



Dust control on concrete cutting saws used in the construction industry

Construction Information Sheet No 54

Introduction

Hand-held saws are used in the construction industry to cut or shape paving slabs, kerb stones or other concrete products. The cutting action generates high levels of respirable dust which often contains a high respirable crystalline silica content. Breathing in this dust can lead to the development of respiratory ill health, in particular scarring of the lung tissue (silicosis) which can result in serious breathing difficulties, depending on the extent of exposure.

This information sheet describes dust control systems which can reduce exposure by up to tenfold when used by trained operators. The systems employ two well established dust control techniques; wet dust suppression and local exhaust ventilation (LEV).

Legal requirements

There are workplace legal requirements (COSHH Regulations 1999^{1,2}) to prevent exposure to crystalline silica dust or, where prevention is not reasonably practicable, to control below the airborne maximum exposure limit (MEL) for respirable crystalline silica of 0.3 mg/m³ 8-hour TWA. Control should be achieved by measures other than Respiratory Protective Equipment (RPE) so far as is reasonably practicable. The most effective engineering measures involve capturing or controlling the dust at source.

There are also environmental legislation requirements (The Environmental Protection Act 1990³) to prevent nuisance contamination or injurious effects. The legislation requires dust emissions to be controlled by best practicable means.

Description of cutting equipment

Hand held cut-off saws used on construction sites to cut paving slabs and kerb stones can be powered by small capacity combustion engines, electricity (110 volts) or compressed air. They are normally fitted with 9 or 12 inch (205 - 230 mm) diameter blades, depending on the manufacturer. There are two blade types: (1) diamond tip and (2) abrasive wheel. The latter commonly consists of reinforced resin bonded silicon carbide or aluminium oxide.

Control systems

(1) *Wet methods*

Wet systems may be used on saws powered by combustion engines or compressed air. Wet dust suppression should not be used on saws that are electrically operated. Wet systems involve spraying water onto the rotating cutting disk to reduce dust emissions. There are two sources by which water may be supplied. One system uses water provided by a portable pressurised tank, the other requires water supplied from the mains.

Portable pressurised tank system

This equipment is supplied by most major cut-off saw manufacturers and plant hire companies. Typically it consists of a polypropylene bottle containing approximately eight litres of water. The bottle is connected by narrow plastic tubing to two spray heads or jets normally attached to opposite sides of the guard. An on-off valve is fitted to control the water supply. An in-line filter is often fitted to prevent the heads becoming blocked. The spray heads/jets can be made from polypropylene but brass is considered a more resilient material. Water flow is produced by pressurising the tank by hand.



(a) (b)
Figure 1 Slab cutting with pressurised portable tank system: (a) without control; (b) with control

Mains water system

This system is essentially the same as the tank, except the water source is from mains supply through a hose to the two water jets.



(a)



(b)

Figure 2 Slab cutting with mains supply water system: (a) without control; (b) with control

Water flow rate

Studies⁴ have shown that a minimum flow rate of about 0.5 litres per minute is required to optimise dust suppression. Low flow rates will reduce performance. Very much higher flow rates do not improve dust suppression, only increase the need to refill the portable tank more often. The portable tank needs to be regularly pressurised to maintain the flow rate. The mains water system does not have this limitation but portability is restricted by the need to cut near a mains supply. The portable tank is more flexible as it can be easily transported around the site but it still requires a water source for refill.

Water may be used on abrasive wheels and diamond tip blades. Diamond tip blades cut more quickly than abrasive wheels. Normally a blade with a diamond tip will cut a paving slab in about one minute. If the portable tank is used, cutting a paving slab with a diamond tip blade normally requires a single pressurisation stroke. However, abrasive wheels take longer. The tank is likely to require re-pressurising during the cut if adequate control is to be maintained.

Cost savings can be achieved. Using water significantly increases the life of the wheels/discs and prolongs the life of the motor by reducing the amount of dust that it works in.

(2) Local Exhaust Ventilation

The method of local exhaust ventilation used on hand held concrete cutting saws uses the saw's guard as a type of high velocity hood. The guard is connected to an industrial vacuum cleaner which provides sufficient exhaust ventilation to capture the majority of dust emitted during the cutting operation. Guards with adjustable inner sleeves are preferable. These maximise enclosure and can be adjusted to accommodate different depths of cut.

This system does not produce the wet slurry associated with wet dust suppression.



(a)
Figure 3 Slab cutting using LEV: (a) without control; (b) with control

(b)

Common Problems and their solutions

Wet systems

- The line of the cut is normally marked with chalk. This can often be washed off by the water supply. Users can overcome this by using other more resilient materials such as wax crayons or a carbon brush (from old electric motors).
- Operators will become wet. Both wet systems require the use of waterproof PPE.

Local Exhaust Ventilation

- Abrasive wheels wear during cutting activities. A system with an adjustable inner sleeve does not automatically compensate for abrasive wheel wear. Diamond wheels wear less quickly and are recommended for this system.
- A generator is required for both vacuum cleaner and saw. Small portable generators can be moved around the site on a wheel barrow.
- These systems often use smaller 9 inch diameter wheels which require operators to bend a little lower when cutting paving slabs, kerb stones etc. Operators should be informed of correct bending postures.

Personal Protective Equipment

- Cutting concrete products containing high silica concentrations may require suitable RPE to be

provided in addition to these engineering controls. Information on the selection and use of RPE is contained in HSE guidance.⁵

- Emptying the vacuum cleaner will require the provision of a suitable dust mask.

References

- 1 *General COSHH ACOP (Control of substances hazardous to health) and Carcinogens ACOP (Control of carcinogenic substances) and Biological agents ACOP (Control of biological agents). Control of Substances Hazardous to Health Regulations 1999. Approved Codes of Practice L5 HSE Books 1999 ISBN 0 7176 1670 3*
- 2 *COSHH: A brief guide to the Regulations INDG136 (rev1) HSE Books 1999 Free; available in priced packs ISBN 0 7176 2444 7*
- 3 *The Environmental Protection Act 1990 HMSO 1990 ISBN 01 0544 3905*
- 4 Thorpe A and Ritchie AS 'Measurements of the effectiveness of dust control on cut-off saws used in the construction industry'. *Annals of Occupational Hygiene* 1999 **43** (7) 433-456 ISSN 0003 4878
- 5 *The selection, use and maintenance of respiratory protective equipment. A practical guide HSG53 HSE Books 1998 ISBN 0 7176 1537 5*

Other sources of HSE guidance relating to crystalline silica include:

Respirable crystalline silica Second edition EH59 HSE Books 1997 ISBN 0 7176 1432 8

Silica Construction Information Sheet 36 HSE Books 1999

Silica dust and you MSA 15 HSE Books 1997

Respirable crystalline silica. Exposure assessment document EH74/2 HSE Books 1999 ISBN 0 7176 1659 2

Further information

While every effort has been made to ensure the accuracy of the references listed in this publication, their future availability cannot be guaranteed.

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