

Available online at www.sciencedirect.com**ScienceDirect**

Procedia Engineering 85 (2014) 3 – 9

**Procedia
Engineering**www.elsevier.com/locate/procedia

Creative Construction Conference 2014, CC2014

The effects of unsatisfactory working conditions on productivity in the construction industry

M Abrey^a, JJ Smallwood^b^a*Nelson Mandela Metropolitan University, Port Elizabeth, South Africa, Mark.Abrey2@nmmu.ac.za*^b*Nelson Mandela Metropolitan University, Port Elizabeth, South Africa, john.smallwood@nmmu.ac.za*

Abstract

The construction industry has been experiencing chronic problems such as poor health and safety (H&S), inferior working conditions, and non-achievement of quality, which have had an adverse effect on construction productivity, overall performance, and image.

A descriptive survey was conducted among medium to large general contractor (GC) members of the East Cape Master Builders Association (ECMBA).

The salient findings include: construction workers are exposed to excessive noise levels; material shortages affect productivity more than other related factors; the non-achievement of quality negatively affects the image of the construction industry more than other factors; construction worker morale and satisfaction is substantially affected by inadequate supervision; the quality of life of construction workers is rated between poor to near poor, and working conditions on construction sites are rated as poor to average.

It can be concluded that unsatisfactory working conditions negatively affect productivity in the construction industry. Furthermore, the image of the construction industry is tarnished.

© 2014 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/3.0/>).

Peer-review under responsibility of the Diamond Congress Kft.

Keywords: Construction Industry; Health and Safety; Productivity; Working Conditions

1. Introduction

Construction work is dangerous [1], and in industrialised countries more than 25% to 40% of work-related deaths occur on construction sites despite the fact that the global construction industry only contributes 10% of the total

employment [2]. There are a variety of H&S hazards and risks that construction workers are exposed to, which may have an adverse effect on working conditions, productivity, time delays, injuries on site, and lost time injuries [3]. These factors further affect the image of the construction industry, construction worker morale and satisfaction, work related musculoskeletal disorders (WMSDs) and the quality of life of construction workers [3]. In terms of WMSDs, approximately 30% of all construction workers suffer from back pain or other musculoskeletal disorders [2].

Employers within the construction industry view H&S as a financial burden, however the related costs of occupational accidents and disease to employers are abundant and include property damage, lost production time, lost skills as well as increased costs associated with recruiting and retaining replacements [4].

Welfare facilities are a major problem on South African construction sites, which often result in unhygienic conditions and impact on worker morale and job satisfaction [5]. The image of the South African construction industry is viewed in a negative light by the public and construction work force due to reports of buildings collapsing, large scale collusion and corruption, the dangerous nature of construction, and unsatisfactory working conditions [3].

Due to the fact that work-related illness and injuries within the construction industry are among the highest of all industries [6], and that racial inequality within South Africa is among the worst in the world [7], construction workers therefore experience a poor quality of life.

2. The Review of Related Literature

2.1. H&S Compliance

Statistics arising from a national construction blitz conducted by the Department of Labour across South Africa indicate that of the 1 415 work places inspected only 759 (47.5%) of employers complied with regulations, and 829 (52.5%) of employers were non-compliant [2]. This resulted in the issuing of 1 388 notices - 86 (6%) improvement, 1 015 (73%) contravention, and 287 (21%) prohibition [2].

2.2. Working Conditions

Construction workers are exposed to more H&S risks than many other industries. The variety of H&S hazards that construction workers are exposed to include noise, irritant or sensitising materials, dusts, fumes and gases, and other hazardous materials such as asbestos, which result in adverse health risks [8].

Employers therefore have a common law duty to ensure that working conditions are healthy and safe, and do not cause harm to the H&S of employees and third parties [9].

2.3. Productivity

Production and productivity are affected by variables such as site conditions, the weather, organisation factors, H&S and personal problems, which should be considered when completing the activity and calculating productivity, as they may adversely affect production and productivity [10].

