MENTAL STRESS AMONG CIVIL ENGINEERING CONSTRUCTION SITE AGENTS AND FOREMEN IN THE NELSON MANDELA BAY METROPOLE

By

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DEDICATION

I dedicate this Treatise to the following:

My late mother Susanne Haydam;

My father Ullrich Haydam, and

My wife Candice Haydam.

ACKNOWLEDGEMENTS

To my supervisor: Professor John Smallwood.

For his advice, support, and patience throughout my research study.

DECLARATION

I, Erich Haydam, hereby declare that the Treatise for the degree Magister Scientiae in the Built Environment (specialising in the field of Project Management) is my own work and that it has not previously been submitted for assessment or completion of any postgraduate qualification to another University or for another qualification.

Signature: ……..

Date: ……..

ABSTRACT

The civil engineering sector of the construction industry as a whole has been suffering from mental stress due to a lack of stress management interventions, rendering employees vulnerable to burnout, poor mental health, and subject to injury on site.

The rationale of this study is to explore the prevalence of mental stress in the civil engineering sector of the construction industry, and the potential causes of stress, vis-à-vis the effects it has on an individual.

An empirical study based on a descriptive and analytical survey method was conducted among medium to large civil engineering contractors in the Nelson Mandela Bay Metropole (NMBM). The study adopted the use of questionnaires, and a review of the related literature to effectively summarise and describe the collected field data. The sample stratum included civil engineering site agents and foremen.

The salient findings include: high job demands, low job control, and low job social support are contributors to stress; site agents and foremen long for more time spent with family and friends; site agents and foremen are exposed to various physical, organisational and socio-economic stressors; site agents and foremen are displaying coping strategies unsupportive of a healthy lifestyle; there is a lack of awareness of stress management in the civil engineering sector of the construction industry; the level of stress experienced by site agents and foremen is rated as a lesser extent; the prevalence of depression among site agents and foremen is rated as a lesser extent; site agents and foremen are at risk of injury due to feeling stressed, and site agents and foremen are exposed to a range of musculoskeletal disorders (MSDs) due to poor ergonomics, and possibly stress too.

It can be concluded that stress negatively affects the civil engineering sector of the construction industry by, *inter alia*, increased employee absence, injuries and accidents, higher staff turnover, depression, and lower levels of production. Furthermore, stress may lead to eventual burnout, rendering an individual at a significantly higher risk of developing physical health complications.

Recommendations include: organisations to address the problem of work-family imbalance, by providing more time off to spend with family and loved ones.

Organisations need to promote and implement internal coping strategies, to assist those who are facing strain to effectively deal with their stress. More support from line managers to employees should be provided, as this will increase their resources in terms of job support, job demand, and job control in their working environment. Also, organisations need to promote teambuilding activities and exercise among their employees. Lastly, organisational policy and government legislation need to be revised in the long term, to provide for individual mental wellbeing, and reduced occupational stress.

Keywords: civil engineering; construction; contractors; stress

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CHAPTER 1: THE PROBLEM AND ITS SETTING

1.1 INTRODUCTION

The construction industry plays a key role in the economic growth of South Africa. Not only does it provide the much needed infrastructure that supports the various economic activities that interact as supply and demand fluctuate, but also provides thousands of working class individuals with income through job creation due to the industry's labour intensive nature. The construction industry is also vast, 429 000 full and part-time workers were employed during the year 2013 (Frittella *et al.,* 2013: 3).

Almost any occupation entails some degree of stress. Highly stressful occupations include the exceedingly demanding practise of medicine, and the life-threatening situations of the South African police force (Thomas and Valli, 2006: 1166; Rothmann and Malan, 2006: 76). Similarly, the construction industry is very stressful. The type of work imitates the operations typically found in a military battalion, where instructions are communicated from management at the top of the hierarchical structure down to technical staff, and the majority of the 'hands on' work force. To smoothly orchestrate such an operation requires the precise coordination and planning of various elements. Construction managers have to deal with subcontractors, shortened contract periods, reduced margins, poorly defined problems, a transient workforce, shortage of qualified staff, and exposure to the various elements – conjuring significant stress (Smallwood and Ehrlich, 1999: 351). Furthermore, Bowen *et al*. (2012: 400-401) assert that they have to multitask on multiple projects, deal with different tasks across different projects, and make professional judgements under conditions of uncertainty, as also, take strain from long working hours, face work-family imbalance, frustration, and burnout. Subbulaxmi (2002) cited by Oyewobi *et al*. (2011: 3) explains that construction workers who handle materials and participate in daily site operations experience stressors in the form of injury, heat, noise, inadequate lighting, irregular hours, work overload, and contingent work. The construction industry as a whole is facing severe occupational health (OH) challenges, most notably due to the mismanagement of stress experienced among construction site personnel, which in turn, is coupled to financial and legislative difficulties for construction firms.

The aim and objectives of the study were to determine whether site agents and foremen are stressed based on the job demand-control-support theory; whether site agents are more stressed than foremen; whether injuries and musculoskeletal disorders (MSDs) are

predicted by poor ergonomics and working while feeling stressed; whether stress management resources are adopted, and whether Health and Safety (H&S) and Hazard Identification and Risk Assessment (HIRA) practices are promoted to a greater extent than that of stress management interventions. This was achieved through administering a self-structured questionnaire, which measured the extent of stressors imposed on construction site personnel, as also, stress and depression symptoms, prevalence of H&S and HIRA practises, and lastly, the prevalence of poor ergonomics and MSDs.

The basis of this study was focussed on a sample of construction site personnel (site agents and foremen) employed in the civil engineering construction sector within the Nelson Mandela Bay Metropole (NMBM). The problems, sub-problems, assumptions, and hypotheses were addressed meticulously, which aided in the establishment of the outcome to the tested hypotheses.

1.2 STATEMENT OF THE PROBLEM

Civil engineering construction site personnel are significantly stressed due to high demands, diminished control, and poor support at work. Furthermore, civil engineering construction site personnel are at risk of increasing the severity of their stress if not managed, precipitating additional problems. Also, the severity of their stress may increase due to other factors, such as existing injuries, stressful working conditions, how stressful they perceive their working environment to be, and MSDs. Lastly, management is over-focussing on H&S, as opposed to embracing stress management and employee wellness interventions.

Consequently, the statement of the problem is theorised as: ‘civil engineering construction site agents and foremen are mentally stressed due to an assortment of factors pertaining to their working environment’.

1.3 SUB-PROBLEMS

Sub-problem 1:

Civil engineering construction site agents and foremen experience mental stress.

Sub-problem 2:

Civil engineering construction site agents and foremen experience injuries, including MSDs.

Sub-problem 3:

Civil engineering construction organisations experience difficulty in implementing stress management interventions.

Sub-problem 4:

Civil engineering construction site personnel face stressful working conditions to various degrees of intensity, which causes some with specific roles in the organisation to experience more difficulty in coping with stress.

1.4 HYPOTHESES

Hypothesis 1:

Civil engineering construction site agents and foremen are mentally stressed due to high job demands, low job control, and low job social support.

Hypothesis 2:

Civil engineering construction site agents and foremen suffer from injuries and MSDs due to poor ergonomics and working while feeling stressed.

Hypothesis 3:

The civil engineering sector of the construction industry promotes H&S practices to a greater extent than that of stress management and employee wellness interventions.

Hypothesis 4:

Civil engineering construction site agents are faced with more stressful working conditions than foremen, subsequently resulting in a higher state of mental stress.

1.5 DELIMITATIONS

This study will be delimited to the following parameters:

- The study is limited to site agents and foremen employed by civil engineering contractors;
- The study is limited to within the Nelson Mandela Metropolitan Municipality's geographical boundaries, and
- The study will not go as far as to establish a stress management system, but rather focus on the current *status quo*, and add to the pool of knowledge by identifying possible interventions for construction site personnel and contractors alike.

