, odorless gas. When working in hot conditions an air cooling tube (also called a “vortex” tube) is highly recommended. This cooling tube is simply connected to the respirator’s intake airline, after the air has been filtered and monitored for carbon monoxide.

OSHA rules require that the use of respiratory protection be managed by a qualified program administrator in your company. As an employee, you must be included in a written respiratory protection program by your employer. You must be trained to correctly wear your respirator. Your health must be evaluated by a licensed health care provider prior to wearing a respirator. You must be trained on the proper care and maintenance of your respirator.

In summary, respirators supplement, **BUT DO NOT REPLACE**, the protection provided by other control measures, such as ventilation. All respirators have an Assigned Protection Factor. Workers must be aware that exposures to silica dust during chipout often exceed the Assigned Protection Factor of an air filtering respirator. This type of respirator can provide protection only if dust levels are **FIRST** reduced through ventilation. Workers should never conduct this work if an air purifying respirator is the **ONLY** protection available.

Hearing Protection

Using a chipping hammer exposes a worker to high noise levels. In the confined space of a mixing drum, this exposure is even higher. Although you may not be immediately aware of the danger, this noise will cause you to lose hearing. It is essential to wear hearing protection when conducting this type of work. Begin by selecting an insert type hearing protector. An insert type hearing protector may also be called an “ear plug”. Look for the Noise Reduction Rating (NRR) provided by the manufacturer. You will want to obtain the highest NRR available on the hearing protectors you choose, and you should select hearing protectors with an NRR of at least 30 dB. Foam insert plugs are a good choice in this category. Although it may seem obvious, it is very important to insert hearing protection properly. The value of the protection will be **GREATLY** reduced if the ear plugs do not properly seal off the ear canal, or if the plugs become loose after wearing them. Begin to use the foam inserts by rolling the plugs into a small cylinder. With your opposite hand, reach around your head and slightly pull your outer ear up and back. This straightens your ear canal and allows the plug to be easily inserted. Gently hold the plug for 5 to 10 seconds while it expands. The plug should be snug in the ear canal and noise should

be noticeably reduced. Periodically check the fit of the hearing plugs, and if they are loose, reinsert the plugs, using clean fingers. Noise levels during chipping are so high that a single set of hearing protectors does not provide sufficient protection. The dual protection of ear muffs over ear plugs must be used. Because you will need head protection, these ear muffs can be attached directly to your hard hat.

In addition to wearing hearing protection, your employer must include you in a hearing conservation program. You should be trained annually on

- the harmful effects of exposure to noise
- the purpose of hearing protectors, including the advantages, disadvantages, and level of protection provided by various types
- the selection, fitting, use and care of hearing protectors
- and the purpose of audiometric testing, along with an explanation of the test procedures

As part of the hearing conservation program, you should be provided an initial hearing test before you begin to do this work. Each year your hearing will be tested again and compared to your initial test. You must be notified of any significant loss in your hearing. If such hearing loss occurs, your employer must take steps to prevent further hearing loss, such as providing more protective ear plugs or muffs, limiting the time of your exposure, or simply retraining you on the correct way to use hearing protection.

Lockout

Before you enter a drum to chipout, you must be sure that all hazards have been controlled through the use of specific lockout procedures. Your employer must provide you with WRITTEN PROCEDURES specifying EXACTLY how your truck should be locked out. You are responsible for following these procedures. The following procedures describe one method to lockout a mixer truck. The procedures used by your company may vary slightly. However, any procedures used must achieve a condition in which the drum is fully immobilized, so that you cannot be injured by movement of the drum once you have entered. Your employer must train you on the specific procedures to be used at your company, and on the types,

sources, and magnitudes of energy that must be controlled by the lockout procedure.

