

ASSESSING AND CONTROLLING THE NOISE IN CONSTRUCTION. ROMANIAN AND EU LEGISLATION

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ABSTRACT

Exposure to loud noises at work can cause irreversible hearing damage, workplace accidents and be a contributing factor to other health problems. Noise-induced hearing loss is the most common reported occupational disease in the European Union; noise at work can also exacerbate stress and increase the risk of accidents. This article provides an introduction to the management of noise in construction both before and during work on site. Also, it shows how the European directive structure and the complementary standards ensure that risks to workers from noise are addressed to reduce the high personal, social and economic cost of ill health and accidents arising from noise exposure.

KEYWORDS: occupational noise, risk management, EU Directives

1. EU policy and legislation on noise at the workplace. Romanian legislation

The Council Directive 89/391/EEC [1] and other workplace-orientated directives, such as those on noise [2], personal protective equipment [3] and pregnant workers [4], provide a structure for dealing with all risks (not just the risk of noise-induced hearing loss) to all workers from noise. The frame-work directive 89/391/EEC sets out the general principles of prevention, and then the more specific directives, of which the noise directive 2003/10/EC is the most significant for noise, give greater detail.

Directives requiring workplace measures are not the only means by which workers' health is protected. The requirements in the "machinery directive" [5] and "outdoor machinery directive" [6], where manufacturers are required to provide noise information about the machinery, and in some cases limit emissions, should also help reduce the risk to workers. These directives also make it clear that prevention through design is vitally important in dealing with occupational noise. "Machinery must be so designed and constructed that risks resulting from the

emission of airborne noise are reduced to the lowest level taking account of technical progress and the availability of means of reducing noise, in particular at source" (Annex 1, Section 1.5.8 from [6]).

Employers are required to control risks at source, eliminating or reducing noise risks to a minimum, taking account of technical progress and of the availability of preventive measures. There should not be a reliance on personal hearing protection such as earplugs when there are better measures available to remove or control the risk (e.g. by dealing with the source of the noise).

EU directives set minimum standards for health and safety, national legislation may require higher standards. There are other directives that may also be relevant. Harmonized standards also exist (for example, on the measurement of noise emissions).

Preventing is better and less costing than treating. The general principles of prevention in EU noise policy are:

- ◆Avoiding risks
- ◆Evaluating the risks which cannot be avoided
- ◆Combating the risks at source
- ◆Adapting the work to the individual
- ◆Adapting to technical progress

- ◆Replacing the dangerous by the non-dangerous or the less dangerous
- ◆Developing a coherent overall prevention policy
- ◆Giving collective protective measures priority over individual protective measures
- ◆Giving appropriate instructions to the workers

The “noise” directive 2003/10/EC identifies **factors to consider when controlling noise risks:**

- ▶ working methods that need less exposure to noise
- ▶ the choice of work equipment emitting the least possible noise
- ▶ the design and layout of workplaces and work stations
- ▶ information, instruction and training of workers
- ▶ noise reduction by technical means
- ▶ maintenance programmes for work equipment, the workplace and its systems
- ▶ noise reduction by better organization of work
- ▶ limiting the duration and intensity of the exposure by work scheduling

Romanian legislation regarding the safety and health relating to noise (generally at work, particularly in construction) is already in compliance to EU legislation [7]-[13].

2. The noise in construction

There are many noisy tasks in construction. This means that workers may be exposed not only to the noise that their work is making, but also to the ambient, or background, noise of other tasks on site. Some of the **main sources of noise in construction** are:

- impacting tools (such as concrete breakers)
- use of explosives (such as blasting, cartridge tools)
- pneumatically powered equipment
- internal combustion engines

Depending on the impact on the workers, the noisy operations in constructions can be classified as follows:

a) constructions in open front or in large fields:

- *foundations and road beds*
 - excavations with bucket cranes
 - digging, leveling and carriage with bulldozers and motor graders
 - loading and carriage with frontal loaders
 - drillings for foundations
 - ramming in the foundation piles and sheet-piles by vibrations
 - compaction with vibratory rammers

- *construction materials processing*
 - concrete: preparation, carriage, pumping and vibrating on site

- pavement mixture*: drying, carriage, sorting, mixing, storage
- crushed and/or pit ballast aggregates*: carriage, crushing, vibratory sorting, fine screening

■ *road works*

- hammers
- asphalt mill cutter
- asphalt distributor equipment
- roll vibrating compactor

b) building constructions (in closed front):

■ *concrete cutting and drilling*

- hammers
- disk cutters
- drilling equipments

■ *metallic items assembling by self-cutting screws for sandwich panels and gyps-board*

The equivalent sound level measured on open sites are the next:

1) $L_{Ieq} = 83 - 92dB(A)$ for foundation and road beds works (demolishing, charging and discharging, vibratory and impulse ramming, vibratory compacting), where the simultaneity of equipment working is about 80%

2) $L_{Ieq} = 85 - 90dB(A)$ for road repairs (scrapping, asphalt cutting, charging and discharging, drilling, asphalt distributing, leveling, vibratory compacting), where the equipment working simultaneity is about 78%

The measured levels of sound intensity of some civil works equipment used in Romania are according to the figures from *tables 1*.

