

AN INVESTIGATION OF FACTORS THAT ASSURE A ZERO ACCIDENT GOAL IN CONSTRUCTION SITES IN GAUTENG, SOUTH AFRICA

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ABSTRACT

Construction accidents and fatalities bear heavily on companies. Thus, achieving zero accidents on construction projects is a desired goal universally. The present study aims to identify critical conditions or factors to ensure zero accidents on projects. A field questionnaire survey was used to collect data in different locations in Gauteng. Participants were selected using snowballing and judgemental sampling techniques. Empirical data were analysed using EXCEL to output descriptive statistics including mean item scores and standard deviation. The factors were further ranked to identify the most important as perceived by the sampled respondents. The study found that clear H&S goals, regular recording of accidents and incidents, regular tool box talks as well as following strict H&S rules, procedures and processes were the most indicators of a good safety record among the sampled organisations. On the other hand, involving staff in H&S planning and worker incentives did not appear to have much bearing on achieving zero accidents in the organizations sampled. The study was conducted in only one Province in South Africa and may not be generalisable to construction organizations in entire country or other geographical areas. The current research identifies factors necessary to prevent or avoid accidents on construction sites. Continuous health and safety improvement is likely if factors to prevent accidents are taken into account to prevent their occurrence.

Keywords: construction industry, Gauteng, health and safety, South Africa, zero accidents

INTRODUCTION

The construction industry contributes significantly to the socio-economic development of any economy through job creation and infrastructure delivery (Erol and Unal, 2015; Haupt and Pillay, 2016). In spite of this vital contribution, the industry is plagued by workplace accidents (Haupt and Pillay, *ibid.*). Accidents are rampant on construction sites, globally. The rate of fatal injury in the United Kingdom (UK) construction sector is about four times higher than the rate across all industries (Health and Safety Executive (HSE), 2017). Statistics from the HSE (*ibid.*) showed that the construction sector had the highest number of fatal injuries in Great Britain, in 2017 (Figure 1). This number is the lowest on record for the sector, although it had fluctuated in past years, with 47 fatalities in 2015/16 compared with 35 in 2014/15.

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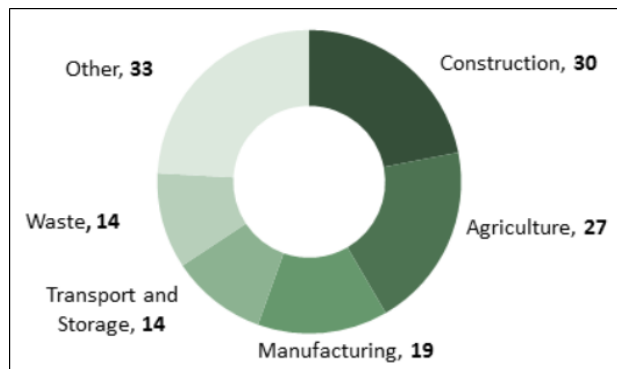


Figure 1: Fatal injuries to workers (Source: HSE, 2017).

The Bureau of Labour Statistics (BLS), (2017) revealed that a total of 991 fatal work injuries occurred in the United States (US) construction industry in 2015/16. In the South African construction industry, the injury rate is significantly higher than the injury rate for all other industrial sectors as a whole. The Department of Labour Statistics revealed that there were 171 fatalities and 755 injuries during the period 2007-2010 (Haupt and Pillay, 2016). These numbers are worrying and thus continuous research on ways to continue reducing the figure until a zero accident goal is achieved, is essential.

Moreover, the costs associated with accidents are grave. The costs resulting from injuries and equipment damage, combined with the associated financial loss resulting from schedule disruptions, insurance hikes, and workers compensation, impact the profitability of any construction operation (Abudayyeh et al., 2006). These costs could be direct, relating to hospital and compensations costs and/or indirect associated with costs from delays, new recruitments and lost work days (Haupt and Pillay, 2016). On the other hand, the benefits of investing in H&S far outweigh the costs. According to the British Safety Council (BSC), (2014), the benefits of investing in occupational H&S can be both financial and non-financial. Non-financial benefits are associated with employee wellbeing, increased productivity and morale and the organisation's enhanced image to the public and the media. There is, therefore, a need to devise strategies to help in achieving zero accidents on construction sites, especially since according to the International Labour Organisation (ILO), employers are induced to regard occupational safety and health as an afterthought due to rapid globalisation and resultant technological change and competitive pressures in the scramble for capital (Haupt and Pillay, 2016). The zero accident goal aspires to a world without severe and fatal accidents, or, in some versions, even without accidents at all and the only absolute definition of a "safe" worksite is one that has zero injuries and fatalities (Young, 2014; Smallwood and Emuze, 2016; Twaalfhoven and Kortleven, 2016).