1.6 DEFINITIONS OF TERMS

Blue-collar worker

Groshen and Williams (1992: 3-4) categorise blue-collar workers as individuals who work in service occupations, precision production, and craft industries, or who are repair workers, operators, fabricators, general labourers, farm workers, forest workers, and fishermen, in contrast to the working conditions of white-collar workers.

Employee Assistance Programme

James *et al*. (2012: 1555), who cite Robertson (2006) describe an employee assistance programme as a comprehensive programme that offers free confidential assessments and short term counselling to employees and families.

Employee wellness programme

A programmatic intervention at the workplace, usually at the level of the individual employee using behavioural science, knowledge, and methods for the recognition and control of certain work and non-work related problems (Berridge and Cooper, 1994: 5).

Ergonomics

Ergonomics is: “the scientific study of people at work, in terms of equipment design, workplace layout, the working environment, working comfort, H&S, productivity, and training.” (Supe *et al*., 2010: 31)

Health and Safety

The provision of H&S in the work place where ‘healthy’ means free from illness, or injury, whereas ‘safe’ means free from any hazard (Republic of South Africa, 2014: 4-5).

Management standard

Set of principles agreed on by organisations in consensus, in order to enhance health and wellness, by identifying work-related stress hazards, and reducing associated risks (Sieberhagen *et al.,* 2009: 23).

Moderator

Rothmann and Malan (2006: 3) cited by Cooper *et al*. (2001) describe a moderator as a third factor that exerts an influence on the zero-order correlation between two variables, which in the case of this study are stressors and stress.

Musculoskeletal disorder

Schneider (2001: 1057) cites the United States of America’s (USA’s) Bureau of Labour Statistics’ definition of a MSD as an “Injury / pain due to repeated trauma.”

Occupational injury

A personal injury, disease, or death resulting from a work-related accident (Laurie, 1998: 10).

Socio-economic status

The relative position of a family or individual on a hierarchical social structure, based on their access to, or control over, wealth, prestige, and power (Taylor and Yu, 2009: 4-5).

Stress

Stress is the physical, mental, and behavioural reaction to a situation or event (Oyewobi *et al.*, 2011: 2).

Stressor

Yusoff (2010: 143) cites Lazarus' (1990) definition of a stressor as the personal and environmental events in life that cause stress. Stress is simply the emotional disturbances or changes caused by stressors.

Stress management

Strategies of coping, recovering, reinterpreting, refraining, and cognitive restructuring adopted by an individual who is under stress, making changes that can reduce stress, or taking actions that can alter the impact of stress (Wahab, 2010: 4).

Stress measurement

Van Zyl (2002: 27) describes stress measurement as the process of identification and assessment of stressors particular to an environment (inside and outside the work situation), and the levels of stress present.

1.7 ABBREVIATIONS

AIDS:	Acquired Immune Deficiency Syndrome
CED:	Chronic energy deficiency
cidb:	Construction Industry Development Board
COIDA:	Compensation for Occupational Injuries and Diseases Act
DoL:	Department of Labour
EAP:	Employee Assistance Programme
HIRA:	Hazard Identification and Risk Assessment
HIV:	Human Immunodeficiency Virus
H&S:	Health and Safety
MS:	Mean score
MSD:	Musculoskeletal disorder
NMBM:	Nelson Mandela Bay Metropole
OH:	Occupational health
RSA:	Republic of South Africa
SWOT:	Strengths Weaknesses Opportunities Threats
USA:	United States of America
WMSD:	Work-related musculoskeletal disorder

1.8 ASSUMPTIONS

- The majority of construction site personnel are stressed to some extent, and
- There is a need for stress management interventions in the construction industry.

1.9 IMPORTANCE OF THE STUDY

A study conducted among a sample of 172 construction site personnel in the USA revealed that 75% of the sample had some form of MSD, and that 16% likely suffered from mental distress and burnout (Jacobsen *et al*., 2013: 1197). After a further interview of ten individuals, nine were diagnosed as being substantially mentally distressed due to, *inter alia*, their occupational injuries. The American study, along with a study conducted among Chinese construction site personnel showed that the work force is twice as stressed as the general population, and found their risk of injury increased almost twofold due to being mentally stressed (Zheng *et al*., 2010: 588).

This research study could provide employers, employees, government bodies, and unions operating in the construction industry with a better understanding of the causes of occupational stressors, and how this concerns an individual's well-being and production levels at work. This is perceived as noteworthy, as the industry is lacking the implementation of an effective stress management system to treat post injury stress, and prevent new stress from arising. Oyewobi *et al*. (2011: 6), Jacobsen *et al*. (2013: 1199), and Kim (2013: 10) have made this recommendation to clients and employers on numerous occasions. The construction industry is still fixated in terms of a 'production and profit driven' mind set, leading to a neglect of the more critical aspects. Furthermore, the cultural belief in South Africa still remains that 'feeling stressed' is seen as a weakness, and that a person should be able to 'sort it out' on their own. Consequently, research findings assert that the construction industry is in dire need of a stress management intervention (Oyewobi *et al*., 2011: 6; Jacobsen *et al*., 2013: 1201; Kim, 2013: 313).

To date no preceding research has been established with respect to stress relative to a specific industry, particularly in the civil engineering sector of the construction industry. Also, limited research has been done with respect to the current *status quo* on stress in the construction industry (Smallwood and Ehrlich, 1999: 351).

Construction and civil engineering operations are remarkably harsh in terms of their working environment, and although established firms promote H&S, injuries and fatalities still arise. The USA alone accounted for 1 178 fatalities in the construction sector during 2007, the most 'on the job' fatalities of any industry (Bezadan, Iqbal and Kamat, 2011: 3573). Working-class individuals often carry heavy objects such as curbs, handle hazardous and flammable materials such as bitumen, work at elevated heights, and are prone to unfair treatment by superiors with no stress management, nor H&S system in place. Another study that observed 35 Turkish construction site personnel during 2009, reported that more than 50% of the sample had a poor attitude to H&S practices, little to no knowledge of H&S training, and have had some form of injury in the past (Arslan and Kivrak, 2009: 4-7), these being just some examples of what warrants consideration.

1.10 SUMMARY

This chapter provides an introduction to the study, describing the research problem area. The problem statement explains that construction site personnel suffer from mental stress. The sub-problems and hypotheses are related to the problem statement, which explain that stress in the construction industry is dependent on the job demand-control-support theory on stress, that stress and poor ergonomics contribute to injury and MSDs, that H&S is promoted more than stress management interventions, and lastly that, some individuals cope better with stress than others, which in this case is hypothesised as site agents. The remainder of the chapter introduces the delimitations, definitions of terms, abbreviations, and assumptions to the reader. The importance of the study is reinforced in the fact that although research pertaining to stress in construction has been conducted, no research has been conducted with respect to stress relative to the civil engineering sector of the construction industry.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

The construction industry of South Africa plays an important role in stimulating economic growth through the provision of bulk infrastructure and various other services. According to the 2nd quarter labour force survey conducted by Statistics South Africa (2014: 8), 8% of the country's economically active population is represented by the construction industry, forming part of the five top employment sectors in the country. The labour intensive nature of the industry plays a critical role in providing employment not only to permanent employees, but also to the vast temporary work force.

Since the dawn of the industrial age, and the subsequent transition in 1994 from the old to new South Africa, and up to the FIFA World Cup in 2010, there has been a remarkable growth and development in the construction industry. The unique nature of the work undertaken contributes to stress not only in professional white-collar staff, but also to construction site personnel.

