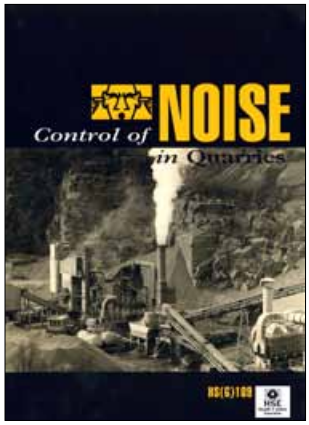
Control of noise in quarries



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The Noise at Work Regulations 1989 came into force on 1 January 1990. This guidance, prepared by HSE's Quarries National Interest Group, advises employers and those managing quarries on theri obligations under the Regulations and gives practical examples of how to reduce and control noise from quarrying machinery.

Others such as quarry foremen, health and safety specialists, employees and their representatives will also find this guidance helpful.

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This guidance is issued by the Health and Safety Executive. Following the guidance is not compulsory and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance as illustrating good practice.

Contents

Introduction

1 The Noise at Work Regulations 1989[1] (Noise Regulations) came into force on 1 January 1990. They place legal duties on employers and others such as machinery designers, makers and suppliers to minimise the risks of hearing damage to employees caused by loud noise at work.

2 This guidance, prepared by the Health and Safety Executive's Quarries National Interest Group, advises employers and those managing quarries on their obligations under the Regulations and gives practical examples of how to reduce and control noise from quarrying machinery. Others such as quarry foremen, health and safety specialists, employees and their representatives, will also find this guidance helpful.

3 The guidance does not address the more technical aspects of noise and should be read in conjunction with HSE *Noise guides 1 to 8*.[2,3] For example, noise measurement and design methods to control noise should only be undertaken by suitably competent persons. This is important, not only because workers may be unnecessarily put at risk, but because money may be wasted.

Noise and the human ear

4 Noise is often defined as 'unwanted sound', but in the context of this document it is any sound that may be hazardous to hearing.

5 The range of human hearing is so great that sound intensities or noise levels cannot be conveniently represented on a linear scale and thus a logarithmic or decibel (dB) scale is used. On such a scale, the doubling or halving of the sound energy is represented by a 3 dB change. However, a 3 dB change is barely perceptible to the human ear and an increase of 10 dB is judged to be subjectively twice as loud. Figure 1 shows examples of everyday noise levels including those found in the quarrying industry.

6 Brief exposure to high levels of noise causes a temporary loss of hearing, often persisting for some hours after noise exposure ceases. This may cause warning signals to be heard less distinctly or not at all. If the exposure is repeated, the hearing loss can become permanent. The degree of permanent deafness depends, not only on the level of noise and its frequency, but also on the duration of exposure and individual susceptibility. Sufferers often do not realise that their hearing is being damaged. Noise induced hearing loss is incurable and in certain cases can be accompanied by ringing noises in the ear (tinnitus). Most hearing loss due to noise occurs during the early years of exposure.

Noise measurements

7 Noise measurements are necessary to assess employee noise exposure and to prepare an effective noise reduction programme. Because the sensitivity of the ear varies with the frequency of sound received, meters used to measure noise levels according to the decibel scale incorporate weighting filters which mimic the response of the human ear. The resultant readings are expressed as 'A-weighted decibels' (dB(A)).

