

Dust control on cut-off saws used for stone or concrete cutting

HSE information sheet

Construction Information Sheet No 54 (Revision 1)



Introduction

This information sheet describes dust control systems used with cut-off saws. Two well-established dust control techniques, wet dust suppression and local exhaust ventilation (LEV), are described.

Cut-off saws (variously known as disc cutters, skill saws, Stihl saws, con saws or 'whizzers') are widely used in the construction industry. These saws can be powered by combustion engines, electricity (110 volts) or, less commonly, by compressed air. They are normally fitted with 9- or 12-inch (205- or 230-mm) diameter blades, depending on the make and model. There are two blade types: diamond tip or resin-bonded abrasive wheel.

Cutting paving slabs, kerb stones or other concrete or stone products produces enormous amounts of dust. This dust will contain some very fine dust called respirable crystalline silica (RCS). Exposure to RCS dust can cause serious health problems which may eventually prove to be fatal.

Health effects

Stones, rocks, sands and clays can contain large amounts of crystalline silica and are used to make kerbs, flags, bricks, tiles and concrete. Cutting these materials produces airborne dust containing very fine RCS particles. These particles are small and it is not always possible to see the RCS dust in normal lighting.

Serious health effects, such as lung cancer or silicosis, can result from exposure to RCS. This is because fine RCS particles can penetrate deep into the lungs. Recent HSE-funded research¹ has suggested that over 650 construction deaths from silica-related lung cancer occurred in Great Britain in 2004. This estimate is based on exposures dating back to 1954. This equates to 12 construction workers a week and suggests silica is currently the second most important cause of occupational lung cancer after asbestos. Forthcoming work will look at predicting future estimates due to more recent exposure levels.



Figure 1 You are at risk if the dust you breathe in over a full shift contains more RCS than the amount shown next to the penny.

Silica causes a stiffening and scarring of the lungs called silicosis. This condition can make the affected person so breathless that they become disabled. Silicosis also increases the risk of serious lung infections such as tuberculosis (TB). This usually follows many years of exposure and is irreversible, but exceptionally high exposures over a few months or years can also be responsible.

Legal requirements

The Control of Substances Hazardous to Health Regulations 2002 (as amended)^{2,3} require the use of the most effective and reliable control options to minimise the escape and spread of substances including RCS. Where adequate control of exposure cannot be achieved, suitable respiratory protective equipment (RPE) will need to be used as well.

Exposure must be kept below the airborne workplace exposure limit (WEL) for respirable crystalline silica of 0.1 mg/m^3 over an 8-hour Time Weighted Average (TWA).

Environmental guidelines

Releases and wastes may be regulated within the Pollution Prevention and Control (PPC) framework. You should consult your local authority or the Environment Agency. In Scotland, consult the Scottish Environment Protection Agency (SEPA). For more information see www.netregs.gov.uk/netregs.

Control systems

Wet methods

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 via spray heads or jets normally attached to opposite sides of the guard. An on-off valve is fitted to control the water supply with an in-line filter, often installed to prevent the heads becoming blocked.

Modern cut-off saws have an attachment to which a mains water supply or a pressurised water bottle can be secured.

Mains water system

Where possible, a direct connection to a water main via a hose is the best option as water can be supplied at a continuous flow rate without the need for someone to pressurise the water tank (see below).

Portable pressurised bottle 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 8 litres of water. The bottle is connected by narrow plastic tubing to the cut-off saw attachment and water flow produced by pressurising the tank by hand.

Water flow rate

Studies have shown that a minimum flow rate of about 0.5 litres per minute is required to optimise dust suppression.⁴ Low flow rates will reduce dust suppression performance. Very much higher flow rates do not improve dust suppression but do increase the need to refill the bottle more often. The bottle needs to be regularly pressurised to maintain the flow rate. A mains water system does not have this limitation but portability is restricted by the need to work near a mains supply. The bottle 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.