Stress is a serious problem to an individual's H&S. Sieberhagen *et al*. (2009: 1) argue that South African legislation generally provides for employee H&S, but limited provision is made for employee wellness in the workplace, and importantly, the development of employee wellness programmes in industrialised countries has been significantly more developed than in South Africa. Traditionally, individual wellbeing has been seen as irrelevant in Western societies, but subsequently has become more important to employers and stakeholders towards the end of the 19th century. In contrast, the focus on dangerous occupations, activities and risks, and negligence of employee wellbeing in South Africa has resulted in a series of ramifications for employers and employees. The South African construction industry have not only been ignoring the importance of stress management and employee wellness, but face further threats in the form of the Human Immunodeficiency Virus (HIV), the Acquired Immune Deficiency Syndrome (AIDS), injuries and fatalities, ergonomic problems, inadequate education, poor H&S regulation by the Department of Labour (DoL), inadequate employee training and development, severe unemployment, poor H&S conformance by contractors and stakeholders, and poor training and development of emerging contractors. The combination of the abovementioned challenges show how the effect of stress is amplified, and leads to a conclusion that its appropriate management is paramount.

2.2 THE STRESS DILEMMA

South Africans are significantly stressed, more so than Western and European societies. This environmental landscape provides a unique set of conditions that make South Africans feel stressed easily. Bowen *et al.* (2012: 393) argue that racial tension and political pressures have created a 'unique' context that leads to stressful events. Furthermore, many organisations do not understand the chronic effect of stress on employees and the organisation (Van Zyl, 2002: 27).

What is stress? Stress is the body's reaction to demands and changes that require it to adapt physically, mentally, and emotionally (Werner *et al*., 2014: 232). Stress is triggered when everyday situations are perceived as either a challenge or a threat, commonly known as the 'fight or flight' reaction. Stress is a dynamic and cognitive state and affects everyone differently. To understand stress, a person needs to understand the source of stress (stressors), and the various interrelated environmental conditions that enhance stressful situations.

Cooper *et al.* (2001) cited by Rothmann and Malan (2006: 3) describe the three main components of stress as stress itself, stressors, and strain. Although many tend to believe that stress is the direct result of organisational stressors, in actual fact, the 'person-environment' relationship is what depicts the existence and severity of stress. The latter two, stressors and strain, are the events encountered, and our physical, behavioural, and psychological responses respectively.

Rothmann and Malan (2006: 4) cite Cartwright and Cooper's (2002) seven most common stressors experienced in the workplace as:

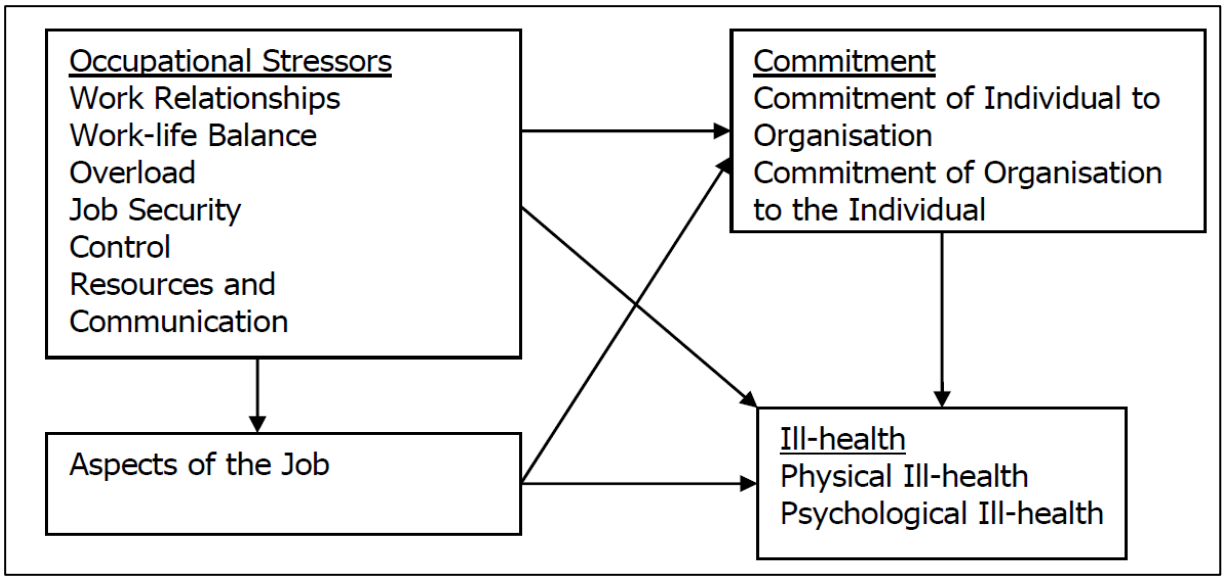
- Poor work relationships;
- Poor job control;
- Poor work-life balance;
- Poor salary and benefits;
- Work overload;
- Inadequate resources and communication, and
- Aspects of the job.

Furthermore, Leung *et al*. (2009: 127-128) categorise stressors as either task, organisational, personal, or physical in form. These stressors, which ultimately induce stress, may take the shape of work overload, or role conflict when considering a specific task, poor organisational culture, or inadequate career growth when the stressor is considered organisational, poor managerial relationships at work when the stressor is viewed as personal, and noise, or harassment when the stressor is physical in nature.

The findings of Haynes and Love (2004: 134) correspond to those of Rothmann and Malan, as depicted above. Haynes and Love (2004: 134) argue that work overload, long hours, and limited time spent with family and friends are the most significant stressors to site managers, followed less intensively by staffing problems, communication problems, paperwork, and company operations respectively. It can be concluded that the stressors in the construction industry are not only similar in nature, but of a high severity, which create the ideal 'grounds' for an individual to perceive their environment as threatening or stressful, thus requiring resources to moderate its effect.

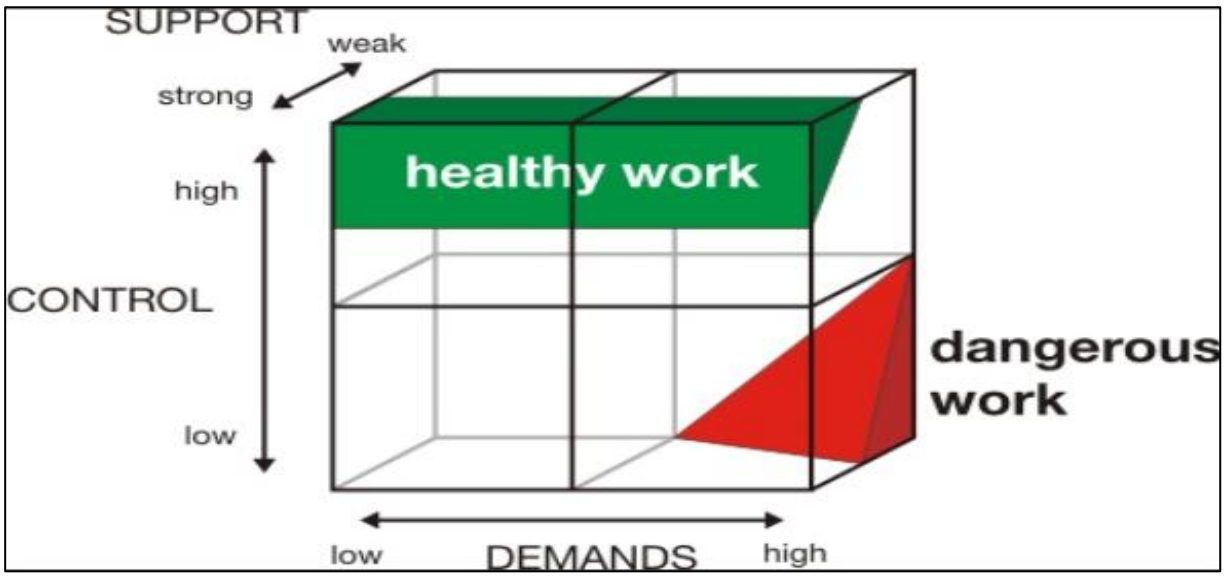
Figure 1 illustrates the model of occupational stress, commitment, and ill health. Stressors imposed on an individual creates a 'source of stress', which is dependent on the organisational environment, job aspects, and the individual's own resistance to stress. Stress affects organisational commitment, and an outcome of stress is poor mental and physical health. Optimal employee commitment is paramount to an organisation's success, and is only achievable with higher job control, less workload, and increased job social support (Coetzer and Rothmann, 2006: 37).