Hence, some studies have been conducted on zero accident goal assurance. For instance, Sherratt (2014) examined the practical realities of the zero accident concept and its impact on H&S management in the UK construction industry. Twaalfhoven and Kortleven (2016) explored the application of the zero accident vision in a private organisation in the Netherlands. A similar study examined enablers, moderators and interventions to achieve the zero accident goal in an aluminium smelter company in New Zealand (Young, 2014). A South African study on zero accidents examined the importance of various actions, beliefs, interaction, states and practices geared towards achieving the zero target (Smallwood and Emuze, 2016). It appears that few studies have been conducted in South Africa on ways to achieve the zero accident goal. The objective of the current study is to identify factors which can assure achievement of the

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zero accident goal among construction organisations. A review of literature in both international and South African context was undertaken. The current study therefore reviews extant literature in a bid to identify factors which can contribute to assuring zero accidents on construction sites. The paper adds to the body of knowledge on H&S management with an aim to achieving zero accident goal. The remaining sections of the current paper presents a brief description of the methods employed in undertaking the study and presents the findings of the study. Conclusions are hereafter drawn from the findings.

OVERVIEW OF THE ZERO ACCIDENT CONCEPT

The zero concept, part of a two-word brand, for instance, Zero Harm', 'Mission Zero', 'Target Zero' and 'Beyond Zero' was introduced in the 1990s and has since been used in occupational H&S and environmental fields (Sherratt, 2014; Twaalfhoven and Kortleven, 2016). Over the years, five zero injury techniques have evolved, including accident/incident investigations; alcohol and substance abuse; safety incentive programmes; safety orientation and training and pre-project/pre-task planning for safety (Hinze and Wilson, 2000). In recent years, more enterprises are starting to implement the "zero accident" concept as one of their safety management concepts, by establishing a "zero accident" objective as their highest safety objective (Fu et al., 2014). Zwetsloot et al. (2017) opined that the zero accident vision is the ambition that all accidents are preventable or the commitment to create and ensure safe work and prevent all (serious) accidents in order to achieve safety excellence. On the contrary, targets, sometimes very ambiguous, may include reduction of fatalities by say 50% within a 10-year period, as was the case in Sweden (Zwetsloot et al., *ibid.*). However, positioning zero as a numerical target creates a goal to be achieved at a real point in time, which may not be achievable and therefore can be seen as simply reflective of wider industry practice in which people will be safe from harm (Sherratt, 2014; Smallwood and Emuze, 2016). The proclamation of zero appears to assure organisational success and merit to any achievement of zero accidents, incidents or harm on construction sites (Sherratt, 2014).

Zero is also applied to aspects of management practice, associating the non-productive with a new homogenised target, zero as positive or negative depending on specific contexts (Sherratt, 2014). The concept helps in identifying root cause of unsafe situations rather than on individual error and blame (Twaalfhoven and Kortleven, 2016). The zero accident goal, which aspires to a world without severe and fatal accidents, or, in some versions, even without accidents at all, entails an allocation of responsibility, bearing in mind certain principles (Twaalfhoven and Kortleven, *ibid.*). These principles include that all accidents are preventable and unacceptable, and that management should proactively advertise that every accident must be prevented; and learning from accidents is considered key to the success of the zero accident vision. In addition, H&S sees stakeholders and customers placed alongside those at physical risk on sites, all of whom become beneficiaries of a wider zero 'approach' (Sherratt, 2014). Therefore, for the zero accident goal to be achieved, hands-on participation and effort is required from all stakeholders.