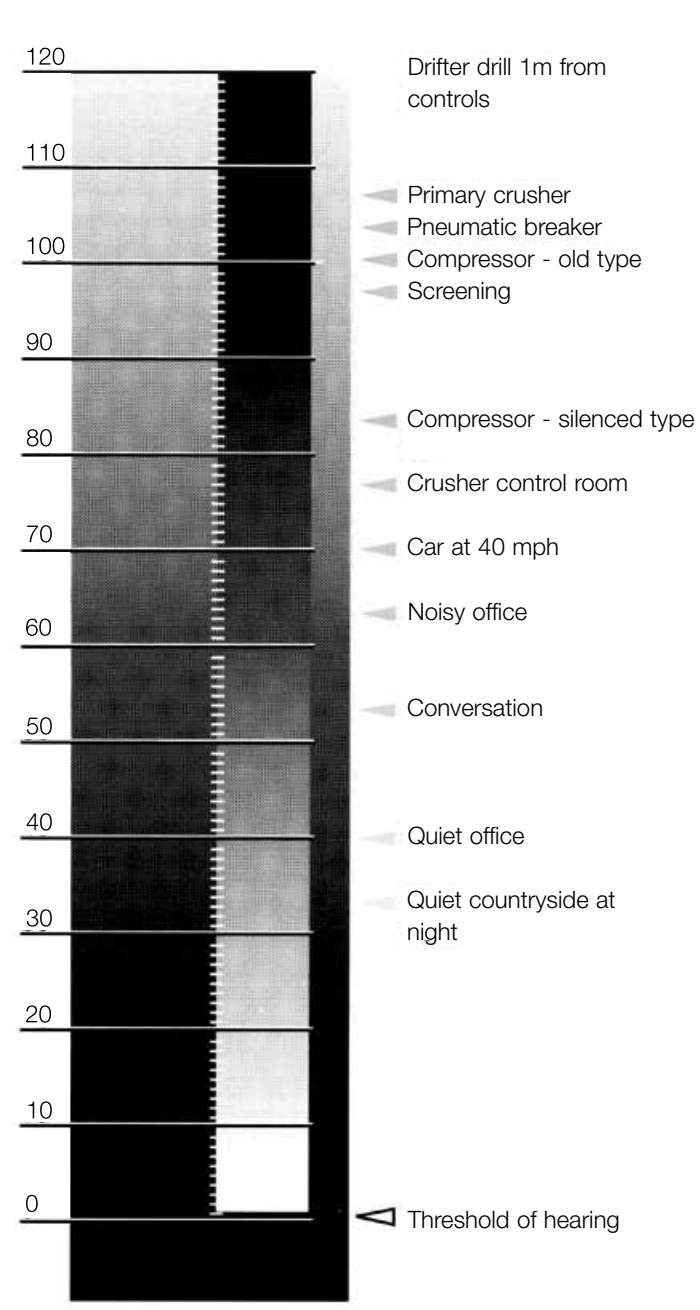

Figure 1 Some typical dB(A) noise levels

In their simplest form, sound level meters indicate the fluctuating noise level and require careful use to evaluate workplace noise exposures.

8 Noise exposure is expressed in terms of the average exposure level over a typical working day normalised to 8 hours, which is abbreviated to $L_{EP,d}$ The $L_{EP,d}$ is defined as the 'daily personal noise exposure'; it is measured in dB(A) and takes into account both noise level and duration. Integrating instruments which average sound over long periods are now available for this purpose. Two types are in use:

(a) the integrating averaging sound level meter which is normally hand-held or tripod-mounted when measurements are made; and
(b) the personal sound exposure meter (dosemeter) which is worn by the worker whose exposure is to be determined.

Further information on instruments is given in *Noise guide 3*.

9 Personal sound exposure meters are most useful for measuring the exposure of mobile workers or of workers whose noise exposure varies in an irregular and unpredictable manner. Logging personal sound exposure meters are now available which allow periods of significant noise exposure to be identified. However, all personal sound exposure meter results are subject to greater inaccuracies than those from other types of sound level meter, due to errors from body effects, shouted speech and contact with clothing.

10 Where measurements are made with an integrating meter over a period of less than 8 hours, it is referred to as the sample L_{eq} or $L_{eq(s)}$, where (s) stands for sample. Sometimes more complex measurements, such as of frequency, are necessary for the selection of ear protection and for noise control (see also paragraphs 57 to 59).

Duties and noise limits

11 Employers have a duty under the Noise Regulations to reduce the risk of damage to the hearing of their employees and employees of other employers from the exposure to noise to the lowest level reasonably practicable. The same duty applies to the manager of a quarry (regulation 2(3)), however this only applies to matters under his control. Under section 1(1)(b) of the Mines and Quarries Act 1954[4] the quarry owner has a duty to make such financial and other provision, and to take such other steps as may be necessary, to ensure that all requirements or prohibitions imposed by or under the Health and Safety at Work etc Act 1974 (HSW Act)[5] are complied with, as well as any regulations made under it.

12 The Noise Regulations prescribe action levels at which employers and quarry managers have clear duties placed on them. The levels for a daily personal exposure ($_{LEP,d}$) are:

First action level	85 dB(A)
Second action level	90 dB(A)

There is also a 'peak action' level or 'peak sound pressure' of 200 pascals (equivalent to 140 dB linear).

13 The main requirements of the Regulations where exposure is likely to be at or above any of the three 'action levels' are summarised in Table 1.

Table 1

Action required where $L_{EP,d}$ is likely to be: **(see note1)**	*below 85dB(A)*	*85 dB(A) First action level*	*90 dB(A) Second action level* **(see note 2)**
EMPLOYERS' DUTIES			
General duty to reduce risk Risk of hearing damage to be reduced to the lowest level reasonably practicable (regulation 6)	**X**	**X**	**X**
Assessment of noise exposure Noise assessments to be made by a competent person (regulation 4)		**X**	**X**
Record of assessment to be kept until a new one is made (regulation 5)		**X**	**X**
Noise reduction Reduce exposure to noise as far as is reasonably practicable by means other than ear protectors (regulation 7)			**X**
Provision of information to workers Provide adequate information, instruction and training about risks to hearing, what employees should do to minimise risk, how they can obtain ear protectors if they are exposed to between 85 and 90 dB(A), and their obligations under the Regulations (regulation 11)		**X**	**X**
Mark ear protection zones with notices, so far as reasonably practicable (regulation 9)			**X**
Ear protectors Ensure so far as is practicable that protectors are:			
■ provided to employees who ask for them (regulation 8(1))		**X**	
■ provided to all exposed (regulation 8(2))			**X**
■ maintained and repaired (regulation 10(1)(b))		**X**	**X**
■ used by all exposed (regulation 10(1)(a))			**X**
Ensure so far as reasonably practicable that all who go into a marked ear protection zone use ear protectors (regulation 9(1)(b))			**X** **(see note 3)**
Maintenance and use of equipment Ensure so far as is practicable that:			
■ all equipment provided under the Regulations is used, except for the ear protectors provided between 85 and 90 dB(A)(regulation 10(1)(a))		**X**	**X**
■ ensure all equipment is maintained (regulation 10(1)(b))		**X**	**X**
EMPLOYEES' DUTIES **Use of equipment** So far as practicable:			
■ use ear protectors (regulation 10(2))			**X**
■ use any other protective equipment (regulation 10(2))		**X**	**X**
■ report any defects discovered to their employer (regulation 10(2))		**X**	**X**