Figure 1: Model of occupational stress, commitment, and ill health (Coetzer and Rothmann, 2006: 30)



In essence, commitment and employee health is greatly dependent on job control, workload, and job social-support, as previously mentioned. Although poor physical and mental health is a problem to white and blue-collar workers alike, poor physical health is more prevalent among blue-collar workers, while white-collar workers suffer from poor mental health, which suggests white-collar workers have higher emotional intelligence and more stress resources available to cope with stress, whereas blue-collar workers abuse substances to relieve stress (Rothmann and Malan, 2006: 13; Tiwary *et al*., 2013: 213-216). This leads to the suspicion that blue-collar workers experience far more advanced levels of stress and strain, in contrast to that of white-collar workers, as depicted through the physical symptoms experienced. This outcome can be utilised to identify stress in industry. On the same note, commitment to an organisation can be used to describe the levels of stress an individual is experiencing. The job demand-control theory initially developed by Karasek (1979: 288), and subsequently expanded by him, effectively describes the relationship between job support, job control, and job demands, and its effect on stress and strain. As depicted in Figure 2, a healthy work environment is established even when job demands are high, as long as job control in the environment is high too. However, this needs to further be complemented by strong job social support. In contrast, high job demand, poor job control, and weak job social support creates the ideal circumstances for the development of organisational stress, resulting in poor commitment, and various other problems associated with it (Karasek, 1979: 288).

Figure 2: The job demand-control model (Karasek, 1979: 288)



Stress is very common among different occupations in South Africa, and is unique to each situation due to demographic and cultural differences. In most cases, the job demand-control-support theory is strongly supported, inclining to dangerous and stressful working conditions for employees. In order to address the stress dilemma facing construction site personnel one needs to understand how stress manifests in a number of organisational environments.

Many would agree that working in the police force, insurance services, or the medical professions are undoubtedly some of the most stressful occupations in South Africa. Meyer *et al.* (2003: 899), who conducted a study among South African police officers, noted that 65% of the studied sample had a high ideation of suicide, and up to 90% had medium levels of suicide ideation. The most significant stress factor was lack of resources and job demand. Meyer *et al.* (2003: 898) argue that police officers are significantly understaffed, poorly paid, lack team co-operation, operate in high risk environments, and often perform crisis management, all of which contributes to family negligence (poor social support), substance abuse, passive coping strategies conductive of an unhealthy lifestyle, low job satisfaction, and overall poor physical and mental health.

In comparison, a study conducted relative to 62 doctors' working conditions in public hospitals revealed that most had ambitious 'type A' personalities, but still faced low job satisfaction, poor mental health, and low self-confidence (Thomas and Valli, 2006: 1164).

The main causes were the bureaucratic management system of the government with the outcome of poor career growth, work-family imbalance, poor work security, dealing with highly infectious patients, understaffing, a lack of resources, irregular hours, poor salaries, and inefficient communication.

Insurance services' workers share similar highly stressful environments. A study conducted among 1 100 employees revealed that job insecurity and poor salaries were deemed as the most stressful to them (Coetzer and Rothmann, 2006: 32). Furthermore, low levels of commitment coupled with poor mental (inability to cope and mood swings) and physical (muscular tension and pains) health troubled them.

With reference to the construction industry, and more specifically the professional work force similar patterns of stress have been observed. According to Rothmann and Malan (2006: 12-13), engineers in South Africa are highly stressed. The study conducted among 369 engineers registered with the Engineering Council of South Africa indicated that 16% were significantly stressed, and 68% moderately stressed (Rothmann and Malan, 2006: 9). The most significant stressors to the engineers were work-family imbalance, and too much travelling, resulting in poor mental health. However, it is notable that engineers do not perceive work overload as a significant stressor, but instead suffer due to conditions of low job control and low social support.

In comparison, architects, construction managers, and quantity surveyors also suffer from high levels of stress. This is especially true for females and young professionals. Rothmann and Malan (2006: 2) citing Garland (2002) explain that these individuals enter the work environment energetically, only to be demoralised by a lack of control and poor career development, rapidly facing burnout. According to Bowen *et al.* (2012: 401), architects are significantly stressed. A sample of 269 architects were surveyed using a questionnaire, where most scored 7 and higher out of 10 on a 10 point scale. Bowen *et al.* (2012: 401) argue that even though architects work fewer hours than other professionals, they are still the most significantly stressed due to little control over certain aspects of their work environment. Similar to engineers, architects experience high organisational control, but low external environmental control, coupled with burnout. Furthermore, the study conducted by Bowen *et al.* (2014: 22) among 177 quantity surveyors reported high stresses in 24% of the sample. Long hours, tight deadlines, work-family imbalance, and

high demanding work with low control knocks the final nail in the coffin with regards to the supporting literature on the job demand-control-support theory on stress.

Given an overview of the stresses and strains experienced by professionals (white-collar workers) in their organisational environment, the approach to the cause and effect of stress among construction site personnel can be more appreciated. The importance of the well-being of these employees is paramount, and as such the intention of this study was to identify causes of stress in the civil engineering construction industry, how it can be managed, and recommendations for future research.

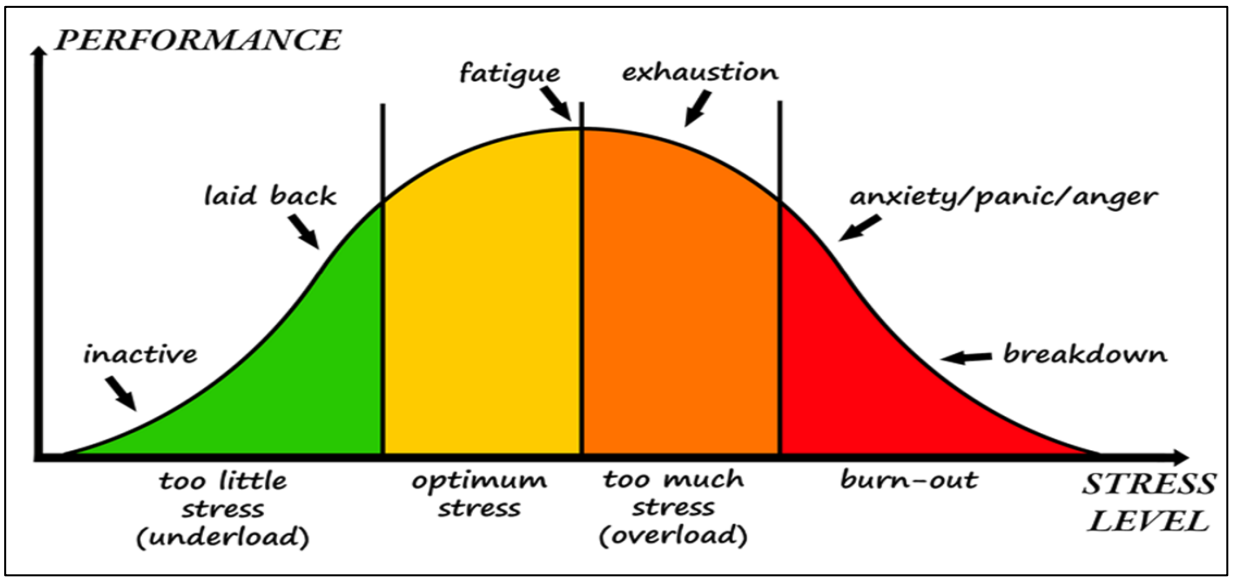
The contemporary prevalence of stress paints a sad picture of the current state of affairs with regards to the well-being of construction site personnel. According to Tiwary *et al.* (2013: 216-217), construction site personnel in India are significantly affected by stressors, and show alarming signs pointing to stress and burnout. This study, conducted among 255 Indian construction site personnel of different job titles, ages, and sex, revealed that 60.4% were significantly stressed due to organisational conditions, 47% were victim to some form of injury, and more importantly, 32.7% showed symptoms of chronic energy deficiency (CED) (Tiwary *et al*., 2013: 215). The working conditions alone explain the prevalence of such findings, as they were faced with not only poor working conditions, but a poor H&S climate as well as discrimination. Most of the personnel resorted to smoking, drinking, and domestic abuse to moderate their levels of stress.

