

# The Impact of Noise on Construction Workers in South Africa

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## Abstract

Workers are major stakeholders in the construction industry generally considered to be dangerous. Their health and safety (H&S) should thus be a priority. One of many hazards, construction noise, when excessive, can result in polluting a neighbourhood, lead to workers experiencing stress and / or experience noise-induced hearing loss (NIHL) and subsequently marginalise their performance. Two descriptive surveys were conducted among members of the South African Forum of Civil Engineering Contractors (SAFCEC) in the Eastern Cape, and the national members of the Association of Construction Health and Safety Management (ACHASM). The salient findings include: noise above the noise-rating limit is frequently generated on construction sites; construction noise can lead to workers experiencing NIHL and stress; workers do not always wear the suitable hearing protection, and construction noise can pollute a neighbourhood.

**Keywords:** construction, health and safety, noise, performance, workers.

## Introduction

Every day, millions of European workers are exposed to noise and to all its subsequent hazards in their workplace. Every fifth worker in Europe has to raise his / her voice to be heard for over half the working day and 7% of workers suffer from hearing problems related to work (European Communities, 2004), and according to European data (European Agency for Safety and Health at Work, 2002), NIHL is the most common occupational illness in the European Union.

In 2012, the Netherlands Centre for Occupational Diseases (NCvB) (2012) reported that the construction sector accounts for 90.4% of ear and mastoid process diseases. According to the Centre for Construction Research and Training (2007), over 50% of workers in all construction trades in the US, with the exception of asbestos works, were diagnosed with NIHL. The percentage of workers with NIHL increased greatly with age, but even 17% of construction workers under age 45 indicated NIHL.

This research seeks to raise awareness of construction noise in South Africa and on the rest of the continent, and lead industry stakeholders to take the necessary measures to control its impact. This in turn may result in higher standards of construction, of which H&S is a parameter, and enhanced worker satisfaction as a result thereof.

## The Literature Review

### Noise and its origins on sites

Noise can be explained as that unwelcome sound or combination of sounds with potential

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harmful effects on a person's health. Such effects can either be physiological or psychological (Seidman and Standing, 2010). On construction sites, it mainly originates from plant and the many activities it is used for, in the form of pneumatic hammers, air compressors, bulldozers, loaders, dump trucks and their backup signals, and pavement breakers (Suter, 1991: 8).

### **Noise assessment**

Noise assessments are a requirement in terms of Noise Induced Hearing Loss (NIHL) regulations at intervals not exceeding two years, regardless of the use of hearing protection devices (HPDs) (Republic of South Africa, 2003). A noise assessment report will provide valuable information such as: the date of the assessment; the assessor's name; the equipment used to measure and the method undertaken; areas, equipment, processes and activities that were assessed; the uncovered sources of noise; the systems of work utilised; the measurements results, and any other relevant factors to the assessment (Worksafe Victoria, 2005).

### **The effects of construction noise**

#### *Noise-induced hearing loss (NIHL):*

NIHL usually results from extended exposure to sound levels greater than 85 decibels A-weighted (dBA) (Centre for Construction Research and Training, 2007). NIHL occurs gradually unless there is a sudden, traumatic exposure at a very high noise level. It begins with temporary threshold shift (TTS), which eventually becomes permanent. The process will be accelerated if any individual's TTS does not recover fully before the next noise exposure (Suter, 1996).

#### *Accidents*

There is a paucity of literature associating noise exposure or NIHL with accidents specific to construction. However, it can be deduced that numerous accidents could have been avoided if construction workers were able to hear warning shouts or signals. The high occurrence of accidents from being hit by objects, of transportation incidents, and the regularity of serious accidents from moving plant and equipment all indicate a failure in communication (Suter, 2002).

#### *Stress*

Construction workers are usually forced to work in a poor physical environment and have to tolerate extreme outdoor temperatures, poor air quality, hazards from working at height, poor housekeeping, exposure to chemicals, 'excessive noise', and many additional factors. Lengthy work hours under such adverse physical conditions result in construction workers being stressed. This is generally manifested in emotional and physical fatigue (Leung, Chan & Yuen, 2010). Working under such a mediocre physical environment causes discomfort to construction workers and consequently lessens their attention to H&S behaviours (Choudhry and Fang, 2008).