Action required where $L_{EP,d}$ is likely to be: **(see note1)**	*below 85dB(A)*	*85 dB(A) First action level*	*90 dB(A) Second action level* **(see note 2)**
MACHINE MAKERS' AND SUPPLIERS' DUTIES			
Provision of information			
Provide information on the noise likely to be generated (regulation 12)		**X**	**X**

Notes: (1) The dB(A) action levels are values of daily personal exposure to noise ($L_{EP,d}$)
(2) All the actions indicated at 90 dB(A) are also required where the peak sound pressure is at or above 200 Pa (140 dB re 20μ Pa)
(3) This requirement applies to all who enter the zones, even if they do not stay long enough to receive an exposure of 90 dB(A) $L_{EP,d}$

Assessment of exposure

14 Regulation 4 of the Noise Regulations requires that when quarry workers are likely to be exposed to the first action level or above, or to the peak action level or above, the quarry manager should ensure that a competent person makes a noise assessment adequate for the purpose. The assessment should:

(a) identify which workers are so exposed; and
(b) provide the quarry manager with such information as will enable him to comply with his duties under the Regulations.

15 An assessment is the foundation of what action, if any, is required in respect of noise. In particular it is the key to ensuring that workers are exposed to the lowest noise levels that can be achieved, and this is the essential first step of control. A noise survey alone does not constitute an adequate assessment.

16 Quarry workers may well be exposed to varying patterns of noise. For some, the nature of the work might entail a complicated pattern of exposure. An assessment will assist in identifying those operations which make the largest contribution to the overall level of exposure and these operations should be targeted for noise control.

17 The establishment of the daily personal exposure level ($_{LEP,d}$) is not only important as confirmation of the individual exposure, but it also helps to decide priorities and maximise on resources. Further information is given in *Noise guide 3*.

18 An assessment should:

(a) establish the daily personal exposure for each employee or group of employees;
(b) identify which employees or group of employees are likely to be exposed to or above any of the action levels;
(c) identify the sources of noise;
(d) confirm, where possible, work patterns, exposure periods and associated noise levels;
(e) identify work stations/work areas where steps are required to reduce noise levels by engineering controls (regulation 7 Noise Regulations and paragraphs 22 to 56 of this guidance);
(f) identify who needs and advise on suitable ear protectors (regulation 8 Noise Regulations and paragraphs 57 to 59 of this guidance);

(g) identify ear protection zones (regulation 9 Noise Regulations and paragraphs 60 to 62 of this guidance);
(h) indicate which employees should receive information about the noise hazard and measures for its control (regulation 11 Noise Regulations and paragraphs 67 to 70 of this guidance).

19 An assessment cannot be considered as a once and for all exercise. It may need to be reviewed. The following are examples of considerations that may give rise to a review:

(a) the installation of new machinery or modifications to or the removal of existing machinery;
(b) changes in workload or work patterns;
(c) changes in machinery operating speeds or conditions.

20 Information on the training requirements of competent persons is given in *Noise guide 6*.

Assessment records

21 The assessment should be relevant to the workplace and should be tailored to the exact circumstances, workplace practices and patterns under examination. Further guidance for recording assessments is given in *Noise guide 3*.

Prevention and control

22 Regulation 7 of the Noise Regulations requires that when employees are, or are likely to be, exposed to the second action level or to the peak action level or above, the noise exposure should be reduced so far as is reasonably practicable. Personal protective equipment (PPE) (ear protectors) can only be used as an interim solution, but may in practice be used long-term when all other reasonably practicable measures have been taken, but have not, in themselves, achieved adequate noise reduction. The reduction of noise exposure should be the main objective.

23 Much can be achieved by careful design and maintenance of equipment and possibly by changing work practices.

24 Methods for reducing exposure include:

(a) using low noise equipment and installations; many quarries equipped with modern plant and vehicles achieve employee noise exposures below 85 db(A) $L_{EP,d}$;
(b) reducing sound radiating surfaces eg use mesh guards instead of plate metal;
(c) vibration isolation eg of operators' cabins and vehicle cabs;
(d) using sound absorbing linings eg in vehicle cabs and engine cover linings;
(e) exhaust silencers eg on pneumatic drill rigs and vehicle engines;
(f) using enclosures around equipment eg to control noise in saw shops;
(g) using noise refuges for employees eg a cabin at the control console of crushing and screening equipment;
(h) maintenance eg replace defective silencers and repair broken windows in vehicle cabs etc.

Such measures may be used singly or in combination. The list is not exhaustive and other techniques might be applicable. Many effective solutions are low cost.

Blasting

Primary

25 The noise from blasting is of very short duration and, depending upon the distances involved, can reach the peak action level. An added problem is the environmental nuisance.

26 The adequate covering of detonating cord, if it is used with at least 0.6 m of material, can reduce noise levels. More common now is the use of in-hole initiation, or the use of non-electric (shock tube) initiation techniques, and substantial noise reductions can be achieved by this method.

