1.0 Noise

High noise levels can have a significant effect on persons directly exposed and those in the surrounding environment. In addition to causing permanent hearing damage, excessive noise is also a source of annoyance and disruption, which may directly or indirectly increase the risk of accidents. The environmental aspects of construction site noise are of particular importance in residential areas.

1.1 Occupational noise

The Control of Noise at Work Regulations 2005 impose a statutory requirement on the employer to reduce the risk of damage to the hearing of employees to the lowest level reasonably practicable. In particular, the regulations require that employers should first decide whether any employees are likely to be exposed to noise levels high enough to cause hearing damage. If so, the regulations require a competent person to carry out and record on the employers assessment form (or BAM noise assessment record form 180-036) an assessment of noise levels and for any necessary control measures to be implemented accordingly.

The regulations require employers to prevent or reduce risks to health and safety from exposure to noise at work and also place duties on employees.

The regulations require employers to:-

- assess the risks to their employees from noise at work;
- take action to reduce the noise exposure that produces those risks;
- provide their employees with hearing protection if they cannot reduce the noise exposure enough by using other methods;
- make sure the legal limits on noise exposure are not exceeded;
- provide their employees with information, instruction and training;
- carry out health surveillance where there is a risk to health.

The regulations require employees to:-

- co-operate and attend for hearing checks where required;
- use the control measures provided and to report any defects;
- use hearing protection where its use is mandatory.

The employer may be BAM as the Principal Contractor, or more commonly a subcontractor carrying out noisy activities.

1.1.1 Action Values

The regulations require specific action to be taken at certain values relating to:-

- the levels of exposure averaged over a working day or week, and
- the maximum noise (peak sound pressure) exposure in a working day.

These values are:-

- Lower exposure action values:
  - daily or weekly exposure of 80 dB (A-Weighted)
  - peak sound pressure of 135 dB (C-Weighted)

- Upper exposure action values:
  - daily or weekly exposure of 85 dB (A-Weighted)
  - peak sound pressure of 137 dB (C-Weighted)
- Exposure limit values, which must not be exceeded:
  - daily or weekly exposure of 87dB (A-Weighted)
  - peak sound pressure of 140 dB (C-Weighted)

Personal noise exposure is the average noise level to which an operative is exposed based on an 8-hour working day and 5 day working week. Where noise exposure varies markedly from day to day it is allowable to calculate exposures over a week rather than a day. If the working day is longer than 8 hours, the average noise level must be lower to avoid exceeding exposure action values. The peak sound pressure level however, requires action even for instantaneous exposure.

The decibel scale is logarithmic and for every 3dB rise, the noise level doubles. For example, an operative without ear protection may be exposed to an average of 79dB for 8 hours, 82dB for 4 hours, 85dB for 2 hours etc.

1.1.2 Noise Assessment

The Project Safety Manager should ensure that a suitable and sufficient noise risk assessment is carried out for any work that is liable to expose BAM personnel to noise at or above the lower exposure action value. The significant findings should be recorded on Noise Risk Assessment form (180-108). For further information about BAM requirements refer to operating procedure Risk Assessment (hs-23).

Assessments are required to

- Identify workers likely to be exposed at or above the lower exposure action value.
- Provide enough information to enable control measures to be selected and implemented.

Under the regulations employers must: -

- Undertake an assessment of risk at or above the lower action value.
- Develop an action plan to eliminate or, where this is not reasonably practical to reduce exposure to noise to as low a level as is reasonably practicable.
- Implement measures (excluding hearing protection) to eliminate or reduce exposure to noise through a hierarchy of controls.
- At the lower exposure action value:
  - Make hearing protection available
  - Provide information, instruction and training
  - Provision of health surveillance for certain individuals may be required.
- At the upper exposure action value:
  - Hearing protection must be provided and worn
  - Hearing Protection Zones must be designated, identified by signs and access restricted
  - Provision of health surveillance for those exposed.

- Maintain noise control equipment including hearing protection
- Provide information, instruction and training about the risks, control measures, hearing protection and safe working practices.

