

Control of dust exposure in the finishing stages in the construction industry



October, 2002

© Stichting Arbouw, Amsterdam

All rights are reserved. Data from this booklet may be used with acknowledgement of the source.

Statements in this booklet are for information only and do not constitute legal advice. Although all possible care has been strived for, mistakes or incompleteness in this booklet cannot be fully excluded. Arbouw does not accept any liability whatsoever for any direct or indirect detriments by using this booklet. Pictures of devices do not constitute an endorsement, and do not imply that other devices are not fit for the same purpose.

TABLE OF CONTENTS

1.	INTRODUCTION	5
2.	GENERAL	6
2.1	Control Level.....	6
2.2	Side effects.....	6
2.3	Cleaning of the workplace	7
2.4	Quality and application of equipment and accessories	7
2.5	Water spray.....	7
2.6	Local exhaust ventilation	8
3.	CONTROL MEASURES.....	9
4.	WHEN PURCHASING DUST EXTRACTION SYSTEMS.....	13
4.1	Important points when purchasing dust extraction systems	13
4.2	Criteria for purchasing dust extraction systems	13
4.3	Specification of the dust extraction system.....	18
4.4	Important points for wet manipulation methods (water suction and slurry disposal)	19
5.	CRITERIA FOR PURCHASING MACHINES.....	21
5.1	Sanding machines.....	21
5.2	Circular saws and angle grinders.....	22
5.3	Flat grinders	24
5.4	Drills.....	25
5.5	Jackhammers (pneumatic, hydraulic, electric).....	26

1. INTRODUCTION

Exposure to dust is a common problem in the construction industry. Dust can be released during various activities with building materials, and subsequently, many employees in the construction industry suffer to some extent from exposure to dust. For this reason, "Arbouw" is paying a lot of attention to the problem of dust exposure in the construction industry.



Dust may be released when tooling construction materials. A respirator must be worn when no local exhaust ventilation is used.

Inhaled dust can cause various health effects, ranging from relatively minor, such as sneezing, to severe, such as irreversible and severe breathlessness. You can find more information regarding the possible health effects due to inhalation of dust in the Arbouw booklet "Dust exposure in the Construction Industry".

Dust can also be released during various processes in the finishing stages of the construction process. You can find examples of these in the Table in Section 3 of this booklet. If you are exposed to dust resulting in a nuisance or a health risk, control measures must be introduced to reduce dust levels to an acceptable level. Ideally, the release of dust is prevented or dust particles are captured

near the source. This booklet will provide a list of possible measures to control dust, such as dust extraction and wet machining techniques.

In subsequent tables, we will refer only to commercially available equipment and accessories. It has been shown in practical situations that these pieces of equipment work properly, provided that they are properly maintained. However, dust extraction systems will be less efficient if, for example, the filter bag is overloaded. Similarly, when the water pump on for example a wet grinding machine is blocked up, this could seriously affect the use of this dust control measure.



In this overview criteria are provided to help you select mobile dust extraction systems, tools and equipment that will assist you in reducing dust levels at the workplace.

Use local exhaust ventilation to extract the dust as close to the source as possible

2. GENERAL

2.1 Control Level

Occupational exposure limits for dust exposure are enforced by the Labour Inspectorate and are based on an 8-hour working day. However, activities associated with the generation of dust are generally not carried out during an entire shift. When assessing the measures for reducing exposure, we have assumed that the tasks associated with exposure to dust have a maximum duration of 6 hours, with the remainder of the working day spent on activities where there is no dust exposure. However, For some activities exposure to dust can still be too high when the duration of the tasks is 6 hours, even though suitable control measures have been implemented. These measures are therefore not sufficient, as the employer's health and safety policy should ensure that employees should be able to carry out their work for the entire work shift without adverse effects.



Cutting blocks with a clipper diminished both dust and noise, compared to cutting with a saw.