TOWARDS ENSURING ZERO ACCIDENT GOAL ON CONSTRUCTION PROJECTS

Literature reveals that success factors to achieve zero accidents can be broadly classified into: H&S safety management system, attitude and behaviour. However, these are essentially related to the H&S practices with regard to the culture of an organisation and thus addressing H&S culture is a very important step to eliminating accidents and thereby improve the general H&S

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performance within an organisation or industry (Musonda et al., 2013). Skeepers and Mbohwa (2015) captured that the process of transforming organisations safety culture entails a synergy between management’s and worker behaviours. These include company strategies, attitudes, behaviours and systems associated with the business of the organisation, which management and workers should exhibit in order to achieve desired H&S performance improvement. Such include risk assessment, regular toolbox talks, regular training and meetings, regular tours, management support, commitment and visible leadership, communication, worker participation and involvement, incentivizing workers (even using carrot and stick approach), strict procedures and rules, as well as clear goals and record-keeping (Fernandez-Muniz et al., 2007; Hughes and Ferrett, 2008; Othman et al., 2008; Agumba and Haupt, 2009; Wilkins, 2011; Musonda, 2012; Ghasemi et al., 2015; Skeepers and Mbohwa, 2015; Musonda et al., 2013; Zwetsloot et al., 2017, van Heerden et al., 2018).

RESEARCH METHODOLOGY

A field questionnaire survey was used to collect data for the study. The questionnaire, with 5-point Likert scale (from 1=strongly disagree to 5=strongly agree) asked questions about the factors which an organization with a good safety record (zero accidents) has. Data was collected in different locations in Gauteng including Parktown, Boksburg, Sandton, Central Pretoria, Midrand and Linksfield. Seven commercial building construction sites including bridge, shopping centres, warehouse, office blocks and a hospital were selected using snowballing and judgemental sampling techniques. The company where the researcher’s in-service training was undertaken was initially selected and further potential participants were identified by the respondents in the first company. The respondents comprised site engineers, site agents, construction managers, contracts managers and project managers at on-going construction sites. These were deliberately selected because they were suitable due to the qualities they possess, being in managerial and or supervisory positions to implement H&S. Out of a total of fifty-nine questionnaires distributed, fifty-six were completed and used for the analysis. The respondents’ distribution is presented in Figure 2. Site engineers comprised 25% of the respondents, while site agents were 23%. Construction managers made up 20%, contracts managers 16%, and project managers, 16%.

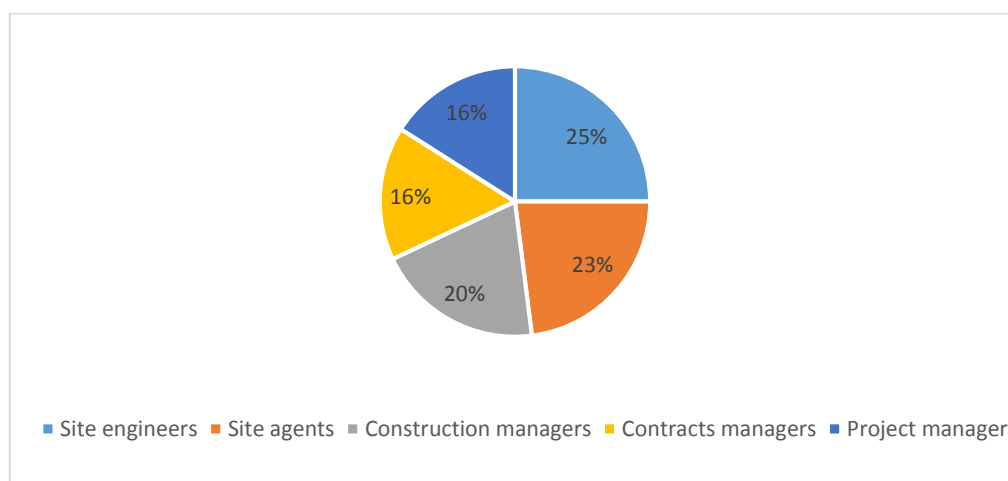


Figure 2: Distribution of respondents

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Data was analysed using EXCEL to output descriptive statistics including mean scores (MS) and standard deviation (SD) and factors were ranked according to the mean scores. The internal consistency reliability of the developed scale of drivers was tested to assess the extent to which the measures represent what they were supposed to measure, using Cronbach alpha. The alpha index was 0.980, indicating acceptable internal consistency (Taber, 2016).

