Controlling Silica When Disc Cutting Roof Tiles

1. INTRODUCTION

This guidance sheet gives information about the control of Respirable Crystalline Silica (RCS) issues associated with the disc cutting of concrete and clay roof tiles. However, the requirement to use water suppression applies to all roof tiles and related roof coverings such as artificial slates, concrete slates as well as all related fittings. Contractors do have the option of using other methods as long as they can demonstrate these are equally as effective at controlling the silica risk. This guidance note does not cover the practice of hand cutting, with the exception that this is recommended where possible to further reduce the risks.

Roof tiles often need to be cut at the verge, ridge, hip and valley area and the most common appliance to undertake this task is a disc cutting saw. These saws produce large amounts of silica dust that can easily be inhaled by the operator and other people in the vicinity. Over time this dust can be very harmful to the lungs and therefore needs proper controls implementing in line with the Control of Substances Hazardous to Health Regulations (COSHH).



POOR PRACTICE–
Uncontrolled Dust Exposure

This image shows dry cutting of roofing materials without effective dust control. Visible dust clouds indicate that respirable silica is being released directly into the breathing zone and surrounding area.

There is no evidence of water suppression or on-tool extraction, meaning exposure is not being controlled at source as required under COSHH. Dust is also spreading across the work area, increasing the risk to others on site.



GOOD PRACTICE–
Dust Controlled at Source

This image shows cutting being carried out with water suppression, controlling dust at the point of generation. The material is dampened, preventing silica dust from becoming airborne.

The operative is also wearing appropriate RPE, providing an additional layer of protection where residual exposure may remain.

This approach reflects good practice, combining engineering controls and personal protection to reduce risk.

2. THE RISK

Silica is a natural mineral found in large amounts in substances like sand, sandstone and granite. It is also commonly found in many construction materials such as concrete and mortar. The silica is broken into very fine dust *(also known as Respirable Crystalline Silica or RCS)* during many common tasks such as cutting, drilling and grinding.

Silica dust damages lungs and airways. It can cause lung cancer, silicosis and Chronic Obstructive Pulmonary Disease (COPD). While some of these lung diseases, like advanced silicosis, can come on quite quickly, most take a long time to manifest often over years because regularly breathing even small amounts of dust add up and damage the lungs and airways. Unfortunately, by the time the damage is noticed, it is more difficult to treat; therefore it is important to limit the amount of silica dust every time work is done to prevent this unseen build-up.

Utilising a disc saw to cut roof tiles might seem the quickest and easiest method however it is not a low-risk method as tests have found that dry cutting one side of a valley can produce very high silica levels. COSHH sets a maximum limit on the amount of silica dust that someone can breathe in during a normal working day, the image below gives an example of this limit compared to a penny. This limit is the legal maximum, the most you can breathe **after** the right controls have been used.



3. CONTROLS FOR SPECIFIC ROOF TILES

Effective control is necessary when using a disc cutting saw because this work is high risk. The measures below outline reasonably practicable solutions for controlling silica exposure for these materials or areas.

PREVENT

Think about limiting the amount of dust you could make before work starts by:

- Natural slate and fibre cement slates do not need cutting with power tools. Use the correct hammers and cutters instead.
- Use manual cutting methods to cut concrete and clay tiles where possible.
- Correctly set out the tiles so that those immediately below the ridge do not need cutting.

CONTROL

Even if you minimise some of the dust this way, you may still need to use a cut-off saw. Control the risk by:

- **Verge tiles**–If cutting is needed, the consistent dimensions mean it is possible to mark the tiles and cut them away from the roof surface if possible on ground floor level within a controlled environment or on the scaffolding using water suppression and respiratory protective equipment (RPE) as detailed in 'controlled cutting' below.
- **Openings and abutments**–If cutting is needed, mark the tiles and cut off the roof surface on the scaffolding using water suppression and RPE as detailed in 'controlled cutting' below.
- **Ridge tiles**–Where variable gauge tiles are used, the cutting may be limited to a small number of the covering ridge tiles. Where fixed gauge or restricted gauge tiles are involved, the top course may also need cutting to length. Mark the tiles and cut off the roof surface on the scaffolding using water suppression and RPE as detailed in 'controlled cutting' below.
- **Hip and associated Tiles**–The roof tiles at the rake of the hip will all require cutting. In many cases this can be done on the roof, using hand tools, as long as this provides the accuracy needed. However, machine cutting will still be necessary in many cases for difficult cuts and where a neater, cleaner cut is required *(e.g. some dry fix systems).* Mark the tiles and cut off the roof surface on the scaffolding using water suppression and RPE as detailed in 'controlled cutting' below. Where two people are working, this could be implemented by using one person to mark the tiles while the other cuts. The process can also be alternated to reduce the amount of time a person is exposed, and it eliminates any off-cuts being left to slide down a roof which could act as a slip/trip hazard.
- **Valley Tiles**–As with those forming the hip, there is a need to size each tile to the internal angle formed. Methods will vary depending on the roof pitch, or the fixing specification, and but in general, tiles should be set back from the valley and marked using the covering width of one or more tiles to establish the cutting line. In this example below, the tiles have been laid staggered, close to valley but not into it. Next, the covering width of two tiles has been transferred horizontally from the cut line in the valley; onto the tiles of the top and bottom courses. Longer valleys may need a mid-point to avoid loss of accuracy when striking. The tiles should then be numbered by course with chalk or a pencil, with any nibs likely to kick the tiles removed, and then cut off the roof surface on the scaffolding using water suppression and respiratory protective equipment (RPE) as detailed in 'controlled cutting' below. Whilst it is generally accepted that cutting tiles individually, rather than in-situ, may result in some slight alignment issues between courses *(especially on open valleys–see dry valleys)* the method of marking and cutting back should result in a valley which is adequately straight over its length, dust and defect free.