The choice of control measure is determined by a large number of factors. If no running water is available for wet machining, dust extraction systems should be used even though it is unlikely that these control measures will be sufficient to reduce dust exposure to below the occupational exposure standard. In such cases, the duration of exposure should be limited, for example by introducing job rotation, so that tasks with dust exposure are alternated with tasks with no

exposure. The table in Section 3 includes the maximum duration of various activities and control measures. The use of respiratory protective equipment is required when these exposure durations are exceeded. You can find information on suitable types of respiratory protective equipment in the Arbouw report: "Respiratory protective equipment against dust in the construction industry" (in Dutch)

2.2 Side effects

Unfortunately, the use of some dust reducing measures can cause other problems. For example, when using wet processes, the dried dust or sludge can become a new source of dust. Therefore, it is important to remove any material before it has time to dry.

Some pieces of equipment can be heavy and manual handling of the equipment could be a health hazard. For example, transport of a clipper for gypsum and lime-sandstone blocks should always be done using mechanical lifting equipment. Also, due to its weight, some mobile dust extraction systems should not be lifted manually.

On the other hand, it is also possible that the introduction of dust reducing control measures has a positive side effect. For example, cutting of plasterboard using a knife or cutters instead of a circular saw will reduce noise exposure.

2.3 Cleaning of the workplace

In some cases, settled dust or dried sludge can contribute significantly to the total dust exposure when disturbed, for example, by forklift trucks. In this booklet it has been assumed that settled dust has been cleaned up as soon as possible. If this is not the case, the dust exposure levels can be considerably higher than expected on the basis of the activities and tasks alone.



Clean up the dust as soon as possible

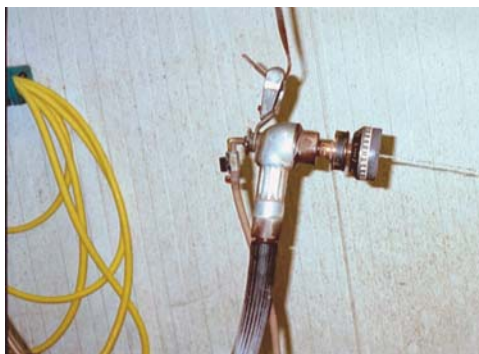
2.4 Quality and application of equipment and accessories

Unfortunately, mobile dust extraction systems are often not universally applicable. This is caused by the manufacturers having to deal with contradictory requirements. On the one hand, equipment should be light and easy to use, whilst on the other hand, the system requires a sufficiently powerful motor and large capacity. The capacity of the filter bag can be a significant factor in the total weight; for example, a full 20-litre filter bag can weigh up to 30 kilograms. Also, a more powerful motor generally increases the total weight of the equipment.

Therefore, the choice of exhaust system should be determined by its intended use.

2.5 Wet machining

If properly designed, the application of water can reduce the release of dust by approximately 95%. The efficiency is less than 100%, as during machining particles can be released at such high speed that even the application of water cannot prevent the release of all the dust.



Polishing with application of water



Water has to be applied as close to the source of the dust as possible, for example at the beginning of the cut when using a stone saw. Furthermore, plenty of water is required to capture the dust.

Water containing dust should be removed before it dries, otherwise dust can be released when removing the dried mud. With stone saws water suction can be installed directly behind the cut. Detached water suction can be used with vertical saws and drills.

2.6 Local exhaust ventilation



Properly designed dust extraction systems can capture approximately 90% of the released dust. The exhaust hood has to cover the entire work area; otherwise the efficiency will be much less than 90%. Even if the exhaust hood entirely covers the work area, dust can escape when working at the edges and in corners

Dust may escape when working at the edges

3. CONTROL MEASURES

On the following pages tables will provide frequently applied processes in the finishing trades of the construction industry, with measures to reduce dust levels. In some cases several control measures are provided and are listed in order of preference.

Machining of natural stone

Activity	Problem	Solution	Preference	Efficiency	Max. ¹ (hours)	New problem	Solution
Sawing (all types of fixed saws)	Quartz dust	Water spray		Sufficient	6	Dried mud	Clear mud
Sanding	Quartz dust	Water spray	1	Sufficient	6	Dried mud	Clear mud
		Local exhaust ventilation	2	Insufficient	1	None known	
Grinding	Quartz dust	Water spray	1	Sufficient	6	Dried mud	Clear mud
		Local exhaust ventilation	2	Insufficient	1	Non known	
Polishing	Quartz dust	Water spray		Sufficient	6	Dried mud	Clear mud
Engraving	Quartz dust	Engraving robot, totally enclosed with air extraction	1	Sufficient	6	None known	
		Local exhaust ventilation with funnel-type hood	2	Insufficient	2	None known	