Secondary

27 Secondary blasting is not common, but when used it often leads to complaints on environmental grounds. Unconfined explosives (plasters) cause greater problems than POP shots (small diameter holes). Careful attention to blast design to achieve good fragmentation can substantially reduce or eliminate the need for secondary blasting. The use of drop balls or other types of breakers have largely overcome the secondary blasting problem.

Drilling

Hand-operated drills

28 Hand-operated drills are used mainly for the drilling of small diameter holes in monumental stone quarrying, which can be used for explosives, plug and feathers or hydraulic splitters. They are usually powered by compressed air and the noise arises from the action of the motor, hammer and air vent, causing operator exposure and environmental nuisance. Vibration to the hands and arms can also be a problem with this type of machine.

29 Recent developments in the design of machines with the fitting of mufflers to the body and dampers to the moil point can achieve reductions in the order of 6-7 dB(A). Also noise levels reduce as the moil penetrates the material being drilled.

30 Many of the older types of machine can be retrospectively fitted with mufflers and dampers for the moil point to reduce noise levels. Unfortunately, excessive rnuffling of the exhaust noise can cause back pressure which reduces the machine's performance; this is most noticeable in old worn units. In practice, mufflers usually reduce noise levels by 5-7 dB(A) while reducing machine performance by about 10%.

Drilling rigs - usually greater than 75 mm diameter hole size

31 These are used mainly for the drilling of holes for blasting at various types of quarrying operation. They can be powered by compressed air, hydraulics or electricity, however, hole flushing is often achieved using compressed air. Water or other mediums are manually employed for hole flushing when coring for exploration or other purposes. In quarries three main types are used:

(a) drifter;
(b) down the hole hammer (dth);
(c) rotary.

32 On the air-operated drifter, the reciprocating hammer and rotation motor are located on the mast and therefore they are particularly noisy. Noise levels in excess of 110 dB(A) have been measured. With the dth machine, the hammer is positioned above the drill bit and for most of the drilling cycle it is located inside the hole, but the initial penetration can result in excessively high noise levels.

33 Hydraulically driven motors are available, are much quieter and should be considered when purchasing new equipment.

34 The fitting of mufflers or suitable silencers can reduce noise levels. In addition, conducting the exhaust from the rotation motor via a transfer hose to a remote position, eg the mast, and using a silencer can reduce noise still further (see Table 2).

Table 2 Examples of noise reduction benefits by fitting a silencer to the rotation motor on a dth drilling machine

Rotation motor on dth drill	*dB(A)*
Without silencer	105
Fitted with silencer	94
Silencer positioned on mast	89

35 It is important to fit properly designed silencers to avoid blockage and freezing up problems. Further information is given in HSE's Guidance Note PM56 *Noise from pneumatic systems*.[6]

36 Many of the larger and more modern machines have integral control cabins for the operator, from which all of the machine functions can be controlled. These cabins also provide protection from dust and the elements, and to avoid the door or window being left open during hot weather, air-conditioning units can be fitted. With well-designed cabins, levels below 85 dB(A) are easily achievable.

Compressors

37 Diesel powered compressors, either mounted on the drilling machine or on wheeled trailer units are often used for powering drills or for hole flushing. Although the trailer units can be located well away from the drill, the noise levels can contribute to the drillers' exposure. Silencers should be kept in good order and covers and doors should be kept closed. Silenced machines are available and should be considered when purchasing new equipment (see Figures 2 and 3).

Figure 2 Old compressor

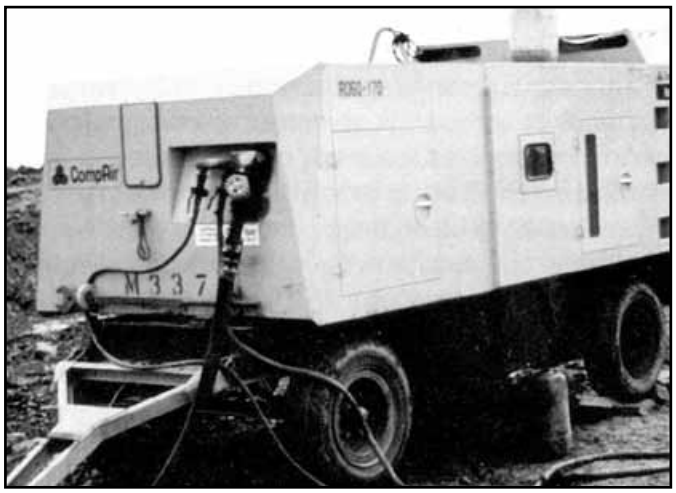

Figure 3 New 'silenced' compressor

Excavators/draglines

38 These are usually diesel or electrically powered machines used for the excavation/loading of material and are controlled by an operator located in the driver's cabin. On new machines, the noise levels in the cabins need not be a problem. On older machines, soundproofing and physically dividing the engine and draw-works from the driver's cab may be necessary to reduce the noise to acceptable levels. Successful noise level reductions can only be maintained if the equipment is kept in good order and the doors and windows fit properly and are kept closed.

Wheel loaders, dump trucks and other machines

39 Insulation and covers around engines and fans can greatly reduce noise levels and sound-proofing of the driver's cab can keep exposures well below 85 dB(A). The benefits of any sound-proofing will, however, be lost if windows and doors are not kept closed. To avoid overheating during hot weather, it is essential that air-conditioning units be fitted. Engines should be fitted with suitable intake silencers.