A similar study conducted among bricklayers revealed further findings. The repetitive nature, high physical demand, low job control, lack of social support from superiors, and limited scope for advancement rendered them stressed and depressed (Boschman *et al*., 2013: 749). Of concern was the fact that bricklayers who had been exposed to observing an injury or accident take place were up to three to five times more depressed and stressed than those who did not (Boschman *et al*., 2013: 753). Furthermore, depression was far more common among the bricklayers than stress itself.

In essence it can be theorised that the job demand-control-support theory is observable in both professional and blue-collar workers' organisational environments. As job control and job social support reduces, and job demands increases, stress develops and subjects undergo strain. Although a certain amount of stress is deemed as 'healthy', too much stress will cause deterioration and eventual burnout. Figure 3 portrays the relationship

between stress and job performance, as can be seen, too little stress will result in lazy and under-performing workers. In comparison, too much stress produces poor performance and detrimental health effects. The so-called ‘sweet spot’ of optimum performance versus level of stress nestles in the optimum stress part of the ‘bell’ graph depicted hereunder.

Figure 3: The performance versus stress curve (Werner *et al.*, 2014: 237)



In summation, stressed employees lack commitment to their organisations, and likewise, organisations to their employees. Stress also causes ill-health to employees, mentally and physically. Most stressful environments strongly support the job demand-control-support theory of stress, especially the overall construction industry. What is significant is the fact that construction site personnel are more prone to CED, depression and more severe physical mental and health deterioration, in contrast to their professional counterparts. Professional individuals seem to suffer more profoundly from poor mental health than physical. This may also be of concern to construction site personnel as they need to be able to navigate dangerous site conditions with limited time to think things through to prevent an accident or injury from taking place. The repercussions of their lack of social support and high levels of stress from unfair rewards and treatment, poor H&S environment, lack of goal setting and training, and a poor physical environment can result in clouded judgement and negligence of one’s H&S, which in turn causes slips, trips, falls, and various other injuries to take place (Goldenhar *et al*., 2003: 234). Hence, the importance to understand what stressors are imposed on construction site personnel, the

nature of strain they produce on them, and the final build up to burn-out and its direct consequences are critical.

2.3 OUTCOMES OF STRESS

To date, limited research has been conducted relative to the relationship between the job demand-control-support theory and injury, as also, depression and injury (Goldenhar *et al*., 2003: 234; Kim, 2013: 305). Work has also been documented with respect to the relationship between depression and non-occupational post traumatic experience, as also, occupational injuries resulting in physical disability (Kim, 2013: 305). The most comprehensive study regarding injury and depression was carried out by Jacobsen *et al.* (2013: 1203), who concluded that construction site personnel were severely depressed, and consequently very susceptible to occupational injuries. This study, conducted among Chinese construction site personnel indicated that they were more than twice as likely to be injured in comparison to the general population, and twice as depressed. Furthermore, Jacobsen *et al.* (2013: 1199) argue that up to 16% of the sample were significantly depressed and distressed, and follow-up interviews reported that 9 out of 10 had some form of mental disorder. The study concluded that depression was more prevalent among the sample than general stresses and strains, which raises the question: “Are construction site personnel significantly depressed due to stress?” (Boschman *et al*., 2013: 753)

Abbe *et al.* (2011: 115) argue that job control, H&S of others, H&S climate, job certainty, and personal H&S compliance are directly related to the outcome of injuries. Furthermore, job demands, skill-underutilisation, overcompensating on the job, social support, exposure to physical and chemical elements, harassment, and discrimination were also related to injury, but not as significant. Moreover, headaches and ‘the feeling of sadness’ were reported as most significant and prevalent. The bottom line is construction site personnel are more prone to injuries than most construction professionals due to being stressed, as they portray both physical and psychological symptoms. What is of most concern is the fact that the majority of studies are pointing to depression as the main outcome of stress. The cognitive state of depression not only puts oneself, but fellow workers at risk of injury due to absent mindedness, not thinking ‘straight’, or in worst case, suicidal ideations. The abovementioned studies conclude that Karasek’s theory of job control, job demand and job support could be connected to outcome of injury. Control is directly related to injury, while demand and social support are less significant. However, H&S aspects in the

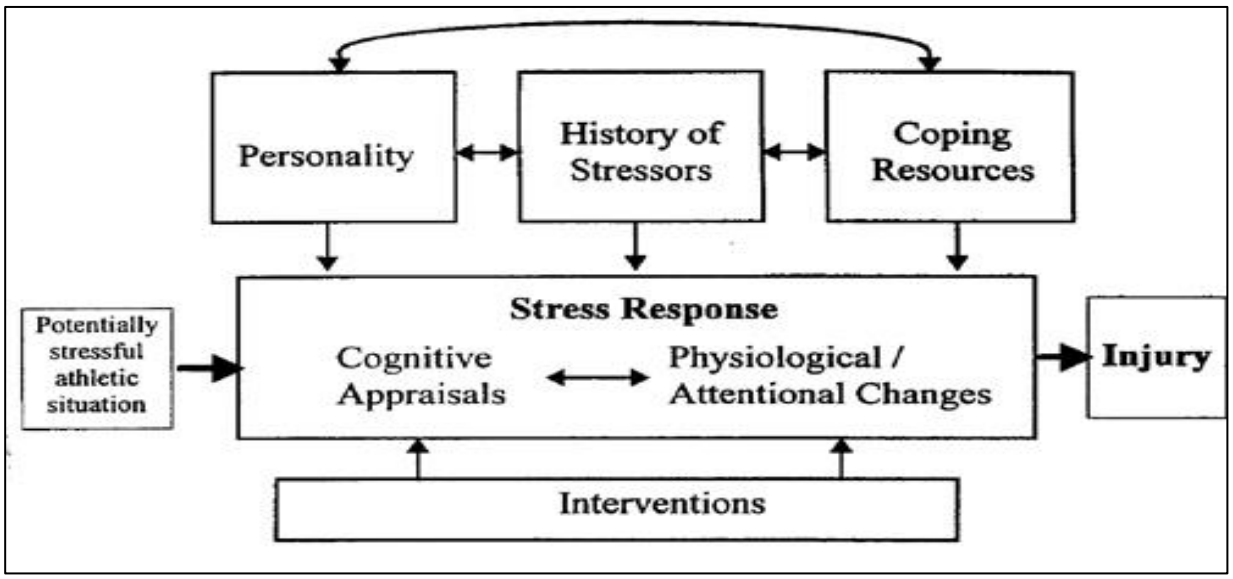
workplace have a significant impact on construction site personnel, due to its direct link to injuries. Consequently, H&S could be seen as both a support and demand parameter in terms of stress. For example, safeguarding the H&S of your fellow employees, or constantly worrying about a poor H&S climate may be physically and psychologically demanding, while lack of H&S training and no provision of H&S gear as being unsupportive by management.