¹ Maximum duration of task, the remainder of the working day has to be spent in a dust free environment

Fitting of partitioning walls

Activity	Problem	Solution	Preference	Efficiency	Max. ¹ (hours)	New problem	Solution
Sawing of slabs of plaster (using circular saw)	Dust	Cutting	1	Sufficient	6	Heavy weight	Use of mechanic cutter and transport
		Local exhaust ventilation	2	Sufficient	6	None known	
Sawing of slabs of (aerated) concrete or sandstone	Quartz dust	Cutting	1	Sufficient	6	Heavy weight	Use of mechanic cutter and transport
		Local exhaust ventilation	2	Insufficient	2	None known	
Sawing of plasterboard	Dust	Notch/break		Sufficient	6	None known	
Sawing of sandwich boards (using circular saw)	Glass and rock wool fibres	Local exhaust ventilation		Sufficient	6	None known	
Sawing of hardened mineral-fibre board (using circular saw)	Glass and rock wool fibres	Notch/break		Sufficient	6	None known	Use of supplementary respiratory protective equipment
High pressure laminate	Wood dust	Local exhaust ventilation		Sufficient	6	None known	
Wooden board	Wood dust	Local exhaust ventilation		Sufficient	6	None known	

Finishing of floorings and walls

Activity	Problem	Solution	Preference	Efficiency	Max. ¹ (hours)	New problem	Solution
Sanding of anhydrite floors	Dust	Power floating	1	Sufficient	6	None known	
		Local exhaust ventilation	2	Sufficient	6	None known	
Sand-blasting	Quartz dust	Local exhaust ventilation		Not known	6	None known	
Spraying plaster	Dust/Solvents	None known					
Drilling (twist drill up to 8 mm/0.25 inch)	(Quartz) dust						
Drilling (twist drill diam > 8mm/0.25 inch)	(Quartz) dust	Air extraction through the drill	1	Sufficient	6	None known	
		Water spray	2	Sufficient	6	Dried dust	Clean while still wet
Drilling (using a hollow drill bit)	(Quartz) dust	Air extraction on the drill	1	Sufficient	6	None known	
		Water spray	2	Sufficient	6	Dried dust	Clean while still wet
Groove milling	(Quartz) dust	Air extraction on groove saw with water supply	1	Sufficient	6	None known	
		Air extraction on groove saw	2	Insufficient ¹	1	None known	

¹ Sufficient for materials containing low amounts of quartz.

4. WHEN PURCHASING DUST EXTRACTION SYSTEMS

4.1 Points of interest when purchasing dust extraction systems

Dust extraction systems can be categorised in two groups; fixed centrally located exhaust ventilation systems from which ducts lead to various parts of the workplace; and mobile dust extraction systems, which can only be used at one place at a time. The first system is not (yet) commonly available in the construction industry, and therefore the information in this section will deal only with mobile dust extraction systems.



Mobile dust extractor

Each dust extraction system is a compromise between the four main requirements of the system. The dust extraction system should:

- have sufficient suction and capacity,
- require little maintenance and servicing (changing of filter bags),
- be robust,
- be lightweight.

Unfortunately, these requirements are largely incompatible. Sufficient suction and capacity often require large and heavy motors, whilst large filter bags when full, will also add substantially to the total weight of the extraction system. In addition, a robust system may require the use of heavy components.

4.2 Criteria for purchasing dust extraction systems

Dust extraction systems all have their limitations, which will limit their effectiveness and use. We have developed a list with criteria, which you should take into account when purchasing a dust extraction system. These criteria are explained in the following section to assist you in determining which aspects are more important for your particular needs.

Sufficient capacity. The extraction system should, when used in conjunction with the tools, have sufficient capacity to capture dust particles and transport these to the filter bags. Theoretically, the air velocity at the opening of the hood (near the tool) should be at least 25% higher than the velocity with which the particles are released into the air by the process. For example, 1.25 x the speed at the surface of a grinding disk. In any case, the air velocity at the face of the hood has to be at least 25 m/s, but when the hood is properly designed, much lower velocities are sufficient. You should seek advice from the supplier on the exact details as the required face velocities may be different for different processes.