40 Retrofitting can be worthwhile but is seldom easy. With all types of vehicle the operator can be protected by a sound-proofed cab or by modifying the existing one. All cabs that are sound-proofed are likely to have the following features:

(a) anti-vibration mountings;
(b) complete enclosure with any openings (for ventilation) fitted with an acoustic attenuator;
(c) vibration damped panels;
(d) acoustic lining of the cab.

41 All equipment having an internal combustion engine can expose both the operator and others to high levels of noise. Noise reduction can be obtained by providing an acoustic enclosure for the engine, which is likely to have the following features:

(a) an efficient exhaust silencer placed away from the operator's position;
(b) a complete enclosure - dampened to prevent vibration;
(c) anti-vibration mountings between the engine and frame;
(d) a low noise cooling fan;
(e) silencers fitted to air inlets.

Crushing/milling

42 There are basically two methods of crushing ie by compression and by impact. The main machine types are:

(a) ***Compressive*** eg jaw crushers, gyratory crushers, cone crushers, roll crushers, ball mills, rod mills.
(b) ***Impact*** eg rotary impactors, hammer mills (fixed or swing hammers).

All types of crushing machines are used to reduce mineral in size and the process involves heavy metal parts/units and the utilisation of considerable amounts of energy. Depending upon the location, installation and particular type of crusher, high levels of noise are involved.

43 Resilient mountings, chute linings, acoustic curtains, lagging, covers etc can bring about useful reductions in noise levels. However it is difficult to reduce noise below the second action level. In many cases this can only be achieved by housing the operator in a control cabin. If remotely situated, the use of closed-circuit television (CCTV) can ensure adequate operation. Figure 4 gives an example of the use of CCTV.

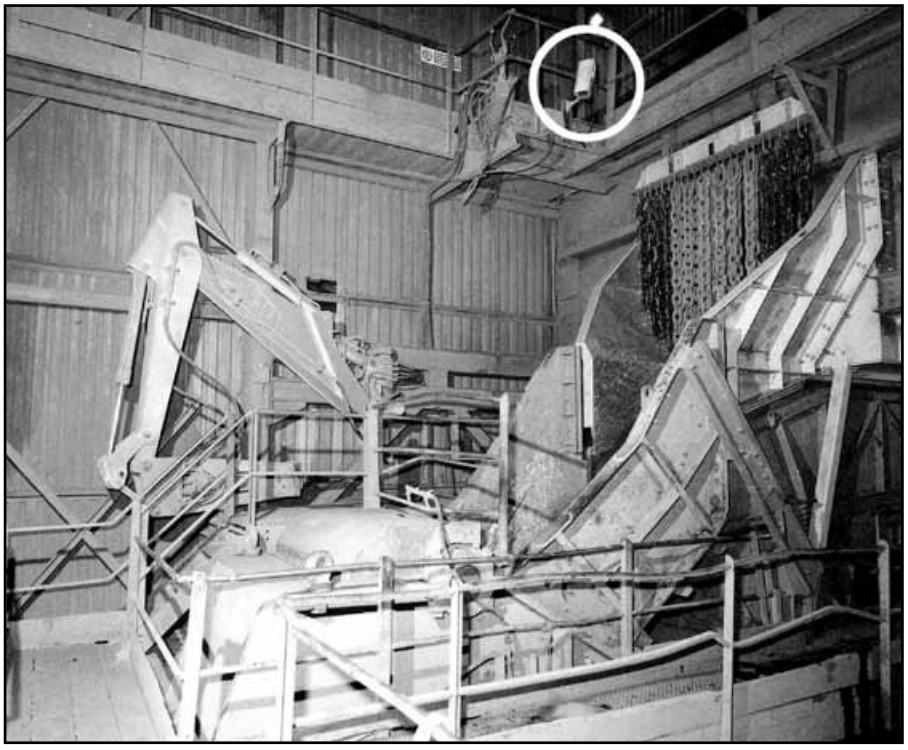

Figure 4 CCTV camera in use at a primary crusher (ringed)

44 Figures 5 and 6 show a before and after effect with an improvised cabin at a secondary crusher where it was considered necessary to employ an operative. The noise reduction benefits are also shown.

Figure 5 Secondary crusher before modification (107 dB(A))

Figure 6 Secondary crusher after modification (81 dB(A))

Screening

45 There are numerous types of screening equipment, many of which are designed for specific purposes. Screens are used to extract or reject material of a specific size from the feed product. They may be located singly or in various arrangements or groups in a screen house. Screening by its very action creates noise and the larger the material the greater the noise problem.

46 The use of synthetic screen mats or cloths to replace the traditional metal plate or woven wire has immense benefits and, coupled with chute linings, enclosures or complete encapsulation, further reductions can be achieved.

47 If a complete screen house is considered to be an enclosure, personnel should only be allowed to enter if suitable PPE is used. Entry to such enclosures should be avoided when the equipment is in use and the use of control techniques including bin level indicators and CCTV should be considered. An example of the use of CCTV in a control room is given in Figure 7.