#### *Performance*

Exposure to excessive noise can strongly affect workers' performance. Continuous noise is generally less disruptive than intermittent and impulsive noise, and particularly when the noise bursts are unpredictable. In the case of noise being in the region of 130-140dBA,

simple routine tasks usually remain unaffected. However, visual and motor effects can follow if noise goes above these levels. In the case of complex activities, especially those that involve concurrent performance, performance is affected from noise levels as low as 95dBA and as low as 80-85dBA in the case of sensitive activities (Suter, 1996).

## **Noise control**

The following are required of contractors in terms of Regulation 9 of the South African NIHL Regulations (Republic of South Africa, 2003):

- The zoning of a workplace or part thereof as a noise zone, where the exposure to noise is at or above the noise-rating limit;
- The demarcation of the noise zone, the notification of its nature and notification of the hearing protection requirement;
- That no person enters or remains in a noise zone unless he or she wears the required HPD, and
- The reason why noise exposure is at or above the noise-rating limit is identified, and that action is taken, as soon as is reasonably practicable, by means other than the use of HPDs, to lower the noise level below the noise-rating limit.

The South African NIHL regulations (South Africa, 2003) also require an employer / self-employed person to minimise noise exposure in his working place, as far as it would be reasonably practicable, by implementing noise control measures in the subsequent order of priority:

- Engineering control measures;
- Administrative control measures, and
- The use of HPDs.

In spite of the hard evidence of noise control measures being applicable, noise control gets hardly implemented because of a misperception that it is 'too complex and too expensive' and because of the lack of trained acoustical engineers, contributed to by a lack of coordinated dissemination of noise control information and a shortage of clear, correct and understandable noise emission information for equipment (Suter, 2012).

## **The Research**

### **Research Methodology**

The descriptive survey method was employed for gathering and processing data obtained through questionnaires relative to construction noise and its impact on a site and its surroundings. Questionnaires were circulated to the Eastern Cape members of SAFCEC and to members of ACHASM per e-mail. 7/17 (41.2%) SAFCEC and 12/88 (16.4%) ACHASM questionnaires were returned which equates to a mean response rate of 21.1% (19/105).

### **Limitations of the study**

The first limitation of this study is the humble participation, although the questionnaires were compiled in a comprehensive and approachable manner to engender participation. The humble response could be attributed to the lack of interest / knowledge in / importance generally attributed to H&S.

Secondly, many participants in the industry, as found in the literature review, tend to avoid noise or H&S topics in general. These are perceived to be extremely complex and to add to the cost of the construction process, which is short sighted as H&S issues eventually affect all project parameters.

Moreover, there is a global shortage of current literature concerning construction noise and / or its impact, and limited South African or African literature is available on the topic.

## Results

Table 1 indicates the frequency of noise measurements / assessments on respondents' projects. Given that the 2.11 mean MS is  $> 1.80 \leq 2.60$ , the respondents can be deemed to perform noise measurements / assessments between never to rarely / rarely.

Table 1. Frequency of noise measurements / assessments on respondents' projects

Group	Response (%)						MS
	Unsure	Never.....				Constantly	
		1	2	3	4	5	
Mean	0.0	42.1	21.1	26.3	5.2	5.2	2.11

Table 2 presents the percentage of measurements / assessments indicating noise levels equal to or above the noise-rating limit. Firstly, the high level of unsure responses is notable. The 3.42 mean MS indicates that the percentage of assessments with noise levels above the noise-rating limit is between 40-59 and 60-79 / 79 / 60-79.

Table 2. Percentage of measurements / assessments indicating noise levels equal to or above the noise-rating limit

Group	Response (%)						MS
	Unsure	0-19	20-39	40-59	60-79	80-100	
Mean	36.8	5.3	5.3	21.1	21.0	10.5	3.42

The mean MS of 2.06, which is  $> 1.67 \leq 2.50$ , indicates that incidents or accidents are related to noise / miscommunication between a minor to near minor / near minor extent (Table 3).

Table 3. Extent to which incidents / accidents on site can be related to noise or miscommunication as a result thereof

Group	Response (%)						MS	
	Unsure	Cannot	Minor.....	Major				
			1	2	3	4		5
Mean	5.2	10.5	31.6	15.8	21.1	10.5	5.2	2.06

Table 4 indicates a high level of uncertainty as nearly half the respondents are unsure. The 2.40 mean MS ( $> 1.80 \leq 2.60$ ) suggests that workers rarely experience a reduction in hearing over the course of the day between never to rarely.