Note:

Using the example below, a certain number of roof tiles will need to be re-laid to ensure the fixing specification is adhered to. This number may be minimised by staggering the tiles or by electing to cut the tiles individually rather than in sets.



Tiles laid 'staggered' to valley



Line struck–two tile widths from desired finishing point in valley line



Cut valley is straight

4. CONTROLLED CUTTING

Always use appropriate water suppression when cutting a tile with a cut-off saw. A minimum flow rate of around 0.5 litres per minute is required for effective dust suppression unless a manufacturer advises otherwise. Low flow rates will not properly control the dust. If cutting needs to be undertaken on the scaffolding, the simplest way of supplying water is likely to be a portable polypropylene hand pump bottle. This contains around eight litres of water that is pressurised by hand. However, an effective flow is sustained only for a limited time (up to four minutes) before re-pressurisation is needed.

Where water suppression is used the following guidelines should be followed:



- Good arrangements are needed to ensure that enough water is available at all times. This could include measures for refilling hand pump bottles or the use of a more permanent water supply.
- Planning is required to prevent excessive handling of the tiles.
- Cutting work should be carried out on the surrounding scaffolding. A dedicated cutting area should be established before work starts. This area should be the most central/ suitable for work. If necessary, it may be that more than one area can be used, e.g. some cutting is done in one area and then work moves to a second new area.
- Even with a dedicated cutting area, it is vital that the integrity of the scaffold boards is not compromised by the cutting operation. A suitable piece of sacrificial material should therefore be placed between the tile and scaffold board.
- Unless mechanical lifting aids are used, roofers are advised against cutting on the ground instead of the scaffolding. There is an increase in the risk of falls and manual handling associated with moving the tiles down and back to the roof area.

REVIEW

- Prior to commencing cutting it is important to check the areas around and below the scaffold to ensure that the waste water will not affect other trades or their works. Using water suppression will make the scaffold surface slippery when wet so additional care must be taken when in these areas including regular cleaning of any offcuts so that you do not create a trip hazard.
- **Supervise**—Ensure controls are properly used, and RPE is worn correctly. Anyone using tight-fitting masks also needs to be clean-shaven, and face-fit tested.
- **Maintain**—Check water jets on the saw are clean and water containers well maintained. Replace seals and worn cutting discs when needed. Properly store and maintain non-disposable RPE. Change filters as recommended by the supplier.
- **Monitor**—You may need a health surveillance programme unless you are sure exposure to silica dust is well below the recommended exposure limit.

5. RESPIRATORY PROTECTIVE EQUIPMENT (RPE)

RPE is an essential part of silica dust control. It should be used for all tile cutting activities, even where water suppression is employed. Water suppression systems are not entirely reliable and even when effective, they do not eliminate all silica dust. The "residual" dust concentrations will be variable and unpredictable, so additional control is necessary.

RPE will also be required for those workers in the close vicinity of tile cutting (e.g. workers assisting with a cutting task, or nearby on the roof or adjacent on the top lift of the scaffold). Workers in more remote areas of the roof (i.e. away from the dust cloud) do not require RPE. This practice of 'segregation' should be considered as the primary control measure for reducing incidental exposure.

