SWI/001

KESCRG SAFE WORKING INSTRUCTIONS

FOR

CEMENT MIXERS

1. Revision Table

Revision	Date	Comments
1	01/01/2011	First Issue following review of draft

2. Objectives

2.1. The objective of this safe working instruction is to enable KESCRG members and others working on canal restoration projects to work safely.
2.2. This document will form part of a suite of documents for safe site working; and will be used for instruction and reference purposes.

3. Introduction

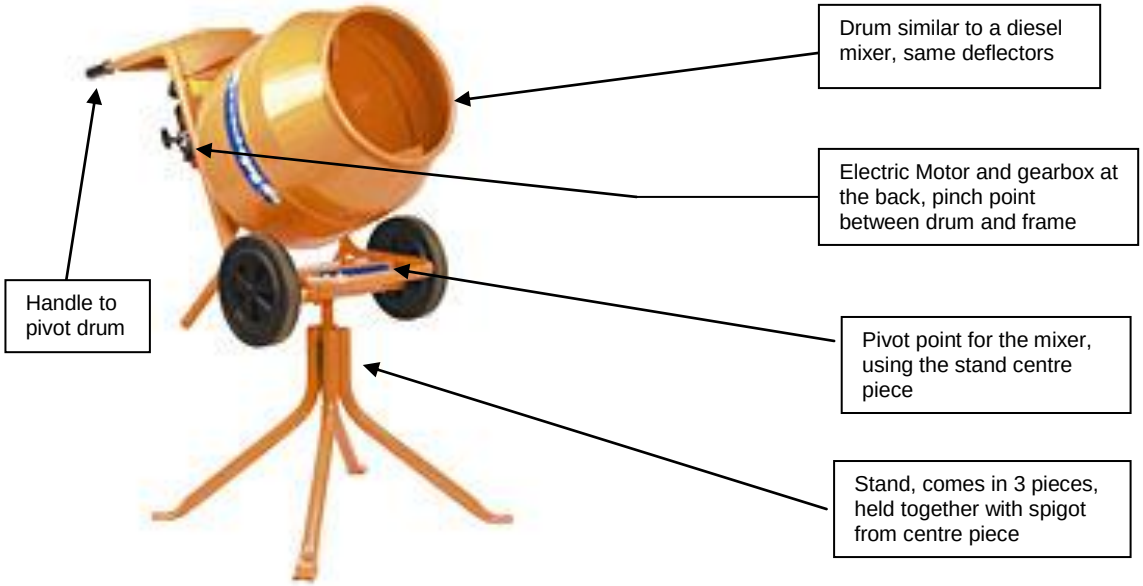
3.1. Electric or petrol/diesel cement mixers have been used in construction projects for many years and take a lot of the hard work out of this activity. This SWI covers the basic principles/procedures for operating this type of equipment; there are many variants which cannot be covered in a brief document. Always familiarise yourself with the exact piece of equipment you are going to use and identify the key components. Most importantly know how to stop it in an emergency, before starting work.
3.2. Cement mixers consist of:

- a drum with deflectors inside to give good mixing
- a prime mover and gear/drive mechanism
- means of tilting the drum (whilst rotating) to enable the mix to be tipped into a wheelbarrow or other means of transport.

General view of mixers

This shows typical diesel mixer, tilt mechanisms; electric mixers require drum to be pivoted.

Electric mixers generally have a “knock-down” frame to raise and support the mixer, as in the photo overpage.



This photo shows an Electric Mixer, as assembled. The drum and motor have to be lifted onto the stand. This is a manual handling issue – needs a 2 –person lift.

4. Health and Safety and Working Environment

4.1. Hazards from mixer

- Pinch points between mixer drum and frame
- Potential for trapped/broken limbs if they are accidentally placed inside the rotation drum.
- Mixers are highly down-geared; this means there is loads of torque to break anything put in its way.
- Pollution and dermatitis from diesel and lubricating (lube) oil. Position mixer in suitable place.
- Potential for electric shock from electric motor or cable (note: mixer must be 110 Volt; outdoor plugs and sockets (CEEFORM type) must be used).
- Route the cable to avoid trip hazards and site the generator to minimise risk of noise/fumes.
- Mixer moving; put the towbar round to prevent runaway and minimise trip hazard.