Construction productivity can be improved through, inter alia, H&S interventions, positive worker relations and supervision, and hygienic welfare facilities. Lastly, various personal factors can influence construction productivity, which include the H&S of employees, domestic relations, nutrition, over exertion, and wages [11]. Other factors such as poor H&S procedures and culture, poor site conditions, unsatisfactory working conditions, inadequate supervision, organisation factors, personal factors, and climatic factors may also lead to a loss in construction productivity [12].

2.4. *Time Delays*

Time delays on construction sites may be as a result of material shortages, incomplete drawings, inspection delays, incompetent supervisors, instruction time, lack of tools and equipment, poor communications, poor site conditions, H&S issues, on site injuries, and rework [13]. Poor site conditions result in major time delays as poor site conditions cause difficulties and unsafe working conditions, which pose H&S risks as they increase the probability of incidents and accidents occurring or workers becoming injured on site, which will result in further time delays [13].

2.5. *Lost time injuries*

Employers often view OH&S as a cost to be avoided if at all possible, however the costs of occupational accidents and disease to employers include property damage, lost production time, lost skills as well as the cost of recruiting and training replacements [4].

There are both indirect and direct costs to employees who incur occupational injuries and diseases. The direct costs suffered by employees include; permanent disabling injuries, loss of employment, and income [4]. The indirect costs suffered by employees affect their families as a result of a loss of the household's 'breadwinner' and increased dependence on governmental support and grants [4].

There are many associated costs which are not covered by a construction firm's insurance policies which include medical fees, sick pay, damage or loss of product and raw materials, overtime and temporary labour, production delays, investigation time, and fines for non-compliance or unsafe working conditions [6].

2.6. *Construction Image*

Reports of buildings collapsing due to poor construction techniques, and an increase in large scale collusion and corruption has resulted in a negative image of the construction industry as a whole. This negative image is mirrored by the workforce due to the dangerous nature of construction work, and the fact that workers are often exposed to unsatisfactory working conditions on construction sites [3].

2.7. *Construction worker morale and dissatisfaction*

The various factors that can lower worker morale and attitude are increased conflict, disputes, excessive hazards, overtime, over-inspection, multiple contract changes, disruption of work rhythm, poor site conditions, absenteeism, and untidy site conditions [14].

Productivity and morale can be improved through the following incentive programmes: incentives for achieving milestones on schedule; bonus schemes across all work groups; performance based incentives; recognition for quality work and reaching milestones; H&S awards / rewards for no lost time accidents or incidents, and H&S competitions to promote healthy and safe competition between trades [12]. Optimum labour management can further improve job satisfaction and productivity, and improved labour relations results in increased job performance.

2.8. *Work-related musculoskeletal disorders (WMSDs)*

Work-related risk factors are the major causes of WMSDs which may include physical demands of the job such as handling heavy materials, repetitive movements, and working positions or stances, physical exertion, vibrations, and working while maintaining awkward postures [15]. WMSDs are a major cause of disability in industrialised societies and result in enormous human and economic costs [15].

In addition to WMSDs, construction workers also experience numerous occupational diseases, which may include noise induced hearing loss, silicosis, asbestosis, and lung cancer [16]. Construction workers are further exposed to manual tasks which contribute to WMSDs, which include muscle strains and sprains, ligament or tendon rupture, prolapsed intervertebral discs, tendonitis of the shoulders and elbows, and carpal tunnel syndrome [17].

2.9. *Quality of life*

It is important to note that the physical health of construction workers affects their quality of life [17]. Musculoskeletal injuries can result in permanent injuries that can have a significant impact on a person's working ability, and quality of life [17].

The construction industry has a poor reputation for, inter alia, being an unhealthy industry to work in [6]. This is due to the fact that its rate of work-related illness is one of the highest of all industries [6].