The stress-injury theory developed by Abbe *et al.* (2011: 116) addresses the relationship between stress, stressors, and injuries among construction site personnel as follows:

- When stressors increase, so do injuries;
- When stressors increase, so do physical, as also physiological symptoms;
- When H&S climate is optimum, injuries decrease;
- When job-related training increases, injuries decrease, and
- When physical and psychological symptoms decrease, so do injuries.

A simplified and adapted version of this model, used to explain the manifestation of stress relative to injury among professional athletes could be applied to construction site personnel.

Figure 4: The stress-injury model (Andersen and Williams, 1988: 297)



Take a bricklayer for example, who has little control over tasks bestowed upon him by his supervisor. Furthermore, a poor H&S climate at work and inappropriate H&S promotion by his supervisor will create a 'potentially stressful' environment, physically and psychologically. Figure 4 describes how an individual's personality, his ability to source coping resources, such as for example, relaxation and laughter, is greatly influenced by the individual's own ability to manage stress, and as such, creates different responses to stress. A history of stressors also influences his response to stress, for example, a poor socio-economic background could amplify the response to stress (Jacobsen *et al*., 2013: 1203). A critical parameter of this model is interventions, as these are lacking. How he interprets the situation will define how intense the stress will be to him, resulting in physiological and attentional changes. These changes, whether it is headaches or feelings of sadness could ultimately result in an unwanted accident to take place.

2.4 STRESS MANAGEMENT

As discussed in the previous chapter, it can be confirmed that mental distress is related to injury and depression, resulting in devastating effects for the employee and the employer. For the most part, South African private and public entities fail to understand the long and short term effects of stress, not only to the organisation, but to the wellness of its employees too. Furthermore, South Africans have a more fragmented approach to the topic of stress than some other societies. It is typical in South African culture to perceive stress as a 'weakness', consequently leaving it dormant until it is too late.

Wahab (2010: 94) argues that stress can only be managed or reduced, as it cannot be eliminated completely from the life of an adult. This highlights the importance of the management of stress in the workplace, to prevent costly employee health benefits and claims, rising consumer costs, as also, reduced profits from occurring.

Stress is not managed in organisations, and various recommendations have been proposed as to how stress could be managed (Oyewobi *et al.,* 2011: 6; Wahab, 2010: 102; Leung *et al*., 2012: 165). Moreover, employees resort to coping strategies unsupportive of a healthy lifestyle to alleviate their levels of stress experienced. Two typical examples include excessive smoking and drinking (Tiwary *et al*., 2013: 216-217).

A study among workers in the banks of Pakistan indicated poor management of stress due to a management flaw (Ali *et al*., 2013: 311). The above mentioned study consisted of a questionnaire survey that supported a need for an adequate rewarding system, freedom of autonomy, time off, organisational change, and reduced role conflict. Another study, conducted among Malaysian school pupils revealed a similar lack of organisational stress management, and as a response pupils made use of internal coping strategies to moderate their stress (Yusoff, 2010: 11). These included, *inter alia*, religion, active coping, such as cognitive approaches, positive reinterpretation, planning, and use of instrumental support such as finance. What was noteworthy was the fact that despite the attempt of these pupils to actively manage their stress, their stress levels were still higher than that of the 'normal' population.

The management of stress among construction site personnel follow similar trends as depicted above. Management support in terms of stress management strategies are lacking. Consequently, the only option for construction site personnel are to resort to individual coping strategies. A study conducted among 150 construction employees in Nigeria revealed that hobbies and exercise, seeking social support, planning ahead, relaxation, laughter, and biofeedback were typical means of 'self-management' of stress (Wahab 2010: 100). A point to note was that even though exercise and relaxation were seen as the most effective method of coping with stress, it still remained rudimentary effective. Once again, this shows that management needs to go further than just providing time off and sick leave. Incentives such as social events encourage team building and increase work engagement. Management should focus on promoting and improving social and sporting activities, work-load adjustment, and more time off as further recommendations.

Another study revealed slightly different findings. Leung *et al.* (2012: 163-164) observed that construction site personnel's stress could be managed by rather focussing on their H&S environment at work. By means of promoting organisational training and proper H&S equipment, stress can effectively be managed. However, such an intervention would require careful monitoring, as too much training will result in more burden on workers, and so, increased stress, and in comparison, insufficient training would also promote stress. Furthermore, the proper use and maintenance of equipment will need to be enforced.

According to Oyewobi *et al*. (2011: 6), recommendations to manage stress include, *inter alia*, time off, fair wages, incentives, work-offloading, delegating of work, social support with superiors and colleagues, and promotion of recreational activities. It can be seen that employee needs to manage stress are strikingly similar. Moreover, the requirements to manage stress in the observed samples match certain features of Karasek's theory. What is also apparent is that no stress management intervention currently exists in the construction industry.

Oyewobi *et al.* (2011: 4) suggest the following steps to reduce stress:

- Understand the cause(s) of long-term stress;
- Understand the cause(s) of short-term stress;
- Manage stress with rational thinking;
- Perform a stress Strengths Weaknesses Opportunities Threats (SWOT) analysis, and
- Establish a stress management plan.

Once a complete medical examination, which includes stress, fitness, health risk assessment, and overall wellness criteria has been conducted on an individual, the individual should be administered to a stress-reducing strategy, which follows the principles of the above mentioned steps. To manage stress, it is critical to understand the long-term causes – it does not help to treat a patient for stresses relating to a specific job task, when in fact, the source of stress might emanate from poor socio-economic standards, or unknown social problems at home. Understanding the short-term stresses enable us to better understand how we react to stress, for very often we perceive a stressful event to be far more stressful than what it actually is, which is why it is important to think things over rationally during stressful times. A SWOT analysis helps reinforce our strengths, and combat weaknesses, while a properly implemented stress management plan, as for example, an Employee Assistance Programme (EAP), will manage stress to benefit both the employer and employee in the long run.

James *et al.* (2012: 1554) argue that a properly implemented EAP within the construction industry could play a significant role in managing the well-being problems faced by employees. A study conducted among 34 construction site personnel indicated that 97% were in dire need of an intervention such as an EAP (James *et al.* 2012: 1556). To

establish an EAP as stress management tool, firstly, existing levels and causes of stress need to be measured, internally and externally. This will help tailor an individual specific stress management plan. Van Zyl (2002: 27) asserts that stress measurement is important in the stress management process, as it identifies and assesses the stressors in a particular environment, individually and organisationally. Furthermore, stress measurement could make employees realise stress is existent, and might motivate them to take action. All too often employees suffering from stress seldom recognise it, and those who do pretend it is not there. The stress measurement model is portrayed as follows:

Figure 5: The stress measurement model (Van Zyl, 2002: 29)