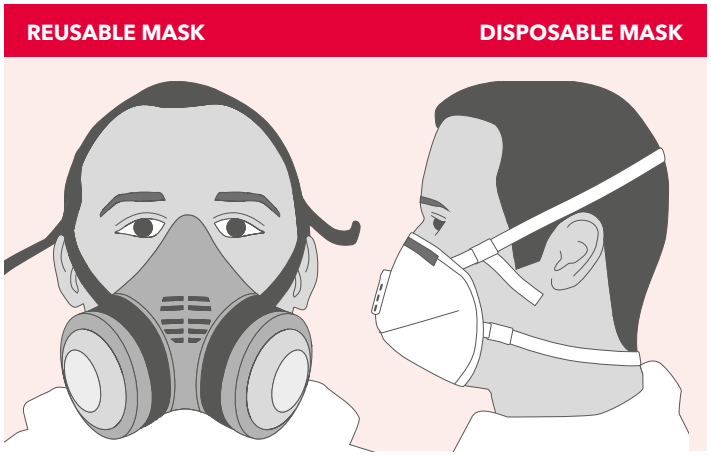
DISPOSABLE/HALF MASK RESPIRATORS

Half masks *(disposable or orinasal)* are likely to be the most common type of RPE used in tile cutting. Masks with an assigned protection factor of at least 20 *(a FFP3 filtering facepiece for disposable masks or an orinasal half-mask respirator with a P3 filter*) should be used. This high-performance RPE should be the minimum protection level for all tile cutting.

Disposable masks should be replaced every shift or when damaged. Orinasal filters should be renewed frequently dependant on use; probably at least weekly. A supply of suitable spares should always be available. Maintenance procedures will also need to be implemented for such masks *(for example, suitable storage arrangements and a monthly thorough examination and test by a competent person).*

These forms of RPE *(disposable and orinasal equipment)* can only provide protection against fine dust such as RCS if the mask actually fits the wearer. Fine dust will readily seep through gaps and holes in ill-fitting equipment. Therefore, a successful face fit-test is crucial to ensure that the user can be protected. In the absence of a satisfactory face fit test, the worker may receive no or little protection despite *"wearing"* the RPE. A qualitative or a quantitative fit test is acceptable for half masks. Fit test providers should be competent *(e.g. those accredited under the Fit2Fit scheme).*

Other factors are also important to obtain protection from a respirator. Wearers should be properly instructed, trained and supervised on the correct use of the equipment. Wearers must be clean-shaven, and the mask must be fitted and worn correctly for the full duration of the tile cutting activity. Where these factors are not implemented, protection will be lost.



POWERED RESPIRATORS



A *"loose-fitting"* type of respirator *(e.g. powered hood, helmet or visor)* should be worn by workers who have beards or are unable to obtain an adequate fit for the disposable or orinasal half masks. Models incorporating head and eye protection can also be selected. These should be to a protection factor (PF) of 20 and a TH2 classification.

Again, the users will require adequate information, instruction and training in the correct use of the chosen equipment. Storage and maintenance arrangements will also be required, including a monthly thorough examination and test by a competent person.

6. TRAINING, INFORMATION AND WORKER INVOLVEMENT

In order for these measures to be effective it is important that appropriate training and information is given to those undertaking tile cutting activities. This should include awareness about the risks involved, the different precautions required, the effective use of water suppression and the appropriate use and, where appropriate, maintenance of RPE. Steps should be taken to ensure worker engagement and consultation as part of this process.

7. BENEFITS



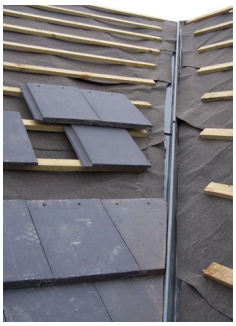
The main change from recent practices in this guidance is the need to wet cut valley tiles. With the method described above *(or similar)*, it is accepted that significantly more time may be needed to complete the valley, and the roof overall, than when dry cutting in-situ.

However, there are many advantages too:

- Using water significantly increases the life of the saw blades and prolongs the lifespan of the disc cutting saw motor.
- There is no need to rough cut first.
- There is less risk of cut tiles breaking during cutting *(and having to be re-cut).*
- The off-cuts can be saved and reused on any hips on the roof *(or forthcoming roofs)* thus saving waste and money.
- Subsequently, repairing damaged valley mortar can be expensive as scaffolding or other edge protection is often needed.

DRY VALLEYS

Recent evidence would suggest that there is trend towards using dry valleys. Where possible, NFRC would encourage that these *(rather than wet valleys)* are specified. The main benefit being that this eradicates the problem of mortar potentially failing in the valleys. However, there are also other benefits as well:



- Dry valleys cannot be cut in-situ. It, therefore, makes the transition to wet cutting off the roof easier.
- Although neat, accurate cutting is still important; the cuts do not have to be quite as precise as with an open valley.
- The valleys are maintenance-free. This can act as a valuable selling point to customers/homeowners.
- Unlike mortar, this system can be installed in cold weather, allowing work on potentially more days during the winter. There is also no setting mortar to be washed out by wet weather.

8. FURTHER INFORMATION

For further information on RPE face fit testing NFRC have produced a further guidance note: GN22 RPE Face Fit Masks.

This guidance is not intended to be exhaustive but to contain the main criteria that should be followed to ensure the health safety and welfare of operatives and others involved in the cutting roofing tiles. Further information can be found on the HSE website at **www.hse.gov.uk**.

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