The air velocity in the ducts has to be sufficient to carry the dust to the filter bags. When the velocity in the ducts is too low, accumulation of dust will occur at corners, bends or connections. In general, the air velocity in the ducts should be 75% higher than the air velocity at the face of the hood. The diameter of the duct is also important and should be at least 35 mm.

The Casing. The likelihood of component damage of a dust extraction system is increased when the system is moved regularly. Therefore, a mobile dust extraction system should be robust, the bodywork should be able to resist knocks

and the hinges, bolts, catches, etc. should not buckle. The bodywork should also assist in the control of noise.

Anti-static material. The air movements in the ventilation system can result in static electricity in certain parts. This can cause shock when touching the system. In addition, dust particles can be attracted to the ducts and bodywork and subsequent cleaning of the system can become a source of dust exposure. Therefore, whenever possible components of the dust extraction system should be made of anti-static material.

The ducts are prone to wear at connections, particularly where flexible ducts are attached to rigid parts. Therefore, the flexible ducts will need to be strengthened at these connections. The ducts should be at least 35 mm in diameter and there should not be any constrictions. Make sure that the connections between the ducts have standardised diameters.

A screw-thread *connection* is sensitive to contamination and will therefore not last long in dusty environments. Most types of connections that click into place are also prone to contamination. Connections that just slide into place have the disadvantage that they can disconnect at any inopportune moment, especially when not secured. Generally, bayonet connections and secured sliding connections are least prone to contamination.



Sliding connections can disconnect easily

Standard connections are important because the use of adaptors will lead to a reduction in suction power. In addition, for each adaptor there will be an extra connection, with the added risk of leakages and sudden disconnections.

Dust in the on/off switch may affect the switch mechanism. A sliding switch can get stuck, whilst conductive dust particles (for example metal dust) can cause short-circuiting of the switch. Therefore, a dust free

switch is preferred, such as a push button beneath a flexible plastic cap.



The switch should be protected against dust

Ease of use of a dust extraction system determines to a large extent if the system will be used in practice. An extraction system on two wheels is very manoeuvrable, but as the centre of gravity can change when the filter bag fills up, the ease of use can be reduced. It is therefore important to check the ease of use of the extraction system with a fully loaded filter bag. A dust extraction system on three or four wheels is less manoeuvrable, but using castors at the front can solve this problem.

It is possible to have only one plug for the electricity supply, when the electricity for the hand tool is provided through the dust extraction system. This system has the added advantage that equipment can only be used when the dust extraction systems is switched on. It is important that there is some delay between switching off the equipment and the air extraction system, to ensure that dust particles are removed from the ducts to the filter bag.



A full dust bag indicator will prevent the continued use when the dust bag is full. The dust bag should fill-up evenly, even when larger dust particles are collected. Obviously the bag should be robust and should not tear when overloaded or when changing the bag. It should be possible to tighten the bag without release of dust, and the bag should be sufficiently dust-proof, or alternatively an after-filter should be used to capture the dust particles that have escaped from the bag.

Tightening the dust bag before removing helps to prevent exposure to dust



Dust is released when emptying the bag

Ideally, the *dust filter* should be fitted with an automatic clearing mechanism. This can be an automatic shaking or knocking system or a reversed airflow mechanism. We advise against using a dust extraction system that requires manual shaking or knocking of the filter bags as the effectiveness depends too much on the discipline of the operator. In addition, the

operator has to stop work too often to knock or shake the filter. It is advisable to use an air extraction system with a sound alarm when the flow resistance increases too much due to the build up of dust on the filters.



A pressure gauge indicates when the filter must be cleaned

Table 1. Criteria for purchasing local exhaust ventilation systems.