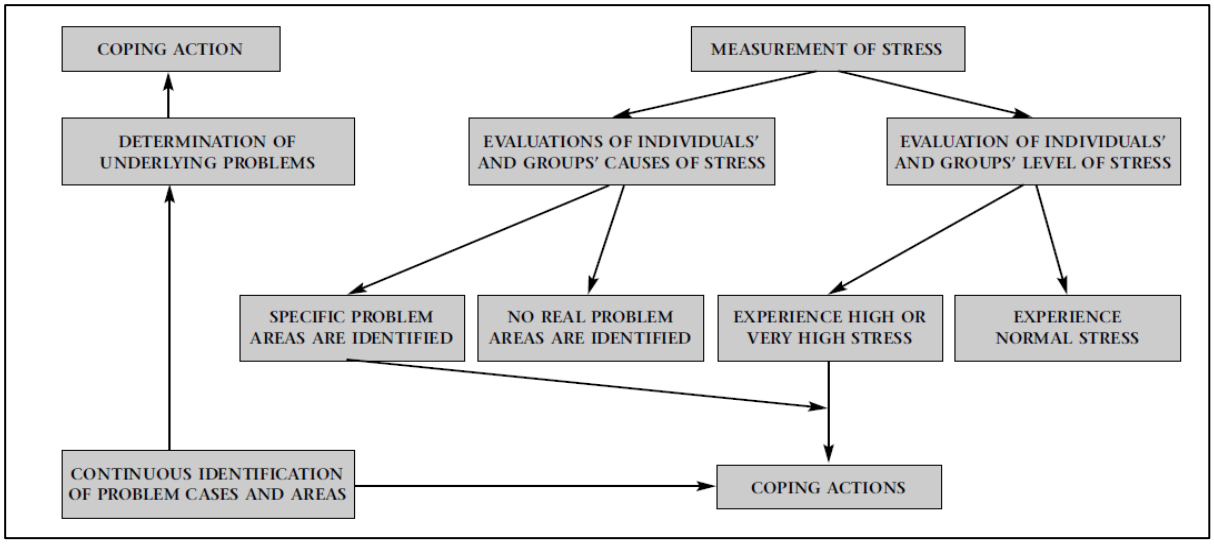
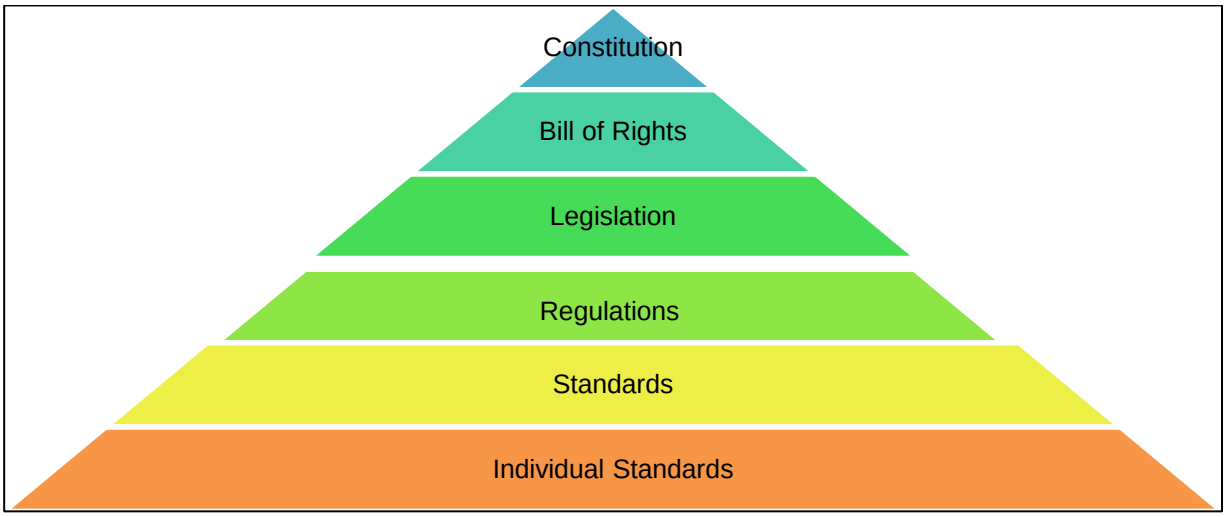


Figure 5 shows that, first off, the measurement of stress should be based upon the causes of stress, as also, the levels of stress experienced. These two factors need to be considered in a non-organisational, as well as an organisational setting. Secondly, as some people have the ability to manage the stressors and demands bestowed on them through cognitive and similar methods, it is important to detect whether the causes are seen as a problem, and if the resultant stressors are actually perceived as normal, high, or severe. Thirdly, employee-specific stress management coping actions can be formulated, containing individual interventions, as well as, organisational interventions. Lastly, the process of stress measurement and stress management should be an on-going process, which ensures that underlying problems are 'surfaced' and treated accordingly.

2.5 LEGISLATION REGARDING STRESS

The Republic of South Africa (RSA) is governed by the Constitution of the RSA, a supreme law that lays the legal framework for citizens in the country to abide by. Directly below the Constitution in the hierarchical structure lies the Bill of Rights, where in Chapter 2 the Occupational H&S Act 85 of 1993 can be found, as also, various other Acts. The OH&S Act governs the various regulations as illustrated in Figure 6, for example, the Construction Regulations. The last two components of the legal framework comprise of the National Standards, as typical example, the South African National Standards and the Individual Standards. The former only being law when mentioned in a regulation, or in a contract document, and the latter, situated at the bottom of the structure, governs organisational sets of rules, such as for example, “everyone needs to use two-way radios on site.”

Figure 6: Hierarchical model of South African government regulation (Brits, 2015)



Most construction site personnel have extended families to some extent. People often ask: what is the main purpose of H&S legislation? A simple answer can be summarised as: “H&S legislation oversees that everyone can finish work safely, and return home to their families uninjured, and so, avoid unintended grief and pain.” Consequently, the construction industry is governed by the OH&S Act, more specifically, the Construction Regulations.

Othman (2012: 182) describes the purpose of the OH&S Act as a legal tool to ensure that fundamental standards are adhered to, and used to monitor the performance of companies. While the OH&S Act, along with the new Construction Regulations of 2014 have seen increased general awareness of H&S in the industry, as also, marginally reduced injuries, it has still resulted in construction professionals not being comfortable in implementing it.

The twelfth edition of the Act intends to create an overall increase in H&S awareness among all stakeholders. Section 37 of the Act proposes to punish clients and employers on grounds of vicarious liability should someone breach the Act. Although a Section 37 (2) contract provides protection against vicarious liability should a contractor (mandatary) breach the contract, if for example, an instruction was carried out under tacit permission, the brunt could rebound back onto the client or employer. In essence, the OH&S Act and a Section 37 (2) contract does not intend to 'police and convict' every party involved, but rather lay down the rules to get everyone to engage in proper safe behaviour, by promoting a more safe environment, as also, healthy employees, by ensuring everyone will be pro-active, including the sub-contractors. If a principal contractor takes the necessary and 'reasonable steps', and an incident still takes place, he should still be 'covered' by a Section 37 (2) contract.

The new Construction Regulations now require a work permit submitted to the DoL on all projects of up to and over R13 million, or where elevated and excavation work of deeper than one meter will take place (Republic of South Africa, 2014: 9). Furthermore, all parties involved will be required to conduct a risk assessment, as also, a professionally prepared H&S plan, supply medical certificates of fitness, and introduction of H&S registration categories. Typically, all H&S officers will be required to register with the South African Council for Project and Construction Management Professions. The question could be asked whether the DoL will be able to cope with the additional administration once applications start to 'flood' in.

Given a brief background to South African legislation relevant to the construction industry, a brief description of the legislation vis-à-vis stress management and injuries can be drawn. Thevan *et al*. (2009: 6) describe the following framework as a simple tool to prevent contractors' non-compliance with the H&S regulations:

- Site specific risk assessment;
- Method statement;
- Safe working procedure;
- H&S induction prior to site establishment;
- Toolbox talks, and
- Encourage participation of H&S strategies.

Othman (2012: 187), who conducted a study among 40 contractors, found the chief causes for contractors' non-compliance to be due to negligence of labourers, labourers not wearing personal protective equipment, uneducated workers, and a lack of supervision. Othman (2012: 187) argues that support from top management is significantly lacking. Furthermore, Othman (2012: 186), who cited the works of Holt (2001), stated in his literature review that the main reason for non-conformance of contractors was loss of concentration of workers.