Figure 7 Use of CCTV in a control room

Conveying/feeding

48 Material being conveyed does not create noise in itself and it can be at the loading end or discharge position that noise problems exist. Again the larger the product, the greater the problem. The use of 'stone' baffles and/or chute linings can reduce both noise and wear. Efficient maintenance can reduce 'squeal' from conveyor idlers. An example of the beneficial effects of chute lining is given in Table 3.

Table 3 Examples of lining a chute to reduce the noise level

Meta/chute	*dB(A)*
No lining	119
Loose conveyor belt lining	116
25 mm thick rubber lining	102

49 By reducing the drop height and by preventing material impacting onto empty bins/hoppers (ie by ensuring material drops onto material) noise levels can be restricted. In addition the use of spiral chutes or lined cascade towers will lower noise levels.

Heating/drying

50 The heating of materials inevitably causes noise problems. The larger the size of material being heated, often the greater the problem. Burners and fans are sources of high noise levels.

51 Much can be achieved by fitting enclosures and/or silencers to burners and fans. Silencers must be placed on both the inlet and outlet sides of fans to reduce noise effectively. Anti-vibration mountings can help to avoid vibrations being transmitted through the structure. Remote operation, including lighting up can help to keep personal exposures down (see Figure 8).

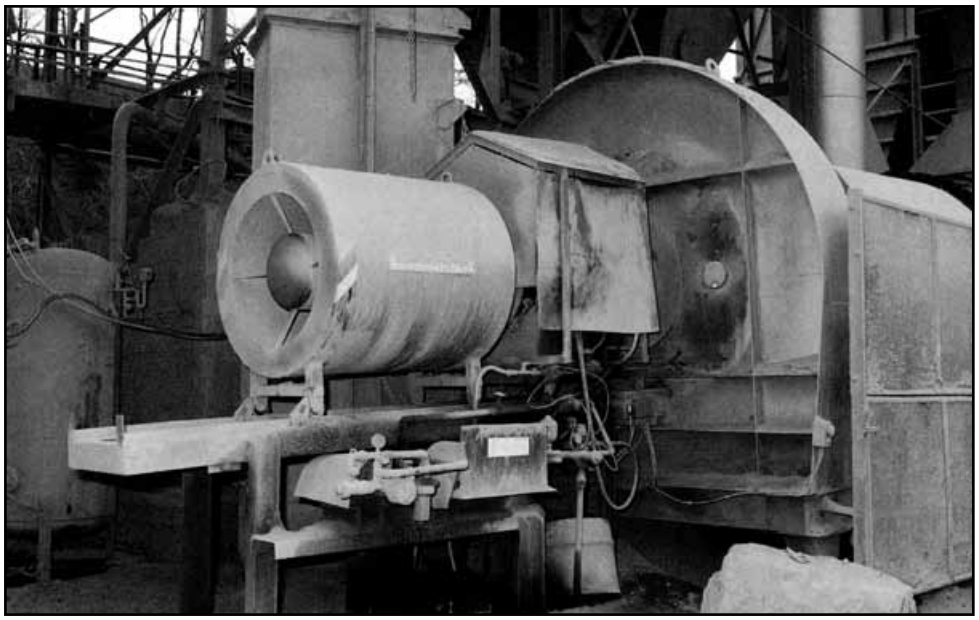

Figure 8 Use of silencer on burner

Saws

52 Both static and portable hand-operated saws are used to cut blocks of stone and slate into selected sizes.

53 The use of dampened saw blades with enclosures where possible and keeping the blades straight and sharp can restrict noise emission (see Table 4). A reduction in the speed of saws can also reduce noise levels.

Table 4 Noise reduction using dampened saw blades

Saw blade type	*dB(A)*
Standard	100
Dampened	87

54 Remote and automatic control of saws can also be used (see Figure 9).

Figure 9 Remote/automatic control of saws

Miscellaneous situations

Plant

55 Well-planned preventative maintenance schemes will have beneficial effects on noise control. Examples of the causes of excessive noise are: worn bearings; air leaks; cover/enclosures not properly fitted or in position loose materials on platforms; loose bolts; rattles and worn chute linings etc. Specific examples are given in Table 5.

Table 5 Examples of noise reduction by carrying out simple modifications

Machine/equipment	*Modification*	*Reduction dB(A)*	
		Before	After
Primary crusher cabin	Improve and insulate	108	89
Compressor	Change to silent type	100	84
Drill	Fit silencer to rotation motor and attach to mast	105	89
Secondary crusher	Install cabin	107	91
Secondary crusher	Fit rubber mounts under cabin	91	81
Metal transfer chute	Fit conveyor belt lining	119	116
Metal transfer chute	Fit 25 mm thick rubber lining	119	102
Screen building	Tighten handrails and remove debris	88	85
Screen	Fit polyurethane module screen decks	100	91
Screen	Line chute under screen and fit rubber screen cloth	107	94
Mobile crusher platform	Fit efficient exhaust silencer	103	92
Mobile crusher cabin	Fit efficient exhaust silencer	93	84
Hand drill	Fit muffler and dampened moil point	110	106
Mobile crusher	Install insulated cabin	92	75
Stone saws	Remote operation inside control room	93	74

Roads

56 Gradients should be as shallow as appropriate to avoid excessive vehicle revs. Road surfaces should be kept clean and dirt free and tight corners should be avoided.