Before entering the drum, you must perform the following steps. Begin by reversing the rotation of the drum to discharge any water or debris left in the drum. Remove bolts from all lower entry ports on the drums and remove the ports. If the entry way is blocked by concrete buildup, remove this using a sledge hammer. **NEVER ENTER TO CHIP OUT A DRUM BY THE UPPER CHARGE CHUTE IF YOU HAVE NOT OPENED THESE LOWER PORTS.** Once the lower ports have been removed, visually inspect the inside of the drum. Look for any areas of excessive concrete buildup. Also look for any areas of concrete which show cracks, movement, or any other indication that the concrete may not be securely attached to the drum. If any such areas are observed, this section of the drum should be rotated to the lowest position, and this should be the first section to be chipped out. Once this inspection is completed, park the truck in the proper work location, set the parking (emergency) brake, and chock the wheels. Remove the ignition key. If you are to be the worker entering the truck, you will keep this key in your possession. Because there may be multiple keys to the truck, you must take an additional step to assure that no one except you can start the truck. You can do this by securing the door to the cab of the truck using a “tie-down”. Secure one end of the tie down over the fender of the front wheel. Secure the other end to the grab bar for the truck cab, or to another secure location so that the tie-down will prohibit access to the cab. Tighten the tie-down and secure the gear mechanism with a lockout clamp so that the tie-down cannot be loosened. The lockout clamp will then be locked using your designated lockout lock. Your lock should also have a tag where you can write your name to show that you are the one who put this lock in place. You should be the **ONLY** person who has the key to this lock, and you must keep this key with you. You are also the **ONLY** person who is allowed to unlock and remove this lock. Once you have completed this step, you have assured that the truck’s engine cannot be started, and without power from the engine, you have made sure that no one can operate the control lever arms to rotate the drum. Place a tag on the control lever arms to indicate that the truck is locked out.

Once the cab to the truck has been locked out, you must now physically secure the drum of the truck. Although the power train has already been locked out, the drum can still rotate because of the shifting load inside the drum as you work, or because of your own movement inside the drum during chipping. Any movement of the drum can cause a serious hazard for the worker inside. The drum can be secured using tie-downs which are tightened and locked in the closed position, as you did for the door to the cab of the truck. Use the lower entry port and secure the drum with one tie-down going from the top of the port over the top of the drum, and a second tie-down fixed to the bottom of the port and attached to the frame of the truck below the port. If the drum has two ports, one tie-down can be used on each port to secure the drum.

Personal Protective Equipment

We have discussed some of the personal protective equipment you must wear while doing this work, such as respirators and ear protection. The use of additional protective equipment is also required. A hard hat must always be worn, for protection against bumps to the head, or from material that may fall. The hard hat may either be a separate piece of equipment, or it may be included as part of the respirator. Safety glasses must always be worn. Additionally, a faceshield is recommended. It is important to protect your skin, because prolonged skin exposure to concrete dust can cause an allergic skin reaction. This is due to a component of Portland cement called hexavalent chromium. Hexavalent chromium can also cause a respiratory allergy, referred to as an occupational asthma. Once an allergy to hexavalent chromium develops, a worker will react to small amounts of the cement dust, and will not be able to work with dry cement. To protect your skin always wear a long sleeved shirt and pants, or wear a protective coverall suit. Feet should be protected with safety shoes which have both a steel insert in the sole, and steel reinforcement over the toes. Hands must be protected from sharp metal edges on the mixer blades. Heavy leather gloves are recommended.

Heat Stress

Working in the drum of a concrete mix truck can cause your body to suffer from heat. While we often consider heat to be only an inconvenience,

prolonged exposure to heat can cause serious injury or death. During summer months, heat is a particular problem while working in the drum. Your risk of heat stress is increased because of the need to wear protective clothing, because humidity levels may be elevated, and because this is heavy work that requires a lot of exertion. Workers must be aware of the dangers of heat stress. These dangers include heat cramps, heat exhaustion, and heat stroke.

Heat cramps are muscle spasms which usually affect your arms, legs, or stomach, and often occur after you have stopped working. While these cramps are painful, you will usually recover in a short period of time. These cramps let you know that you have not replaced certain vitamins and minerals (called electrolytes) that you lost from sweating.