3. Research Method and Sample Stratum

A descriptive survey was conducted among 50 medium to large general GC members of the ECMBA using a self-administered questionnaire, which was distributed by post and by e-mail. Responses were returned via post, e-mail, and facsimile which consisted of two sections. 14 Completed and returned questionnaires were included in the analysis of the data, which equates to a response rate of 28%.

4. Research Findings

Table 1 indicates the extent to which seven factors effect productivity on construction sites in terms of percentage responses to a scale of 1 (Minor) to 5 (Major), and MSs ranging between a minimum value of 1.00 and a maximum value of 5.00. MSs > 3.00 indicate that respondents perceive that the frequency that the factors affect productivity is major as opposed to minor. It is notable that 1 / 7 (14.3%) of the MSs > 3.00, namely material shortages. Although the other factors have MSs \leq 3.00, and thus the extent can be deemed minor, the MSs ranked second to joint fifth are $> 2.60 \leq 3.40$ (near minor to some extent / some extent) - poor maintenance of plant and equipment resulting in idle time, poor H&S culture resulting in increased incidents and accidents, unsatisfactory working conditions, unattainable deadlines or time constraints, and negative worker relations and poor supervision. The MS of incorrect use of personal protective equipment is > 1.80 to ≤ 2.60 , which indicates that it affects productivity between a minor to near minor / near minor extent. These findings reflect those recorded in the review of the literature. Furthermore, the factors are all controllable by management, and to a degree, by supervision. This reinforces the argument that management and supervision have more influence on productivity than the workers have.

Table 1. The extent to which certain factors impact productivity.

Factor	Response (%)						MS	Rank
	U	Minor.....Major						
		1	2	3	4	5		
Materials shortages	0.0	14.3	21.4	21.4	21.4	21.4	3.14	1
Poor maintenance of plant and equipment resulting in idle time	0.0	28.6	21.4	7.1	21.4	21.4	2.86	2
Poor H&S culture resulting in increased incidents and accidents	0.0	21.4	28.6	7.1	35.7	7.1	2.79	3
Unsatisfactory working conditions	0.0	21.4	28.6	14.3	21.4	14.3	2.79	3
Unattainable deadlines or time constraints	7.1	21.4	7.1	28.6	28.6	7.1	2.71	5=
Negative worker relations and poor supervision	0.0	28.6	14.3	21.4	28.6	7.1	2.71	5=
Incorrect use of PPE	0.0	35.7	14.3	14.3	28.6	7.1	2.57	7

Table 2 indicates the extent to which certain factors negatively affect construction worker morale and satisfaction in terms of percentage responses to a range of 1 (Minor) to 5 (Major), and MSs ranging between a minimum value of 1.00 and a maximum value of 5.00. It is notable that two (25%) MSs > 3.00, which indicates the extent that inadequate supervision and poor worker relations do so is major, as opposed to minor. The remaining six (75%) MSs ≤ 3.00, which indicates that the extent the factors do so is minor, as opposed to major. However, the MSs ranked first to fourth are > 2.60 ≤ 3.40 (near minor to some extent / some extent) - inadequate supervision, poor worker relations, unhealthy and unsafe working conditions, and inadequate welfare facilities. The MSs for Lack of incentive and bonus schemes, excessive and extended working hours, over exposure to harsh environmental conditions resulting in dehydration, and labour intensive construction techniques are > 1.80 to ≤ 2.60, indicating that these factors negatively affect construction worker morale and satisfaction between a minor to near minor / near minor extent. Given that performance = ability x motivation, and that morale and satisfaction impact on motivation, these findings are notable. Factors such as over exposure to harsh environmental conditions resulting in dehydration relate to first level physiological needs in terms of Maslow's hierarchy of needs [18]. Unhealthy and unsafe working conditions, inadequate welfare facilities, and over exposure to harsh environmental conditions resulting in dehydration, constitute second level safety and security needs. Inadequate supervision and poor worker relations constitute level three needs.