FINDINGS AND DISCUSSION

The respondents were asked to indicate the factors that contribute to a good safety record (zero accidents) in organisations. Table 1 presents the results. *A company with clear H&S goals and that records accidents and incidents regularly and regular toolbox talks* ranked first with MS=4.36, SD=0.672, respectively. *Strict rules, procedures and processes* (MS=4.34, SD=0.695) and *formal risks assessment before undertaking activities* (MS=4.34, SD=0.793) followed. *Management conducting regular H&S tours on projects* (MS=4.23, SD=0.831) and *senior management attending project H&S meetings* (MS=4.14, SD=0.943) ranked fourth and fifth, respectively.

The least-ranked factors were *encouraging staff participation in safety strategy sessions* (MS=4.13, SD=0.810), *involving all staff in planning project H&S* (MS=4.00, SD=0.809) and *having incentives for worker H&S performance* (MS=3.77, SD=0.953). Although these factors ranked the least among the factors used in the current study, the sampled respondents deemed them to be important, giving that their mean scores were above the mid-point score of 3, indicating agreement with the statements. The SDs were also close to 1, indicating that respondents had similar views.

Table 1: Findings on indicators of good safety record (zero accidents)

Organisations exhibiting the following have a good safety record:	Agreement (%)					MIS	SD	Rank
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree			
Company has clear H&S goals and records accidents and incidents regularly		1.79	5.36	48.21	44.64	4.36	0.672	1
Has regular toolbox talks		1.79	5.36	48.21	44.64	4.36	0.672	1
Have strict rules, procedures and processes			12.50	41.07	46.43	4.34	0.695	2
Have formal risk assessment procedures before activity	1.79		8.93	41.07	48.21	4.34	0.793	2
Conducts H&S training and inductions			12.50	46.43	41.07	4.29	0.680	3
Management conducts regular H&S tours on projects		3.57	14.29	37.50	44.64	4.23	0.831	4
Senior management attend project H&S meetings	1.79	7.14	5.36	46.43	39.29	4.14	0.943	5
Encourages staff participation in safety strategy sessions	1.79		16.07	48.21	33.93	4.13	0.810	6
Involves all staff in planning project H&S		3.57	21.43	46.43	28.57	4.00	0.809	7
Have incentives for worker H&S performance	1.79	10.71	16.07	51.79	19.64	3.77	0.953	8
Average						4.19	0.786	

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The findings from the current study is slightly consistent with results from Abdullah *et al.* (2008), conducted among similar respondents in the Malaysian construction industry where training was considered important. However, leadership was ranked first in Abdullah *et al.*'s study, followed by training and worker involvement. Likewise, the study by Agumba and Haupt (2009) considered H&S commitment and support as paramount because it plays an important role to most of the other factors, including goal setting and recording of accidents, which ranked first in the current study. Agumba and Haupt's study also agreed that strict rules, procedures and processes, and formal risk assessment procedures before undertaking activities form part of creating a structure that promotes H&S, where communication will be considered key for this to be achieved.

Encouraging participation and involvement of workers in H&S strategy planning, although they ranked the least, were deemed important, because for any H&S program to be effective, meaningful participation and involvement of workers and their representatives in all H&S strategy planning and implementation programs need to be at the forefront (Occupational Safety and Health administration (OSHA), 2016). Workers have much to gain from a successful H&S program and the most to lose if the program fails. Further, by encouraging workers (of all levels and skills) to participate in the program, management signals that it values their input into H&S decisions (OSHA, *ibid.*).

CONCLUSION

The study sought to identify factors that contribute to zero accidents in the construction industry. The objective has been met. A field questionnaire survey was used to conduct the study. The study found that clear H&S goals, regular recording of accidents and incidents, regular tool box talks as well as following strict H&S rules, procedures and processes were the most indicators of a good safety record among the sampled organisations. These factors or conditions are necessary to prevent or avoid accidents on construction sites. Continuous health and safety improvement is likely if measures are put in place (which purport culture) to prevent accidents.

The study was conducted in only one Province in South Africa and may not be generalisable to construction organizations in entire country or other geographical areas. The findings of this study could assist construction managers and project managers in identifying ways of significantly reducing and possibly eliminating the occurrence of accidents and incidents in the construction industry.

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