Aspect	Points of interest	Criterion	✓
Function	A mobile exhaust ventilation system has to be flexible and easy to transport on a building site.	Required	
	The air velocity (when used in combination with the tools and capture hood) has to be at least 25% higher than the speed with which the dust particles are released into the air (which is dependent upon the task). Or the hood is designed in such a way that a lower speed is sufficient.	Required	
	The air velocity in the ducts has to be approximately 75% higher than the air velocity at the opening of the hood.	Required	
	The diameter of the ducts has to be at least 35 mm.	Required	
	There should be no narrowing anywhere in the ducts.	Required	
	A centrally located extractor fan does not need to be moved as often.	Choice	
	A cyclone as a pre-separator is recommended when required to capture much (coarse) dust.	Preferred	
	There are special requirements for the exhaust ventilation systems for wet dusts (see elsewhere).	Choice	
	Are the accessories exchangeable?	Preferred	
	The capture hood has to be efficient, should be able to encapsulate the working area and should be adjustable.	Required	
Weight	A light-weight exhaust ventilation systems is preferred when the system is to be transported manually, with an easily removable dust bag.	Required	
	When the construction site is easy accessible with few obstacles and if the exhaust ventilation system is only used on ground level, the weight of the system is of less concern.	Choice	
Robustness	An exhaust ventilation system needs to be robust. The casing should be able to endure knocks and blows.	Required	
	The hinges, bolts, etc. should not buckle	Required	
	The extraction system should be made of anti-static materials.	Preferred	
	The ducts should be strengthened at the connection points.	Required	
	Are the connections for the ducts strong, without any leaks? Bayonet connections or secured sliding connections are preferred.	Choice	
	As far as possible, standard connections should be used for the ducts.	Preferred	
Easy to handle	An extraction system with two wheels is very manoeuvrable, but beware of the centre of gravity when the dust bag is full.	Choice	
	An extraction system with 3 or 4 castor wheels, are stable and manoeuvrable	Choice	
Electricity supply	Pay attention to the power source, some exhaust systems are high voltage systems	Choice	
	Is the switch dust-free, for example, a push button with a flexible plastic cap?	Required	

	Does the equipment only operate when the exhaust ventilation system is switch on?	Preferred	
	Does the ventilation system continue to operate for a few moments, to empty the ducts after being switched off?	Required	
Noise	The casing should reduce noise levels to optimum levels	Required	
	When using multiple tools and motors, interference of low frequency noise can occur, which result in a 'droning' noise	Choice	
Filter bag	Is the filter bag easily removable?	Required	
	Is the filter bag dust-free or is there an after-filter?	Preferred	
	The filter bag should be sufficiently robust and should not tear whilst in use or being removed.	Required	
	Is there an indicator alerting the user to a full filter bag?	Preferred	
	The filter bag should fill-up evenly.	Required	
Dust filter	In case of quartz dust, a filter is required which captures at least 99.995% of all the dust particles to conform to IEC 60335-2-69	Required	
	An alarm to indicate that the resistance across the filter is too high.	Required	
	An automatic cleaning mechanism for the dust filter is preferred.	Preferred	

4.3 Specification of the dust extraction system

Apart from the factors which can be assessed visually and which have been described in the section on the criteria, there are some factors that cannot be assessed visually. It is important to request and compare the specifications from the various suppliers. Table 2 provides a list of specifications which should be obtained from the supplier.

Table 2. Specifications when purchasing dust extraction systems.

-
- Dust release from exhaust
 - Air velocity in the opening of the hood and the ducts at each specific application
 - Empty weight.
 - Maximum weight with full loaded filter bag
 - Capacity of the filter bag
 - Exchangeability of accessories
 - Required power source
 - Filter material (needled carpet or equivalent material)
 - Capture efficiency.
-

The required capture efficiency is regulated in the IEC (International Electrotechnical Commission) norm 60335-2-69. The norm distinguishes three hazard categories: hazardous dust (H), dust of medium hazard (M) and dust with low hazard (L). The table below describes the required capture efficiencies for these three categories.

Category	Description	Capture efficiency (%)
L	Dust with occupational exposure limit of >1 mg/m ³	95
M	Dust with exposure limit of >0.1 mg/m ³	99.5
H	Amongst others, carcinogens and dust containing viruses and bacteria	99.995

Quartz is listed as a carcinogen and therefore belongs to the hazardous category and the use of a HEPA dust filter (99.997%) is mandatory. To ensure international compatibility, we have chosen for a capture capacity of 99.995%, in accordance with IEC 60335-2-69.