4.2. COSHH (Control of Substances Hazardous to Health)

- Lime and cement can give rise to burns or blindness if they enter the eye. Eyewash required on site.
- Lime and cement can give rise to dermatitis, wear gloves
- Dust can lead to respiratory problems if inhaled. Dust mask required.
- Diesel, petrol and lube oil are irritants and flammable.

4.3. Manual Handling

- Rotating drum will snatch a shovel with potential for limb damage so wear gloves and position yourself so materials can be flung into mixer without shovel entering it
- Potential for muscular-skeletal injury. Position mixer and material to minimise twisting and lifting.
- Position materials close to mixer to avoid carrying shovelfuls...avoid slips and trips.
- Don’t overdo it. Stop when tired. Accidents happen easier when you are tired.
- Use of shovel can cause blisters, wear gloves.

- Slippage of handwheel could injure thumbs, grip with fingers only and use gloves.
- Use the latch mechanism to minimize risk of handwheel slipping, causing drum to pivot out of control.
- Assembling an electric mixer is a 2 man lift, preferably with a 3rd person to hold the stand steady and control the lift.

4.4. PPE. The following Personal Protective Equipment (PPE) is mandatory:

- Hard hat, safety boots and fastened high viz jacket (no loose bits to catch in machine). This applies to any site work.
- Dust Mask
- Safety eyewear
- Gloves
- Eye Wash available on site

5. Pre-start checks and maintenance

5.1. Carrying out pre-start checks will save damage to the mixer and will save time. If it's a hire mixer....**Read the Instructions first, not after it's broken!**
5.2. Mixers will vary in detail but the following is generally applicable:

- Fill up with fuel before you start, keep **correct** fuel in a suitable container. Fuel could be diesel or petrol. Stop the mixer and let it cool to fill up, and use a funnel to avoid spillage. **Fuel + hot machine** = **BOOM!**
- Ensure spillages are dealt with immediately to avoid pollution/fire hazards.
- Check the lubricating oil, if on a long camp then make sure there is spare oil in a sealed container for use. Small funnel needed for top-up.
- Check that all the operators are briefed and know how to stop the mixer.
- Check that the mix ingredients are to hand, in sufficient quantities.
- Make sure all the crew know the cement or mortar mix quantities
- Check everyone has correct PPE as above.
- Check there is Eye Wash nearby (and it's in date!)
- With electric mixers check the cable is free from damage, correctly fitted to the mixer and routed safely.

5.3. See below for typical locations

6. Starting the mixer

6.1. Engine operated mixers need the controls set to a “Run” position, with choke engaged if necessary (if fitted).
6.2. Check the area around the mixer is clear, with no obstructions around rotating parts. Ensure mixer is empty before starting, or drum tipped up to minimise load on starter mechanism.
6.3. Check the fuel is “On”. Then operate the starter key or operate the recoil starter. It may take 2 or 3 goes to start manually, or a few seconds to crank over to starting speed. Some hand-cranked machines may need the de-compressor operated to enable the motor to turn over. Disengage it once the engine is rotating.
6.4. The mixer should then fire up and run. If it takes more than a few seconds then re-check fuel etc as above.
6.5. Electric mixers usually have an “ON/OFF” switch.