Typical sound levels from construction equipment

Sound Level Db(A)	Noise Source	
95	Hand tools – electric	
100	Hand tools – air	
101	Forklifts	
102	Hammer drill	
103	Dumper	
104	Concrete mixer	
105	Hand tools – petrol	
106	Tower crane	
107	Circular saw bench	
108	Trucks	
109	Excavator	Six ton drop hammer (cased piles)
110	Crawler crane	
111	Heavy lorries	
112	Ready mix truck	
113	Hoists – diesel	
115	Rock drill	
117	Generators	Rotary bored piles
118	Loaders	Screen drop hammer (sheet piles)
119	Cranes – lorry mounted	
120	Compressors - compactor	Impact boring (driving case method)
121	Bulldozers - graders	Two ton drop hammer (precast concrete piles)

Often, it will not be necessary to make detailed assessments and the guidance to the regulations gives the following table of simple tests as a rough estimate as to whether a risk assessment is required.

This can only be treated as ‘Rule of Thumb’ guidance and is not a suitable and sufficient noise assessment.

Test	Probable noise level	A risk assessment will be needed if the noise is like this for more than:
The noise is intrusive but normal conversation is possible. (This is comparable to the noise level of a busy street, a typical vacuum cleaner or a crowded restaurant)	80 dB	6 hrs
You have to shout to talk to someone 2m away	85dB	2 hrs
You have to shout to talk to someone 1m away	90dB	45 min

Assessment of peak sound pressure is likely to be required when workers are exposed to explosive sources (e.g. cartridge tools) or impact noise (e.g. pile driving).

Assessment of noise can be a complex issue on construction sites as the noise circumstances change quickly as does the workforce. Where several subcontractors are working on the same site, each is an employer and must therefore take steps to protect the hearing of their own and other employees likely to be affected. Co-operation between sub-contractors on this issue is essential and arrangements should be made by the BAM site management to coordinate the actions and ensure control measures are implemented.

The HSE Guidance on Regulations L108 includes noise exposure 'ready-reckoners' are given in paragraphs 154-160.

1.1.3 Methods of noise reduction

The risk of damage to hearing must be reduced as far as reasonably practicable, preferably by control at source or initial selection of less noisy machinery. The following options should be considered:

- specify noise reduced plant from hire firms or manufacturers
- carry out more pre-fabrication off site
- pre-plan to reduce the need for scabbling (by using larger pours or chemical methods to provide a key), drilling, cutting, breaking out and grinding
- specify noise exposure requirements in sub-contract orders
- select quieter methods of working, for example drilled fixings in preference to cartridge tools, or electric motors in preference to diesel engines
- use silencers and mufflers on tools and plant where available
- use enclosures or barriers with signage to establish ear protection zones
- locate noisy plant in the most remote position possible
- programme operations such that noisy work is undertaken with the least number of operatives in the immediate location.

If all practicable methods of noise reduction have been considered, it is acceptable to resort to the use of personal hearing protection for operatives who remain exposed above the exposure action values. Ear muffs or plugs may be used but their selection must be based on the assessment to ensure they provide sufficient protection.

1.2 Health Surveillance

The regulations require the provision of suitable health surveillance where the risk assessment indicates a risk to workers' health.

There is strong evidence to show that regular exposure to noise above the upper exposure action values can pose a risk to health and therefore health surveillance must be provided to workers who are regularly exposed.

Where exposure is between the lower and upper exposure action values, or where employees are only occasionally exposed above the upper exposure action values then health surveillance may still be required if it is discovered that individuals may be particularly sensitive to noise.

Provision of health surveillance is the duty of the employer and may be BAM or a subcontractor who is an employer in their own right. For more information on health surveillance refer to the Occupational Health procedure (hs-41). Where required, health surveillance for BAM employees may be arranged through Human Resources.

Induction Health Questionnaire (180-051) can be used to identify potential early onset symptoms and raise awareness. This questionnaire is not health surveillance.

1.3 Environmental noise

The effects of construction site noise can affect the local environment by causing a nuisance to those who live or work in the vicinity. Complaints to the Local Authority Environmental Health Office (EHO) are always investigated and may result in legal action or an enforcement notice being issued on a particular site.

This can be extremely disruptive to the construction operations and costly to the company. The following guidelines should therefore be applied:

- As early as possible prior to commencement of a project, the potential problems of environmental noise should be addressed. Establish the type of properties surrounding the site and anticipate the likely complainants.
- Early contact with surrounding residents or places of work is useful to inform people of possible noise, its likely duration and to establish good relations. A contact name and telephone number should be given in order that any complaints can be made directly to BAM site management who then have an opportunity to deal with the matter promptly and maintain good relationships.
- If high noise levels are likely, arrange for a background noise survey before any work commences to record existing noise levels (BAM noise assessment form 180-037).
- Early contact with the EHO is useful to discuss the forthcoming project and any foreseeable noise issues and to make them aware of the intentions to deal with them.