4.4 Points of interest for wet machining methods (water suction and slurry disposal)

In general, wet methods are very effective in reducing dust exposure. However, in some cases the use of water can lead to specific restrictions and concerns. There are three factors to consider: the choice of the correct wet and dry vacuum cleaner, the required adjustments to the tools and the disposal of the slurry.



When purchasing a wet and dry vacuum cleaner, more or less the same factors and criteria should be taken into account as for the dust extraction systems. Some vacuum systems can be used for both dry and wet dust. In this case it is important to determine if any concessions have been made with regard to the dust filter and filter bag. Be aware that a wet and dry vacuum cleaner requires a special filter bag. The extracted slurry should be collected in a bag, which should be easy to empty whilst the dust is wet. It is preferable to use disposable bags.

In general, wet methods are very effective in reducing dust exposure.

The wet and dry vacuum cleaner should have a sufficiently large reservoir so that it does not have to be emptied after each small task. On the other hand, a full reservoir should not be too heavy so that emptying can become a problem. Some commercially available wet and dry vacuum cleaners contain two pumps, so that the residue can be transported continuously from the reservoir to a large container or to the sewage system, for example in the bathroom or kitchen. In such cases, the drainage should be rinsed with sufficiently amounts of water, to prevent blocking of the drains.¹

Water should be recycled when little water is available or when water cannot be disposed off. Systems are available that recycle the extracted water on site. These consist of 'big-bags' in which the slurry remains behind. The bags with the slurry can be disposed of together. To prevent long delays before a sufficient amount of clean water is available, bags are required that filter the water quickly.

¹ Seek advice from your local water or sewage utility company before washing slurry into the sewage system

The water supply can be fitted on the tools using a tube with an in-line tap so that the supply can be regulated. The water supply should be fitted to the bottom of the tools, to limit the amount of water that flows over the tool in case of a leakage. In addition, a tube fitted this way will probably be less of a hindrance to the use of the equipment.

5. CRITERIA FOR PURCHASING MACHINES

Apart from the dust extraction system, the machine or tool to which the extraction system is fitted should comply with a number of criteria. For each type of machine or tool we have provided a number of criteria, which can be visually assessed. From the following you should be able to determine which criteria are most relevant to your circumstances.

5.1 Sanding machines

Dust extraction on normal and random orbital disk sanders is best carried out through the holes in the base plate or backing pad. However, dust can still be released at edges and a hood covering the sander can assist in capturing this dust. To limit restricted vision, the hood should be made of transparent anti-static material. Unfortunately, when a hood is attached to the sander it is possible that the sander will not be able to reach certain areas, especially corners.

It is important when using a belt sander that the extraction should be in the direction of the belt. Extraction against the direction of the belt requires much more suction.



Dust extraction at the back of the sander will interfere least with the work

Ideally, sanders should be fitted with an external extraction system. A sander or random orbital disc sander can also be fitted directly with a paper filter bag, a so-called integral extraction system. The air used for cooling of the sander will provide the extraction. A filter bag made of cotton will not be able to capture the dust adequately. An integral extraction system will not be sufficient on belt sanders since these produce too much dust.

In general, dust extraction from the back of the sander will interfere less with the work. Extraction from the top of the sander will cause the extraction tube to twist and possibly disconnect. A swivelling connection will prevent this.

Table 3 summarises the criteria for the sanders

Table 3 Criteria for purchasing sanders

Factor	Points of interest	Criterion	√
General specifications	Function, weight, and robustness		
Ease of use	Is the connection fitted at the best place? (at the rear of the sander)		
	If on fitted on top, is the tube from the exhaust system allowed to rotate?		
Power supply	Has the sander an infinite variation of speed		
	When used in wet conditions, is the sander connected to a transformer (in case of short-circuiting due to moisture)		
Connection of tubes	Does the connection of the extraction system consist of a normalised quick fitting?		
	Is the connection meant for external extraction?		
	If not, are paper (not cotton) bags supplied?		
Extraction	Is dust extracted through the holes of the base plate or backing pad?		
	Is the dust extracted in the direction of the belt, in case of a belt sander?		
	Is it possible to fit a hood over the sander to cover the work as much as possible?		
	Does the hood impair the view too much?		
Wet sanding	Is the water supplied on the bottom side of the tool?		
	Is the sander properly protected against moisture?		
	Can a screen/cap/hood be fitted to prevent spatter?		