Blade selection

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 bottle is used, cutting a paving slab with a diamond tip blade normally requires a single pressurisation of the bottle. However, abrasive wheels take longer and the tank is likely to require re-pressurising during the cut if adequate control is to be maintained. Using water significantly increases the life of the wheels/discs as well as prolonging the life of the motor by reducing the amount of dust that it works in.

Local exhaust ventilation

The method of LEV is suitable for all hand-held cut-off saws including electric ones. It uses the saw's guard to act as a dust-collecting 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 of the blade and can be adjusted to accommodate different depths of cut. This system does not produce the wet slurry associated with wet dust suppression. To prevent the recirculation of harmful dust vacuums should be fitted with an H Class 13 HEPA filter to EN60335-1.

Personal protective equipment

Even with the use of water suppression or extraction, suitable RPE with an assigned protection factor of at least 20 will still be needed, for example either FFP3 filtering facepieces or orinasaal respirators with P3 filters. Wearers should be appropriately trained and face fit tested for the equipment.⁵ A qualitative fit test is acceptable.⁶ Nuisance-grade dust masks do not protect your lungs. Emptying vacuum cleaners will also require the wearing of suitable RPE.

Other matters

Wet systems

The line of the cut is normally marked with chalk, which 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 proprietary marker. Operators will also need to wear waterproof trousers or leggings to prevent them becoming wet.

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 therefore recommended for use with LEV. 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 told about correct bending postures.

Other risks

Other risks created by this work will also need to be controlled, for example:

- noise;
- flying debris;
- hand-arm vibration;
- manual handling;
- electricity;
- refuelling.

A safe power source is required for both the vacuum cleaner and the saw.

Consider the health and safety of the operator and of others when cut-off saws are used. Use suitable personal protective equipment (PPE), such as hard hats, eye protection and ear defenders. Make sure these items are worn correctly and are suitable for use together. To protect passers-by from the ejection of shards or fragments during the cutting process some form of segregation may be required, eg screening or other physical barriers attached to scaffolding or inside buildings.

Maintain equipment

Check your cut-off saw, control systems and RPE regularly. Maintaining an adequate water flow by cleaning and maintaining the water jets is essential and should be done at least every time the blades are changed. Ensuring sufficient LEV capacity is equally important. Replace worn cutting discs to reduce the cutting time and noise and vibration levels. Maintain hoses and bottles. Inspect and maintain masks.

References

- 1 *The burden of occupational cancer in Great Britain: Results for bladder cancer, leukaemia, cancer of the lung, mesothelioma, non-melanoma skin cancer and sinonasal cancer* RR595 HSE 2007 www.hse.gov.uk/research/rrhtm/index.htm
- 2 *Control of substances hazardous to health (Fifth edition). The Control of Substances Hazardous to Health Regulations 2002 (as amended). Approved Code of Practice and guidance L5 (Fifth edition)* HSE Books 2005 ISBN 978 0 7176 2981 7
- 3 *COSHH a brief guide to the Regulations: What you need to know about the Control of Substances Hazardous to Health Regulations 2002 (COSHH)* Leaflet INDG136(rev3) HSE Books 2005 www.hse.gov.uk/pubns/indg136.pdf
- 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 *Respiratory protective equipment at work: A practical guide* HSG53 (Third edition) HSE Books 2005 ISBN 978 0 7176 2904 6
- 6 *Fit testing of respiratory protective equipment facepieces* Information Document HSE 282/28 http://www.hse.gov.uk/foi/internalops/fod/oc/200-299/282_28.pdf
- 7 *Stone dust and you* Leaflet INDG315(rev1) HSE Books 2006 (single copy free) www.hse.gov.uk/pubns/indg315.pdf
- 8 Publication series: CN - COSHH essentials in construction: Silica. Available online at: <http://www.hse.gov.uk/pubns/guidance/cnseries.htm>

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

Further information

Visit www.hse.gov.uk/construction for more specific information on CDM 2007 and health and safety in the construction industry, including a link to additional guidance for CDM dutyholders developed by the construction industry.

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This information sheet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do.

A web version of this leaflet can be found at: www.hse.gov.uk/pubns/cis54.pdf.

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