- The best practical means of minimising noise must always be observed and measures implemented, such as using modern machinery, ensuring maintenance, using silencers etc.
- If an environmental noise survey is required, either at the request of an EHO, or if it is otherwise deemed appropriate, perhaps to confirm compliance with a specific restriction, Health and Safety Services can carry out or arrange for the survey to be undertaken by an independent specialist.
- In the event of a notice being served (usually under Section 60 of the Act) by a Local Authority on the site, restricting the hours of noisy working, actual noise levels or both, under no circumstances must the requirements of the notice be contravened. Health and Safety Services must be notified immediately and sub-contractors must be informed of any such restrictions. (Refer to operating procedures 4.15 and Environmental Management Procedure).

1.4 References

1.4.1 Occupational Noise

Legislation

The Control of Noise at Work Regulations 2005

Management of Health and Safety at Work Regulations 1999

Construction (Design and Management) Regulations 2015

Provision and Use of Work Equipment Regulations 1998

Guidance

BS 5228 Noise and vibration control on construction and open sites

L108 Controlling noise at work

INDG362 Guidance for employers on the Control of Noise at Work Regulations 2005

INDG363 Protect your hearing or lose it!

1.4.2 Environmental Noise

Legislation

Environmental Protection Act 1990

Control of Pollution Act 1974

Guidance

Noise Exposure Ready – Reckoner

Worried about your hearing

2.0 Vibration

2.1 Hand Arm Vibration (HAV)

Over the last few years there has been growing concern about the need to reduce the effect that prolonged and regular work with hand-held high-vibration tools can have on the hands and arms of users. Without effective controls workers using such equipment may suffer various forms of damage collectively known as 'Hand –Arm Vibration Syndrome' (HAVS). The best known form of damage is Vibration White Finger (VWF), which is a prescribed industrial disease.

The Control of Vibration at Work Regulations 2005 requires employers to:

- Assess the vibration risk to their employees
- Decide if they are likely to be exposed above the daily exposure action value (EAV) of 2.5m/s² A(8) and if they are:
  - Introduce a programme of controls to eliminate risk, or reduce exposure to as low a level as is reasonably practicable;
  - Provide health surveillance to those employees who continue to be exposed above the action level or otherwise continue to be at risk;
- Decide if they are likely to be exposed above the daily exposure limit value (ELV) of 5m/s² A(8) and if they are :
  - Take immediate action to reduce their exposure below the limit value;
- Provide information and training to employees on health risks and the actions being taken to control those risks;
- Consult with trade union or employee representatives on the risk control measures and provision of health surveillance
- Keep a record of the risk assessment and control actions
- Keep health records for employees under health surveillance
- Review and update the risk assessment regularly

Application of this policy and procedure should ensure that risks from HAVS are properly controlled.

2.2 Arrangements for securing the health and safety of employees and other persons

2.2.1 Assessment

The Project Safety Manager must ensure that an assessment is carried out where it is identified that operatives may be exposed to significant levels of vibration from the use of hand-held high vibration tools.

The Hand-arm vibration chart hs-gn-61 provides information on hand-held high vibration tools currently in use and assessment must be carried out in accordance with company requirements for risk assessment and any significant findings recorded.

A full numerical assessment of the vibration dose from a work pattern is beyond the scope of this procedure as it requires specialist measurement of vibration magnitude.

However, using data from hs-gn-61 and from equipment manufacturers and suppliers a reasonable initial assessment can be made. It will be necessary to identify activities likely to cause vibration and record these within the Construction Phase Health and Safety Plan and continue to review this throughout the duration of the project.

Assessment must be carried out and recorded 180-028 prior to work commencing. The HSE Guidance on Regulations L140 includes HAV exposure ready reckoners.

If following assessment overall exposure is high then more accurate measurements will require to be taken whilst the tool is in use unless the process is changed or equipment with lower levels of vibration is used.

2.2.2 Controlling vibration and reducing exposure

The amount of energy transferred from hand-held high vibration tools to an operative's hands should be reduced to the lowest level reasonable practicable.