5.2 Circular saws and angle grinders



Incorrectly placed local exhaust ventilation affects effectiveness

Circular saws and angle grinders should always be fitted with a safety guard, ensuring that it is impossible to touch the rotating circular saw or grinder and covers (mainly) the sharp teeth or edge of the saw or grinder. However, these may not always be efficient as an exhaust hood, as these have to enclose the entire grinder or saw. If required, additional flaps can be used.

An exhaust hood also has to continue to perform well as the grinding disc wears down. As the dimensions of the grinder change during use, it sometimes can be difficult to have a good enclosure.

The air extraction should be in the direction of the movement of the circular saw. Dust extraction against the circular movement of the saw requires much more suction power. Sometimes the air extraction is fitted at the top or front of the tool. Fitted this way, it is possible that the tubes twist and disconnect. A swivelling connection will prevent this.



A circular saw with dust extraction above and below the sawing table

Table 4 summarizes the criteria for the purchase of circular saws and angle grinders.



A correctly designed exhaust hood encloses the dust source entirely

Table 4: Criteria for purchasing circular saws/angle grinders

Factor	Points of interest	Cri ter ion	√
General specifications	Function, weight, robustness, ease of handling		
	Is the angle grinder suitable for wet cutting?		
Ease of use			
Power supply	Has the tool an infinite variation of speed		
	When used in wet conditions, is the equipment connected to a transformer (in case of short-circuiting due to moisture)		
Connection of tubes	Does the connection of the extraction system consist of a standard quick fitting?		
	Does the fitting allow twisting/rotation of the tubes?		
	Is the connection fitted on a logical position? (on the rear of the tool)		
Extraction	Is the tool fitted with an extraction hood (not just with a safety guard)?		
	Does the hood cover the entire cut?		
	Are additional measures available to improve enclosure (flaps or brushes)?		
	Does the extraction perform well after maximal allowable wear of the grinding disc?		
	Does the hood impair the view?		
	Is the air extracted with the movement of the saw/grinder?		
	Does the extraction transport the dust particles towards fragile parts of the tool?		
Wet operations	Is the water supplied on the bottom side of the tool?		
	Is the tool properly protected against moisture?		
	Is it possible to fit screen, cap or hood to prevent spatter?		
	Is it possible to recycle the water?		

Enclosed sawing systems that produce less dust are currently being developed.

5.3 Flat grinders

Grinding of stone is preferably carried out under wet conditions. When this is not feasible for technical or organisational reasons, the flat grinders can be fitted with a guard of soft/flexible material, which is ground away at the same rate as the stone. This ensures that the process is properly enclosed. The tubes of the water supply should be fitted so that these do not curl and twist during use. If necessary, a swivelling connection can be used which allows the tube to rotate.

Vulnerable parts of the equipment should be protected from the polluted air stream. When dust particles penetrate certain delicate parts the lifespan of the equipment can be shortened. Also, clearing dust from the equipment can become a source of dust.

Table 5 summarizes the criteria for the purchase of flat grinders.

Table 5: Criteria for purchasing flat grinders

Factor	Points of interest	Criterion	✓
General specifications	Function, weight, robustness, ease of handling		
	Is the grinder suitable for wet grinding?		
Ease of use			
Power supply	Has the tool an infinite variation of speed		
	When used in wet conditions, is the equipment connected to a transformer (in case of short-circuiting due to moisture)		
Connection of tubes	Does the connection of the extraction system consist of a standard quick fitting?		
	Does the fitting allow twisting/rotation of the tubes?		
	Is the connection fitted on a logical position? (<i>on the rear of the tool</i>)		
Extraction	Is the tool fitted with an extraction hood (not just with a safety guard)?		
	Does the hood cover entirely area that is being ground? Also in corners and along edges?		
	Are additional measures available to improve enclosure (flaps or brushes)?		
	Does the extraction perform well after maximal allowable wear of the grinding disc?		
	Does the hood impair the view?		
	Is the air extracted with the movement of the grinder?		
	Does the extraction transport the dust particles towards fragile parts of the tool?		
Wet operations	Is the water supplied on the bottom side of the tool?		
	Is the tool properly protected against moisture?		
	Is it possible to fit screen, cap or hood to prevent spatter?		
	Is it possible to recycle the water?		