Table 2. Extent to which certain factors negatively affect construction worker morale and satisfaction.

Factor	Response (%)						MS	Rank
	U	Minor.....Major						
		1	2	3	4	5		
Inadequate supervision	0.0	21.4	0.0	21.4	35.7	21.4	3.36	1
Poor worker relations	0.0	14.3	14.3	21.4	50.0	0.0	3.07	2
Unhealthy and unsafe working conditions	0.0	14.3	28.6	21.4	28.6	7.1	2.86	3
Inadequate welfare facilities	0.0	14.3	28.6	35.7	21.4	0.0	2.64	4
Lack of incentive and bonus schemes	0.0	21.4	21.4	35.7	21.4	0.0	2.57	5
Excessive and extended working hours	0.0	28.6	21.4	28.6	14.3	7.1	2.50	6
Over exposure to harsh environmental conditions resulting in dehydration	0.0	28.6	28.6	21.4	14.3	7.1	2.43	7
Labour intensive construction techniques	0.0	28.6	35.7	28.6	7.1	0.0	2.14	8

Table 3 indicates the respondents' rating of construction workers' quality of life and working conditions on construction sites in terms of percentage responses to a scale of 1 (Very poor) to 5 (Excellent), and a MS ranging between a minimum value of 1.00 and a maximum value of 5.00. The MS relative to quality of life is ≤ 3.00 , which indicates that respondents perceive construction workers' quality of life as poor as opposed to good. However, the MS of working conditions is marginally > 3.00 , which indicates that respondents perceive working conditions on construction sites as good as opposed to poor, however marginally so given that the MS is 3.07. These findings do not bode well in terms of productivity as both aspects have an impact on workers' physical and mental well-being, which in turn affect morale and motivation, in turn performance, and ultimately, productivity.

Table 3. Respondents' rating of construction workers' quality of life and working conditions.

Aspect	U	Response (%)					MS
		Very poor.....Excellent					
		1	2	3	4	5	
Quality of life	7.1	14.3	35.7	28.6	14.3	0.0	2.29
Working conditions	0.0	0.0	7.11	78.6	14.3	0.0	3.07

Table 4 indicates the extent to which respondents agree with the statement 'Unsatisfactory working conditions negatively affect productivity in the construction industry' in terms of percentage responses to a scale of 1 (Strongly disagree) to 5 (Strongly Agree), and a MS ranging between a minimum value of 1.00 and a maximum value of 5.00. Given that the MS is > 3.00 the respondents can be deemed to agree as opposed to disagree with the statement. This finding reinforces the argument proffered relative to the respondents' rating of construction workers' quality of life and working conditions.

Table 4. Extent to which unsatisfactory working conditions negatively affect productivity in the construction industry.

U	Response (%)					MS
	Strongly disagree.....Strongly agree					
	1	2	3	4	5	
0.0	0.0	21.4	35.7	35.7	7.1	3.29

A summary of the salient findings relative to the aims and objectives of the study are as follows: construction workers are exposed to excessive noise levels; material shortages are perceived by respondents to affect productivity more than other related factors; time delays are attributable to poor specification; construction worker morale and satisfaction is affected by inadequate supervision; the quality of life of construction workers is rated between very poor to poor / poor; working conditions on construction sites are poor, and unsatisfactory working conditions are negatively affecting productivity in the construction industry.

5. Conclusions

Research has shown that productivity on construction sites is adversely affected by unsatisfactory site conditions. This may further exacerbate the problem as inadequate H&S will increase the probability of accidents and injuries occurring, which will result in time delays, thereby decreasing construction productivity.

The findings of the study reported on indicate that the quality of life among construction workers is poor and that working conditions are unsatisfactory. The findings further suggest that unsatisfactory working conditions are negatively affecting productivity in the construction industry.