Ear protection

57 The use of ear protectors is not an acceptable alternative to the implementation of noise control measures (see paragraph 22). However there are a number of circumstances where the use of ear protectors is likely to be the final option to achieve adequate control of the risk of hearing damage. Generally, ear protection is of great importance when operators are exposed to high levels of noise for short periods of time. Long-term exposure to high levels of noise should be dealt with by other control measures detailed in the Noise Regulations, *Noise guides 1 to 8* and paragraphs 22 to 56 in this guidance.

58 It is important that the type of ear protector used is suitable for the purpose. This means that it provides sufficient protection and is suitable for the user.

59 To check the suitability of a particular type of ear protector, it is necessary to measure the sound pressure level in the octave bands from 63 Hz to 8 KHz using a suitable sound level meter equipped with a frequency analyser. The information obtained can then be compared with the manufacturer's 'assumed protection' data for that ear protector to ensure suitability as in Table 6. Figure 10 shows examples of suitable and unsuitable ear protectors. Some quarry processes such as crushing may give rise to high levels of low frequency noise. Since most ear protectors give poor attenuation at these levels the checking for suitability is important. *Noise guide 5* gives further information on the types and selection of personal ear protectors.

Table 6 Noise with an A-weighted level of 112 dB(A) has octave band pressure levels as shown below. Values of assumed protection of the protector are used to obtain octave band levels of assumed protection which converts to 82 dB(A)

Octave band Hz frequency	63	125	250	500	1k	2k	4k	8k
Band pressure level (dB)	83	90	84	92	99	108	108	104
Assumed protection of protector in dB (from supplier)	11	10	16	28	29	32	31	27
Octave band assumed protection level in dB	72	80	68	64	70	76	77	77

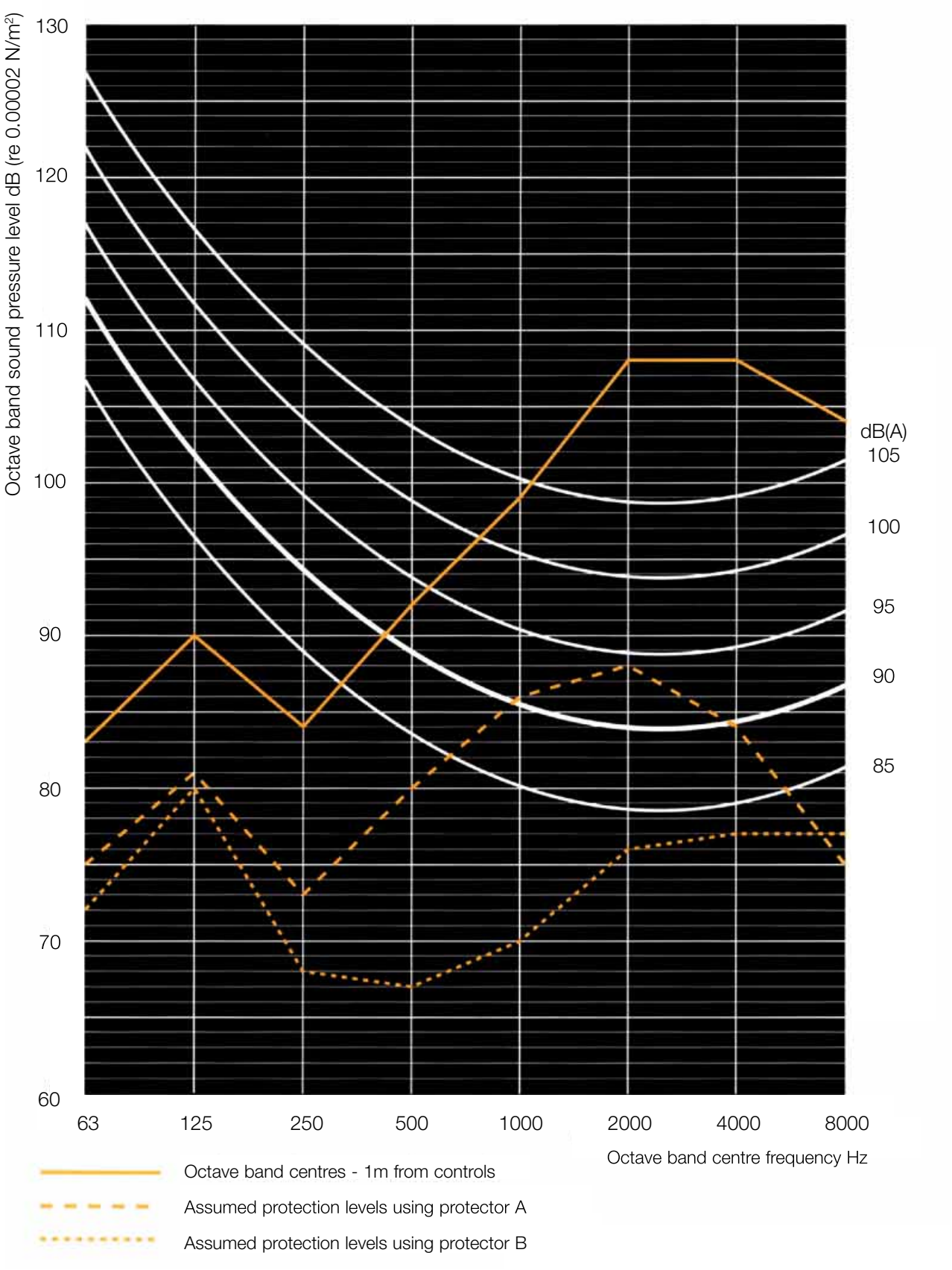

Figure 10 Octave band chart showing examples of suitable and unsuitable ear protectors (machine: drifter drill)