5.4 Drills



Dust extraction can be fitted on the drill axis

Drilling in stone is preferably carried out under wet conditions. Where this is not possible dust extraction should be applied. Dust can be extracted through the shank or shaft when using a twist drill bit of 8 mm or more. When using tipped drill bits the extraction can be fitted on the drill axis.

When drilling in concrete with a hollow drill bit (Diamond drill bit) it is possible to extract dust

through the tip of the drill. When using a diamond drill bit dust exposure can be prevented by using an enclosed drill system.

Table 6 summarizes the criteria for the purchase of drills.

Table 6: Criteria for purchasing drills

Factor	Points of interest	Criterion	√
General specifications	Function, weight, robustness, handling		
	Is the drill suitable for wet drilling?		
Ease of use			
Power supply	Has the tool an infinite variation of speed		
	When used in wet conditions, is the equipment connected to a transformer (in case of short-circuiting due to moisture)		
Connection of tubes	Does the connection of the extraction system consist of a standard quick fitting?		
	Does the fitting allow twisting/rotation of the tubes?		
	Is the connection fitted on a logical position? (<i>on the rear of the tool</i>)		
Extraction	Is it possible to extract air through the axis of the drill bit (twist drills from 8mm)?		
	Are accessories available for extraction (tipped drill bits)		
	Does the extraction hood impair the view?		
	Is the air extracted with the movement of the drill?		
	Does the extraction transport the dust particles towards fragile parts of the drill?		
Wet operations	Is the water supplied on the bottom side of the drill?		
	Is the drill properly protected against moisture?		
	Is it possible to recycle the water?		

5.5 Jackhammers (pneumatic, hydraulic, electric)



Use of pneumatic jackhammers can cause the release of large amounts of dust due to their release of compressed air. Most dust will be generated when the air is released forwards. The air used for cooling electrical jackhammers can also blow dust in the air. To some extent this can be prevented by releasing the air backwards.

Using hydraulic jackhammers results in less release of dust and these are therefore preferred when it is important to keep the dust exposure as low as possible.

A ring-shaped air extraction can be fitted to the chisel of the jackhammer. However, this can

Jackhammers cause the release of large amounts of dust.

reduce the visibility which could be a problem where accurate cutting or chiselling is required. For rough demolition work, this is generally not a problem.

Table 7 summarizes the criteria for the purchase of power hammers.

Table 7: Criteria for purchase power hammers

Pneumatic power hammers

Factor	Points of interest	Criteria on	√
General specifications	Function, weight, robustness, handling		
	Is it possible to use a hydraulic power hammer?		
	If not, is it possible to use an electric power hammer?		
	If not, is compressed air released to the side or the rear instead of forwards?		
Ease of use			
Power supply			
Connection of tubes	Does the connection of the extraction system consist of a standard quick fitting?		
	Does the fitting allow twisting/rotation of the tubes?		
	Is the connection fitted on a logical position? (<i>on the rear of the tool</i>)		
Extraction	Is a ring-shaped air extraction fitted around the chisel?		
	Does the ring-shaped air extraction impair the view?		
	Does the air extraction transport the dust particles towards fragile/vulnerable parts of the hammer?		
Wet operations			

Electric power hammers

Factor	Points of interest	Criteria	✓
General specifications	Function, weight, robustness, handling		
	Is it possible to use a hydraulic power hammer?		
	If not, is opening releasing air used for cooling sideways instead of forwards?		
Ease of use			
Power supply			
Connection of tubes	Does the connection of the extraction system consist of a standard quick fitting?		
	Does the fitting allow twisting/rotation of the tubes?		
	Is the connection fitted on a logical position? <i>(on the rear of the tool)</i>		
Extraction	Is a ring-shaped air extraction fitted around the chisel?		
	Does the ring-shaped air extraction impair the view?		
	Does the air extraction transport the dust particles towards fragile/vulnerable parts of the hammer?		
Wet operations			

During milling the amounts of dust released can be so large that manageable dust extraction systems cannot cope. Therefore, the use of traditional methods for milling grooves is discouraged.