In construction this will normally be achieved through eliminating the use of hand-held tools, (e.g. using a hydraulic breaker for pile caps), using low vibration tools or decreasing exposure through limiting the usage period of the tool, see hs-gn-61.

Other measures that may assist in achieving this include:

- Substituting for a process involving less vibration.
- Correct selection and maintenance of tools.
- Arrangements to reduce the grip, push and other forces applied by the operative.
- Using tools designed to avoid the need for operatives to grip high-vibration parts.
- Training workers in good operating techniques.
- Reduce the length of exposure, for example through job rotation.

2.2.3 Permit to Work – Use of Vibrating Tools

The Project Safety Manager should ensure that a permit to work system is established for all BAM personnel (including BAM agency and BAM Plant) who will be using tools where the anticipated vibration exposure will be above the Exposure Action Value (EAV) each day, based on the vibration risk assessment for the activity. BAM operates the permit to work system for use of vibrating tools for BAM personnel only, not for supply chain personnel. The Permit to Work – Use of Vibrating Tools (180-048) should be used. Where a permit is successfully completed and issued, the record of the permit should be saved on Livelink.

2.2.4 Provision of personal protective equipment

There are various gloves available with special soft linings intended to provide vibration isolation but these are not usually effective in reducing the amount of vibration reaching a worker's hands. The amount of vibration reduction they provide is limited by practical restrictions on the thickness and softness of the lining, particularly at low frequencies.

However, gloves are useful for their ability to keep the hands warm (this increases blood flow) and provide physical protection.

2.2.5 Maintenance of hand-held vibration tools

All hand-held vibration tools purchased and owned by the company must be maintained in accordance with the manufacturer's specification for that tool. A record of inspection and maintenance for each tool must be maintained.

Confirmation must be sought from both tool suppliers and subcontractors that handheld vibration tools are being maintained in accordance with the manufacturer's specification.

2.2.6 Purchase and hire of hand-held vibration tools

The Project Safety Manager must ensure that:

- Determine prior to purchase or hire if an alternative method of work is available.
- The lowest vibration tool suitable for the job is purchased/hired.
- The manufacturer/hirer provides vibration levels and advice on safe use of the tool.
- Hired tools are maintained to the manufacturer's specification.

2.2.7 Use of hand-held vibration tools by subcontractors

The Project Safety Manager should identify at the initial meeting with each subcontractor whether the use of hand-held vibration tools is proposed for the subcontract work.

If hand-held vibration tools are to be used the Project Safety Manager should determine whether an alternative method of work is available. If this is not practicable the following information must be provided prior to the subcontract work commencing:

- Detailed assessment identifying the hazards, risks and control measures.
- Details of the type and number of tools to be used.
- Details of how exposure to vibration will be reduced.
- Details of information, instruction and training provided to operatives.
- Details of maintenance system for tools to be used.
- Details of health surveillance carried out for each operative

2.3 Health surveillance

2.3.1 General

Provision of health surveillance is the duty of the employer and may be BAM or a subcontractor who is an employer in their own right. For more information on health surveillance refer to the Occupational Health procedure (hs-41). Where required, health surveillance for BAM Construct employees may be arranged through Human Resources.

Induction Health Questionnaire (180-051) can be used to identify potential early onset symptoms and to raise awareness. This form is not health surveillance.

2.3.2 Pre-employment assessment

All persons joining BAM Construct are required to complete an employment application form that includes a section relative to individual health and requests details of any specific health problem(s), which the person may have. All applications are reviewed and, where considered appropriate a person may be referred to the company medical practitioner for further examination.

2.3.3 Routine assessment

As risk of injury increases with the length of lifetime exposure those operatives identified as regular users of hand-held high vibration tools will be subject to routine health surveillance.

Operatives must be made aware of and advised to report signs of injury.

2.4 Procedure for dealing with health and safety issues

Whenever an employee raises a matter related to the use of high vibration tools as a health and safety issue, the Project Safety Manager will:

- Take all necessary steps to investigate the circumstances.
- Take corrective measures where appropriate.
- Advise the employee of actions taken.

Where a problem arises as a result of the use of high vibration tools in the workplace, the employee must inform their supervisor immediately.