In heat exhaustion the body sweats excessively. The skin may feel cold when you touch it and it may appear pale. A worker may become dizzy or mentally confused. The time needed to recover from heat exhaustion may vary from several hours up to a few days.

If a worker does not take protective measures when signs of heat exhaustion are present, heat stroke can occur. Heat stroke is a **SERIOUS MEDICAL CRISIS**. In heat stroke, the body no longer sweats. The skin is red, dry, and hot. Body temperature rises, and if it cannot be stopped, death may follow.

The most important thing you can do to avoid the hazards of heat stress is to drink extra water before and during this work. Water must **ALWAYS** be readily available for workers. When eating, choose foods and drinks that will help you to replace the electrolytes that you lose during sweating. Fruits such as bananas and strawberries, and “sports” drinks will help you replace these lost minerals. Avoid caffeinated drinks and alcohol. Take a break from this work if you start to feel overheated, if you are getting a headache, or if you feel dizzy or confused. During hot weather, it is recommended that this work be done on a cycle of 30 minutes of work followed by 30 minutes of rest. Alternating work with a partner outside the truck can help you achieve this work pattern. Using an supplied air respirator with an air cooling tube is also recommended.

Entry Certificate

To make sure that all of the safety measures described in this training have been completed, and for compliance with OSHA's Permit Required Confined Space standard, a "declassification certificate" must be completed prior to entry. It is recommended that your supervisor be the one to complete this certificate. The certificate must be completed for each truck, and must confirm that the following safety measures have been completed:

- All lockout measures have been completed and only the entrant has the key to all of the locks
- All hatches have been opened
- All personal protective equipment is available, in good condition, and is worn
- All breathing airlines are correctly connected, filtered, and monitored for carbon monoxide
- All dust controls are in place and working
- All heat stress provisions such as water and a work/rest cycle are in place
- Provisions to summon emergency services are in place

It is strongly recommended that this work be conducted with a partner outside the truck drum. The partner can assist the entrant with tools, airlines, entries and exits, with observation for heat stress, and with any other hazards that may arise. The partner can also alternate on a work/rest cycle to relieve the workload on the employee in the drum.

By working with your employer's safety program and following all of the safety measures described in this training, you can conduct chipout work in a safe and productive manner.

APPENDIX A: EVALUATION OF TRAINING

1. Concrete dust from chipping should be considered a nuisance dust, but not a toxic dust.
True / False
2. Respirators should always be worn when conducting chipout work.
True / False
3. A cartridge type air purifying respirator by itself will provide sufficient breathing protection during chipout work.
True / False
4. Insert hearing protectors (ear plugs) alone will provide sufficient protection from noise exposures during chipout work.
True / False
5. As a part of a hearing conservation program, you must be given an annual hearing test.
True / False
6. Silicosis is disease which can be cured with proper medical care.
True / False
7. If the lower access port of a mixer drum is closed, a worker may enter the drum through the upper charge chute.
True / False
8. A worker who stops sweating during hot, active work may be experiencing a serious medical crisis.
True / False
9. The compressed air line which is used to operate tools, such as chipping hammers, can also be directly connected to a supplied air respirator for breathing air.
True / False
10. A “declassification certificate” must be completed prior to each entry into a mixer drum.
True / False

APPENDIX B: ENTRY/DECLASSIFICATION CERTIFICATE

Date:

Supervisor:

Truck ID:

This “declassification certificate” must be completed for each truck prior to entry to confirm that the following safety measures have been completed:

- All lockout measures have been completed and only the entrant has the key to all of the locks
- All hatches have been opened
- All protective equipment is supplied and worn
 - Respirators
 - Hearing protection
 - Safety footwear
 - Safety glasses
 - Gloves
 - Coverall protective suit or long sleeved shirt and pants
- All breathing airlines are correctly connected, filtered, and monitored for carbon monoxide (Mark NA –not applicable if not using supplied breathing air)
- All dust controls are in place and working
- All heat stress provisions such as water and a work/rest cycle are in place
- Provisions to summon emergency services are in place
- Partner is available outside drum