Table 1.1 L_{Ieq} - civil works equipment

Producer and type	Level of noise [dB(A)]	
	outside	in cabin
EXCAVATORS		
Promex P 802	79,0	76,5
Promex P 851 HyEl	76,1	78,2
Promex S 1204 HyEl	76,9	77,4
Promex S 1203	74,0	78,0
BULLDOZER-EXCAVATORS		
Caterpillar 428 D	77,8	-
Fiat-Hitachi FB 90/2-4PT	74,5	-
Fiat-Hitachi FB 100-4PT	74,0	-
Hydromek TR HMK 102B	79,4	-
JCB 2CX Streetmaster	79,0	-
Komatsu WB 93R-2	77,0	-
Borex 2101	88,2	-
FRONTAL LOADERS		
Comelf 50.21	92,0	-
JCB 170 Robot	91,6	-
Gelh SL 4625	85,5	-
JCB 407B ZX	76,0	-
Komatsu WA 270-3	74,0	-

Table 1.2 L_{Ieq} - civil works equipment

Producer and type	Level of noise [dB(A)]	
	outside	in cabin
VIBRATING COMPACTORS		
Dynapac CP 201	86,6	71,3
Vibromax W 1601	87,0	80,0
Vibromax W 554	81,2	-
Ingersoll-Rand ABG DD16	83,8	-
VIBRATING BOARDS AND RAMMERS		
Ammann AVH 6020	96,7	-
Bomag BP 18/45 D-2	97,4	-
Bomag VD 450/22	85,0	-
Ravi RRP 21 DY	96,0	-
Vibromax SL 2R	96,0	-
HAMMERS		
Spit Prakt 490	92,8	-
Spit Prakt 331	84,8	-
ASPHALT MIXTURE STATIONS		
Nicolina IMA E	77,4	86,2
Nicolina-Marini 80-90	70,0	-

3. Managing the noise in construction. Reducing and controlling the noise

The implementation of noise management in construction has the next aspects:

- planning noise control measures before works start on site

- managing noise on site

a) PLANNING NOISE CONTROL

Before works start on site, the noise control measurements have to be managed for the next stages:

1.design stage - design out or minimize noisy work

2.organisational stage - plan how the site will be managed and the risks controlled

3.contractual stage - ensure that contractors meet their legal requirements

4.building stage - assess the risks, eliminate or control them; review the assessment

Planning the noise control before work starts on site consists of:

- ▶implement a low-noise procurement policy (purchase and hire) for machinery and work equipment

- ▶set desired noise-control requirements in the tender specifications (meeting national legislation as a minimum)

- ▶plan the work process to minimize workers' exposure to noise

- ▶implement a noise-control programme (for example, by planning, training, induction, site layout, maintenance activities)

MANAGING NOISE ON SITE

Noise must be actively managed once work starts on site. This can be seen as a four-stage process:

1.Assess - a competent person should assess the noise risks

2.Eliminate - remove noise sources from site

3.Control - take measures to prevent exposure, with personal hearing protection as the last resort

4.Review - check to see if there are any changes in the work; amend the assessment and control measures accordingly

1.Assessment. Worker noise exposure should be assessed, with particular attention being paid to the following:

a.the workers and their exposure, including:

- the level, type and duration of exposure, including any exposure to impulsive or impact noise and whether the worker belongs to a particular risk group

- where possible, effects on workers' health and safety resulting from interactions between noise and vibrations and noise and work-related ototoxic substances (substances that can harm ears)

- risks to workers' health and safety from failing to hear warning signals or alarms

- the extension of exposure to noise beyond normal working hours under the employer's responsibility

b.technical knowledge and information, including:

- the information on noise emission provided by manufacturers of work equipment

- the existence of alternative work equipment designed to reduce the noise emission

- relevant information from health surveillance

- the availability of suitable hearing protectors

2.Elimination of noise. Where possible, the production of noise should be eliminated. This can be achieved by changing the construction or work method. Where elimination is not possible, then the noise should be controlled.

3.Control the noise. There are three steps to the protection of workers from noise, using technical and organization measures:

a.control the noise at source

b.collective control measures, including work organization

c.personal hearing protection

a.Control of noise at source. Such control measures include:

- using a machine with lower noise emissions

- avoiding metal on metal impacts

- damping to reduce noise or isolating vibrating parts

- fitting silencers

●carrying out preventive maintenance (as parts become worn, noise levels can change)
b. Collective control measures. Actions can be taken to reduce the exposure to noise of all those who may be exposed, in addition to the steps above. On sites with more than one contractor, liaison between employers is essential. Collective measures include:

- isolating noisy procedures
- restricting access to noisy areas
- interrupting the path of airborne noise through the use of noise enclosures and barriers
- using absorptive materials to reduce reflected sound
- controlling ground-borne noise and vibration by using floating slab measures
- organizing work so that the time spent in noisy areas is limited
- planning to have noisy work done when as few workers are as possible exposed
- implementing work schedules that control exposure to noise

c. Personal hearing protection. Personal hearing protection should be used as a last resort. Where they have to use:

- the personal hearing protection must be worn and its use enforced
- it should be suitable for the job, type and level of noise and compatible with other protective equipment
- workers should have a choice of suitable hearing protection, so that they can find the most comfortable one
- training should be given on how to use, store and maintain the hearing protection

4. Review. Work on construction sites changes frequently. Review the risk assessment often and amend the control measures in place.

4. Conclusions

Regarding the noise management, there are some aspects which need particular attention from the people: training, involvement, health.

Training is an important part of noise control. Persons requiring this are those carrying out the noise assessment, those writing the tender documentation to ensure that contractors will control noise, that managers will meet their duties regarding control and

record keeping workers, who need to know how and why to use work equipment and control measures to minimize exposure to noise. Training should be as specific as possible. Workers in the construction industry are often multi-skilled, using many different tools. They should know how to minimize their exposure to noise from each of them. Particular attention should be paid to new workers.

Workers on site often know about particular noise problems and possible solutions. Employees and their representatives should be consulted in the assessment procedure and in discussions on how to implement control measures.

Workers have a right to appropriate health surveillance according to EU legislation and to national applicable legislation.

5. References

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