2.5 Information and training

BAM Construct will train and provide information and instruction to workers and their supervisors on:

- The nature of the risk and signs of injury.
- How and why any signs of injury should be reported, either to someone who will arrange for them to be investigated, or as part of an established routine health surveillance programme.
- Action the workers should take to minimise risk, including;
  - Using work practices designed to minimise vibration being directed into the hands.
  - Maintaining good blood circulation.
  - Making sure tools are properly maintained
  - Reporting defects and problems with equipment and obtaining replacements where necessary.

2.6 Record keeping

- Records should be kept of all items relating to the use of high vibration tools, which include the following:
- The results of assessment of the risks to which persons may be exposed whilst using high vibration tools
- Details of routine inspection and maintenance (including dates, defects discovered and action taken) of tools and equipment.
- Details of information and training provided to persons using high vibration tools.
- Records of health surveillance for employees must be kept

2.7 Whole Body Vibration (WBV)

Exposure to whole-body vibration (WBV), particularly to large shocks and jolts, is a back pain health risk for employees who drive mobile machines or other work vehicles over poor surfaces as a main part of their job. It affects those who are driving or riding on a vehicle along an unmade road, operating earthmoving machines or standing on a structure attached to a large, powerful, fixed machine which is impacting or vibrating.

The Control of Vibration at Work Regulations 2005 require employers to control the health risks to employees from exposure to WBV

Employers must:

- Assess the vibration risk to their employees
- Decide if they are likely to be exposed above the daily exposure action value (EAV) of 0.5m/s² A(8) and if they are:
  - Introduce a programme of controls to eliminate or reduce their daily exposure to as low a level as is reasonably practicable;
- Decide if they are likely to be exposed above the daily exposure limit value (ELV) of 1.15m/s² A(8) and if they are :
  - Take immediate action to reduce their exposure below the limit value;
- Provide information and training on health risks and controls to employees at risk;
- Consult with trade union or employee representatives about the risks and proposed control measures
- Keep a record of the risk assessment and control actions
- Review and update the risk assessment regularly

2.7.1 Assessment

The Project Safety Manager must ensure that an assessment is carried out where it is identified that operatives may be exposed to significant levels of whole-body vibration.

- Identify those at risk e.g.
  - Plant operators
  - Older people with history of back pain
  - Younger inexperienced people
- Factors influencing risk e.g.
  - Poor design of controls
  - Adjustment of driver seat and controls
  - Sitting for long periods
  - Poor driver posture
  - Repeated manual handling
  - Excessive exposure
  - Repeated climbing in and out of cab

- Assessment of risk

  Although it may not be necessary to carry out measurements of vibration an assessment of the risk must be made and could include consideration of e.g.

  - Manufacturer's guidance on WBV risks
  - Selection and suitability of equipment
  - Poor driving techniques
  - Length of time exposed
  - Jolts and bumps
  - Condition of roadways
  - Reporting of back problems
- Control Measures

  Train and instruct operators and drivers e.g.

  - Adjustment of driver weight setting on seats (where available)
  - Correct adjustment of seat position and controls
  - Adjusting vehicle speed to suit ground conditions
  - Smooth driving techniques regarding steering, braking etc and operation of attachments such as excavator buckets
  - Following established traffic routes
- Correct selection of vehicles and machines that are suitable for the job e.g.
  - Appropriate size, power and capacity for the work and ground conditions
- Maintenance of machinery and roadways e.g.
  - Potholes filled in, ridges levelled, rubble removed
  - Maintain vehicle suspension systems – tyres etc
  - Replace solid tyres before they reach their wear limits
  - Obtain appropriate advice from manufacturers regarding vehicle seats

For further advice on control measures is available in the free HSE leaflet INDG242(rev1)

2.8 References

Legislation

The Control of Vibration at Work Regulations 2005

Management of Health and Safety at Work Regulations 1999

Construction (Design and Management) Regulations 2015

Provision and use of Work Equipment 1998

Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR)

Guidance

L140	Hand-arm vibration: Guidance on Regulations

L141	Whole-body vibration: Guidance on Regulations
INDG143	Getting to grips with Manual Handling
INDG175	Control the risks from hand-arm vibration – Advice for employers
INDG242	Control back-pain risks from whole-body vibration – Advice for employers
INDG296	Hand-arm vibration: Advice for employees
INDG404	Drive away bad backs: Advice for mobile machine operators and drivers