Ear protection zones

60 Regulation 9 of the Noise Regulations requires that all ear protection zones are demarcated and identified by means of signs. An ear protection zone is one where any employee is likely to be exposed to the second action level, 90 dB(A), or above. The signs should comply with BS 5378: Part One: 1980 *Signs*.[7]

61 Where reasonably practicable, the sign needs to be located at the entrance of the ear protection zone and, where necessary, further signs may be required. An example of a sign is given in Figure 11.

Figure 11 Noise protection zone notice

62 No person should enter any ear protection zone when the equipment is in use, unless suitable ear protection is being worn.

Maintenance and use of equipment

63 Under regulation 10 of the Noise Regulations, the employer has a duty to ensure so far as practicable the proper use and condition of any equipment provided to reduce noise exposure (see also paragraph 66).

64 Noise control measures and equipment such as those described in paragraphs 22 to 56 should be checked from time to time to ensure that they are being properly used and also being kept in good order. The effectiveness of such measures also needs to be monitored and the findings may be needed before deciding to take remedial action.

65 Where disposable defenders are used (see paragraphs 57 to 59), then suitable stocks should be maintained. Reusable protectors should be inspected periodically and repaired or replaced as necessary.

66 Employees also have a duty to make use of noise control measures, eg silencers, enclosures etc and also to report any defects eg faulty equipment, damaged ear defenders etc.

Information, instruction and training

67 Regulation 11 of the Noise Regulations requires that workers who are likely to be exposed to the first action level (85 dB(A)) or above, should be informed about the risks and the precautions to be taken. Employees must be informed of the steps to take to obtain personal ear protectors and also of their obligations under the Regulations.

68 The instruction and training should include information on the control measures and, if necessary, details of the maintenance requirements and how to report defects in noise control equipment.

69 Employers and quarry managers have a duty to select suitable PPE for particular circumstances (see paragraphs 58 to 59) and to ensure that it is correctly used. Training and instruction is required to ensure that workers understand how to fit and wear the PPE provided, where to store it and what to do if damage occurs or if a replacement is needed.

70 Employees should be issued with HSE's free leaflets *Noise at work - advice for employees*[8] and *Listen Up*.[9]

Duties of designers, manufacturers importers and suppliers of plant and machinery

71 Section 6 of the HSW Act imposes general duties on designers etc to provide articles that are safe and without risks to health and to provide information needed for their safe use. Regulation 12 of the Noise Regulations modifies this duty to include specific requirements for provision of information on noise emission. These duties are, that if a machine (crusher, screen, wheel loader, dozer etc) is likely to produce noise capable of harming health, action will need to be taken to:

(a) reduce the noise to the extent reasonably practicable;
(b) provide information on any measures needed to keep noise under control when the machine is used.

72 Manufacturers/suppliers also have duties under the Supply of Machinery (Safety) Regulations 1992.[10] Noise reduction is included in Schedule 3 of the Regulations as one of the essential health and safety requirements. These Regulations came into force on 1 January 1993 but there is a transitional period until 31 December 1994. During that period, manufacturers and suppliers have the option of either meeting the pre-1993 requirements (eg section 6 of the HSW Act) or the new Regulations.

73 Prospective purchasers of new equipment should request information from suppliers etc where machinery is likely to cause people at work to receive a daily personal noise exposure at or above 85 dB(A) or the peak action level, to enable them to provide adequate information to their workers (see *Noise guide 2*).

74 It is good noise control practice to specify noise emission limits when planning new premises and purchasing new machinery and equipment (with the machine/ equipment under normal operating conditions). This is important in order to avoid unnecessary expenditure.

References

1 *Noise at Work Regulations 1989* SI 1989/1790 HMSO ISBN 0 11 0977904

2 *Noise at work. Noise guide 1: legal duties of employers. Noise guide 2: legal duties of designers, manufacturers, importers and suppliers* HSE 1989 ISBN 0 7176 0454 3

3 *Noise at work. Noise guides 3 to 8: Noise assessment, information and control* HS(G)56 HSE 1990 ISBN 0 7176 0458 6

4 *Mines and Quarries Act 1954 Chapter 70* HMSO ISBN 0 10 850389 5

5 *Health and Safety at Work etc Act Chapter 37 1974* HMSO ISBN 0105437743

6 Guidance Note PM56 *Noise from pneumatic systems* HSE 1985 ISBN 0 11 883529 7

7 BS 5378: Part 1: 1980 *Signs*

8 *Noise at work - Advice for employees* (free HSE leaflet) IND(G)99(L) 1991

9 *Listen up* (free HSE leaflet) IND(G)122(L) 1992

10 *The Supply of Machinery (Safety) Regulations* 1992 SI 1992/3073 HMSO ISBN 0 11 025719 7

Further information

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