7. Using the mixer.

7.1. Ensure there are sufficient materials to hand and that the containers (1m³ bags of sand, bags of lime or cement) are to hand and positioned to minimise twisting and lifting to shovel into the mixer.
7.2. The first mix may require some measuring out of ingredients, so use a dry bucket or a dry shovel to measure out the ingredients. Make a note of how many shovelfuls are required. Put water in a bucket and keep a note of water use for next time.
7.3. Ensure mask and eyewear are used; lime or cement can cause blindness or burning in the eye.
7.4. With the mixer drum rotating, shovel in the ingredients. For mortar, lime or cement in first, some water in to minimise dust and then the rest of the ingredients, not too much water to start. Do not allow the shovel to enter the drum, it may catch the deflectors and your arm will follow!! For concrete, dry ingredients go in first.
7.5. Allow to mix, add water in small amounts until correct consistency is achieved. All bricklayers have different ideas about “runniness” of their mortar! Proper mixing takes time, **do not be impatient!**
7.6. When mortar is properly mixed, position a wheelbarrow under the arc of the drum. Operate the tilt mechanism **slowly** to discharge the mixing drum. Do not overfill the barrow (manual handling of the barrow). Keep thumbs out the way, see 4.3. above.
7.7. With an electric mixer pivot the drum using the handles.
7.8. When drum is empty, start the next mix. If the deflectors inside the drum appear to be clogged then switch the machine off and clear them with an old trowel (or similar) or the next load will not mix properly.
7.9. **Always** check for a site-specific mix. Some typical mixes are included in Appendix A.

Lime being placed in the mixer; note the mask, safety glasses and gloves.
Note also the high-viz, the eyewash is hidden from view

Note materials within easy reach, and clear space behind to allow foot traffic and easy loading of the barrow

8. Cleaning after use

8.1. The mixer will need cleaning at the end of each working day, so allow enough time for this.
8.2. Empty out as much mortar as possible, then put an assortment of brickbats, stones and water in the drum and allow mixer to run for 10 minutes or so.
8.3. Pivot the mixer drum so that the deflectors are hit by the brickbats and all the old mortar is knocked off.
8.4. Empty out into a barrow and flush out the drum with clean water. Dispose of the debris safely, not into a watercourse. There should be no residual sediment left in the drum as this will stick and prevent the next load mixing correctly. If there is, repeat cleaning process until it is completely clean.
8.5. Stop the mixer, switch off the fuel. With an electric mixer, turn off the power and neatly coil the power cable and extension lead. Leave the drum facing down so it drains out and does not fill with rainwater.

8.6. **Never bang the drum with a shovel**, you will damage the drum and possibly damage the drive mechanism. Hire companies will charge for damage.

9. Looking after the mortar or concrete

9.1. Mortar or concrete mixing is hard work! Make sure that the following precautions are taken to look after the mix once it has been placed:

- Cover up at the finished work at the end of the day with hessian sheeting or similar to protect it from the weather. Rain and frost can ruin the finish; heat and wind can dry it out too quickly and cause it to crack. Cracking is helped by drying out too quickly, cover up and keep the moisture in!
- Protect any cast concrete by keeping the formwork on until the concrete is past the green stage so the edges do not get damaged.
- Any walked-over areas – put a board over to avoid damage.

APPENDIX 1

TYPICAL MORTAR AND CONCRETE MIXES

1. These are “typical” mixes; always follow any site specific instructions for mixes.

2. Typical Mixes.

A. Lime Mortar Mix

Hydraulic Lime Mortar (NHL5)	Sharp Sand	Building Sand (smooth)	Water	Notes
1 part	1½ parts	1 part	Enough to give correct runniness, add slowly, bit at a time whilst mixer is rotating	Cover up at end of day, finish joints whilst “green” with flat trowel for traditional flat joints

B. Cement Mortar Mix
Note: Plasticiser can be added, follow manufacturer’s instructions

Portland Cement	Sharp Sand	Building Sand (smooth)	Water	Notes
1 part	Nil	3 or 4 parts	Enough to give correct runniness add slowly, bit at a time whilst mixer is rotating.	Cover up at end of day, finish joints whilst “green” with a flat trowel or a radius tool (“frenchman”) for radiused joints.

C. Concrete Mix
Note.
1. The strength of a concrete can be adjusted by increasing/decreasing the amount of cement that is added.
2. Generally sand and stone will be supplied together as ballast, so the ratios below will be combined.

Portland Cement	Sharp Sand	Coarse Aggregate (max size 10mm)	Water	Notes
1 part	2 parts	3 parts	Enough to make it workable, max of 15%	Mix the dry ingredients first. Cover up at end of day,

3. General Points
3.1. With concrete, the more water that is added the weaker the concrete, however the concrete workability increases with water content. So there may have to be a compromise.
3.2. Proper additives (plasticisers) added to cement mortar make it more workable. Washing-up liquid must not be added.