6. Recommendations

It is therefore imperative that there is a paradigm shift from perceiving that quality and productivity on construction sites is more important than H&S. Employers within the construction industry should disregard the view that H&S is a financial burden, which can be avoided if at all possible to a more responsible and holistic approach addressing the positive effects that H&S has upon productivity, worker satisfaction, and morale.

Implementing a positive H&S culture within the organisation and ensuring that there are healthy and safe working conditions and welfare facilities on construction sites will ultimately provide a greater return on investment as a result of an increase in productivity.

References

- [1] Hawkins, J. and Wells, J. (2013). Promoting Construction Health and Safety through Procurement: A briefing note for developing countries. London: Institution of Civil Engineering (ICE).
- [2] Construction Industry Development Board (cidb). (2009). Construction Health & Safety in South Africa: Status & Recommendations. Pretoria: cidb.
- [3] International Labour Organization. (2001). The Construction Industry in the Twenty-First Century: Its image, employment prospects and skill requirements. Geneva: International Labour Office.
- [4] Department of Labour. (2003). The National Occupational Health and Safety Policy. Pretoria.
- [5] University of KwaZulu-Natal. (2009). Pre-Construction Health and Safety Specification. Durban: University of KwaZulu-Natal.
- [6] Health and Safety Executive. (2012). Upper limb disorders in the workplace. 2nd ed. London: Crown.
- [7] Industry Insight. (2012). The State of the South African Construction Industry. Cape Town. 24. [Online]. Available: www.industryinsight.co.za [Accessed 06 December 2013].
- [8] Danso, H. (2012). Construction Workers Satisfaction with Work Provision Requirement Dimensions in Ghana's Construction Industry. International Journal of Engineering and Technology. 2 (9), 1-2.
- [9] Basson, A.C., Christianson, M.A., Dekker, A., Garbers, C., le Roux, P.A.K., Mischke, C. and Strydom, E.M.L. (2009). Essential labour law. 5th ed. Johannesburg: Mace Labour Law Publications.
- [10] Panas, A. and Pantouvakis, J.P. (2010). Evaluating research methodology in construction. The Built & Human Environment Review. Vol. 3 (1). Centre for Construction Innovation. Athens: National Technical University of Athens.
- [11] Sugiharto, A.L.W.I. (2003). Factors Influencing Construction Productivity in the Indonesian Context. Tarumangara University. In Proceedings of the East Asian Society for Transportation Studies. Vol.4. Jakarta, October 2003.
- [12] Jergeas, G. (2009). Improving construction productivity on Alberta oil and gas capital projects. Management department of civil engineering, Schulich School of Engineering. Alberta: University of Calgary.
- [13] Emsley, M. and Makulsawatudom, A. (2001). Factors Affecting the Productivity of the Construction Industry in Thailand: The project managers' perception. In: Akintoye, A., 17th Annual ARCOM Conference. 5-7 September 2001. Manchester: University of Salford. Association of Researchers in Construction Management, Vol. 1, 281 -290.
- [14] Intergraph. (2012). Factors Affecting Construction Labour Productivity: Managing efficiency in work planning. Huntsville: Intergraph Corporation.
- [15] Baril, R., Dion-Hubert, C., Lapointe, C., Paquette, S., Sauvage, J., Simoneau, S., Stock, S. and Vaillancourt, C. (2005). Work-related Musculoskeletal Disorders. Guide and tools for modified work. Montreal: Direction de santé publique.
- [16] Kew, G. (2011). The Construction Industry. Medical adjudication, medical surveillance and the law. Pretoria: South African Society of Occupational Medicine.
- [17] Queensland Government. (2007). Participative ergonomics in civil construction handbook: Reducing the risk of musculoskeletal injury in the civil construction industry. State of Queensland: University of Queensland and Curtin University of Technology.
- [18] Nyameh, J. 2013. Application of the Maslow's hierarchy of need theory; impacts and implications on organizational culture, human resource and employee's performance. International Journal of Business and Management Invention. 2 (3), 39-45.