Table 4. Worker experience of hearing reduction over the course of the day

Group	Response (%)						MS
	Unsure	Never.....				Constantly	
		1	2	3	4	5	
Mean	47.4	15.8	15.7	10.5	5.2	5.2	2.40

Table 5 also indicates that more than half the respondents are unsure regarding the frequency workers experience tinnitus. The 2.00 mean MS, which is  $> 1.80 \leq 2.60$ , suggests that workers never to rarely / rarely experience tinnitus.

Table 5. Frequency of tinnitus experience by workers

Group	Response (%)						MS
	Unsure	Never.....Constantly					
		1	2	3	4	5	
Mean	52.6	10.5	31.6	0.0	5.2	0.0	2.00

The findings in Table 6 suggest respondents are mostly unsure with respect to noise resulting in workers experiencing stress. The 1.38 mean MS ( $> 1.00 \geq 1.80$ ) indicates that workers experience stress as a result of noise exposure between never to rarely.

Table 6. Frequency workers experience stress as a result of noise exposure

Group	Response (%)						MS
	Unsure	Never.....Constantly					
		1	2	3	4	5	
Mean	57.9	26.3	15.7	0.0	0.0	0.0	1.38

The mean MS presented in Table 7 suggests that workers are often required to wear HPDs. It can also be noted that no respondents opted for the 'Unsure' and 'Never' options.

Table 7. Frequency workers are required to wear HPDs based upon assessments / measurements, standard practice and / or workers' requests

Group	Response (%)						MS
	Unsure	Never.....Constantly					
		1	2	3	4	5	
Mean	0.0	0.0	10.5	36.8	15.7	36.8	3.79

The 4.26 mean MS, which is  $> 4.20 \leq 5.00$ , indicates that workers are often to constantly / constantly inducted regarding the use of HPDs (Table 8).

Table 8. Frequency of workers' induction regarding the use of HPDs

Group	Response (%)						MS
	Unsure	Never.....Constantly					
		1	2	3	4	5	
Mean	0.0	5.2	0.0	10.5	31.6	52.6	4.26

In Table 9, the mean MS of 3.00 ( $> 2.60 \leq 3.40$ ) indicates that the frequency of audiometric testing is between rarely to sometimes / sometimes. Of the 19 respondents, as many as 21.1% indicated they never performed audiometric testing on their workers.

Table 9. Frequency of audiometric testing performed on workers

Group	Response (%)						MS
	Unsure	Never.....Constantly					
		1	2	3	4	5	
Mean	0.0	21.1	10.5	31.6	21.1	15.8	3.00

Table 10 indicates a mean ‘Unsure’ response of 31.6%. Furthermore, the mean MS suggests that between 0-19% and 20-39% of medical tests revealed that workers have experienced NIHL.

Table 10. Percentage of medical testing that revealed the experience of NIHL among workers

Group	Response (%)						MS
	Unsure	0-19	20-39	40-59	60-79	80-100	
Mean	31.6	52.6	5.2	10.5	0.0	0.0	1.38

## Conclusions

Noise generated on construction sites often exceeds 85dBA, also known as the noise-rating limit. Exposure to such noise can cause NIHL and accidents. It is therefore an H&S hazard and workers’ performance can be marginalised as a result thereof.

Nearly half of the respondents have never performed noise assessments although it’s a regulatory requirement indicating non-compliance and a lack of commitment to combating NIHL.

Workers do not always make use of the requisite HPDs and are therefore still subject to the effects of exposure to noise.

The generally lower MSs relative to SAFCEC respondents indicates that either they are not aware of the reality or that they do not wish to portray their organisations negatively.

Respondents to the survey did not always have a thorough knowledge of situations addressed, as indicated by the high percentage of ‘Unsure’ responses. This implies a lack of H&S related communication and knowledge of the status of H&S on site.

The South African construction industry suffers from a poor H&S culture.

## Recommendations

Based upon the conclusions, the following recommendations are made:

- Construction contractors should comply with regulations and perform noise assessments and audiometric testing as required, thus enabling the implementation of adequate measures to address and verify the problem;
- Contractor associations need to increase awareness of noise, NIHL, and the impact thereof on workers’ performance, and the necessary measures to mitigate the aforementioned, and
- Communication between the respective levels in construction organisations needs to be improved to ensure that what happens on site is known organisation wide.

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