Although support from top management and the above mentioned procedure can promote compliance with legislation, help reduce contractor non-conformance, relieve employee stress as they feel a greater sense of social support and sense of H&S, a stress management and measurement intervention, as also, a stress detection, mitigation, and management component to the typical risk assessment is still lacking. Construction site personnel showing inadequate levels of concentration 'raises an eyebrow' in terms of possible stressors they could be exposed to, and their current levels of stress experienced. Also, these employees are at risk of injury and subsequent stress due to lack of interest they portray to H&S, and a safe working environment. In essence, management needs to be more proactive with H&S best practices, but also be aware of stress and management thereof.

According to Sieberhagen *et al.* (2009: 23-24), South African legislation on employee psychological wellness is lacking. The OH&S Act deals quite well with the physical aspects, such as, 'keeping employees free from hazards', and 'free from occupational injuries and illnesses', but reference to employee psychological wellness and stress management is literally non-existent, especially when compared to industrialised countries. Sieberhagen *et al*. (2009: 21) further explain that since the 1900s stress has been brought into context in European countries. For example, the United Kingdom prevents stress and promotes work wellness through the H&S at Work Act of 1974, and

the Management of H&S at Work Regulations of 1992. Similarly, the Netherlands have enforced the Working Conditions Act of 1990, which promotes wellbeing at the workplace, and Denmark has promulgated the Working Environment Act of 1975, which promotes the management of psychosocial problems in the workplace. Finland also regulates psychosocial factors, such as 'work that is harmful mentally', through the Finnish OH Care Act of 1978. And Lastly, Germany utilises their national labour law, and their social security law to promote workplace wellbeing, and reduce workplace stress.

Legislation is one way of managing and preventing occupational stress, however, self-regulated 'management standards' and policies implemented by top management will contribute significantly and enhance overall measurement of performance (Sieberhagen *et al.,* 2009: 23).

Sieberhagen *et al.* (2009: 24) also argue that the lack of South African legislation on employee psychological wellness is of concern, and government, as also, employers need to allow for this in the national plan, as also, organisational policies. They further state that to successfully mitigate and manage stress-related risks, a stress risk assessment, employee training, and employee awareness regarding stress management needs to be implemented.

2.6 THE ROLE OF THE DEPARTMENT OF LABOUR

The DoL is the principal government body that regulates H&S and disease prevention in the workplace. The two main Acts applicable to the DoL are the OH&S Act of 1993, as also, the Compensation for Occupational Injuries and Diseases Act (COIDA) of 1993. The intentions are that H&S should be regulated at the workplace through thorough and regular inspections by the department's inspectors, and severely affected workers are given the opportunity to claim from the DoL in terms of the COIDA, if they have suffered a misfortune and proved this through a self-paid medical examination. Furthermore, organisations who have registered their employees with the COIDA protect themselves from possible civil claims for damages in terms of the common law.

The setback that the DoL is facing is that employers do not see this government body as capable of managing H&S in the construction industry, and hence H&S on site is suffering. Geminiani and Smallwood (2008: 9), who cite the work of Strydom (2002) assert

that staff shortages, high turnover, lack of experienced staff, and poor remuneration has crippled the DoL's ability to manage and conduct regular and thorough H&S inspections. Geminiani and Smallwood (2008: 27) further argue that the department is not effective in determining the root cause of fatalities, or exercising its legal power to enforce and manage legislation. Othman (2012: 188) contributes to the findings by concluding that the DoL presents a complacent attitude with regards to their inspections and management systems. A strong H&S culture prevents incidents downstream on site, but requires a team effort from workers, middle management, and directors. Similarly, a system is needed that monitors the 'blitz checks' carried out by the DoL's officers.

Legislation relating to stress management is missing from the OH&S Act, just as legislation regarding the treatment of depression, for example, is missing from the COIDA, due to both not being seen as a form of illness. Even though a site complying with H&S requirements will most definitely prevent mishaps from occurring, the question is still asked: 'Would a safe site still prevent a stressed employee from behaving safely, if this person is not thinking 'clearly', and not incur serious consequences?' The cognitive state of stress is a silent killer that needs to be recognised.

There is 'room' for improvement in the DoL in terms of not only providing more thorough inspections and regulating the construction industry in terms of the OH&S and COIDA, but also to be more open to stress-related incidents, and recognising early stages of stress and treating it similarly to how a normal 'incident' would be treated.

2.7 ERGONOMICS AND STRESS

Ergonomics, which is a study area concerned with the degree of comfort or discomfort a workplace provides to its employees has an influence on certain aspects of stress. Research has shown that both the Indian and South African construction industry is suffering from a range of ergonomic problems (Smallwood and Haupt, 2007: 41). The nature of work undertaken often involves working above shoulder level and below knee height (Merlino *et al*., 2003: 60). Furthermore, the high degree of manual handling of materials and heavy equipment causes all kinds of MSDs, which especially affect the lower and upper back, knees, wrists, and hands (Merlino *et al*., 2003: 59). Employees suffering from any of the latter are at risk of occupational fatality, or serious injury, and the development of stress related illnesses.

According to Smallwood and Haupt (2007: 32), the main ergonomic problems faced by the construction industry are:

- Working in the same position for long periods;
- Bending and twisting the back awkwardly;
- Working in awkward and cramped positions;
- Working when injured or hurt, and
- Handling heavy materials and equipment.

Furthermore, Deacon and Smallwood (2010: 52) assert that construction site personnel from the civil field of work are mostly troubled by MSDs due to the following ergonomic shortfalls:

- Forceful exertions;
- Awkward and static postures;
- Vibration exposure;
- Work repetition, and
- Work duration.

It can be noted from the above that exposure to such situations can be frustrating to construction site personnel, as also, dangerous and stressful to themselves and those around them. The above-mentioned may seem exclusively associated with contractors, and how they run their site operations, but in actual fact, all stages of a project's decisions affect the downstream ergonomics on site. All stakeholders need to be aware of different HIRA tools available to reduce ergonomic problems, especially designers who prepare design drawings and contract specifications (Smallwood, 2009: 60).

Schneider (2001: 1063) argues that construction site personnel are at significant risk of musculoskeletal injury due to the type of work they perform. Construction site personnel's injuries are mostly in the form of MSDs, more specifically, sprains and strains. A literature review conducted on 658 injured construction site personnel in the USA revealed that the construction industry was ranked second after transportation in terms of sprain and strain injuries. Out of the sampled individuals 38% suffered from sprains and strains, and 22% of the injuries were due to overexertion by means of manual lifting of objects, shovelling, and digging (Schneider, 2001: 1058).

A study conducted on South African soil among 25 building and civil construction site personnel of various low-income occupations revealed that they were mostly uneducated and exposed to various forms of MSDs and ergonomic problems. The sample primarily suffered from awkward bending and twisting of their backs and consequent pain in the lower back region on a regular basis (Deacon and Smallwood, 2010: 58). It is notable that the nature of civil work has its own unique features. Such employees are involved with steel fixing, as also, curb laying, which are both ergonomically challenging. Additionally the prevalence of Expanded Public Works Programme type projects enforces the use of labour-intensive construction methods, which are understandably not in favour of sound ergonomic construction methods.

Another study conducted by Smallwood and Haupt (2007: 38) among 112 multi-disciplinary delegates by means of questionnaire ranked the frequency of bending and twisting of construction site personnel's backs as a daily phenomenon, followed by repetitive movements, and noise. The prevalence of back pain and poor back posture, as also, the other unique features from the civil engineering industry in relation to the building industry, such as exposure to vibration needs to be noted, and also how this creates different stressful scenarios.

2.8 HEALTH AND SAFETY AND STRESS

H&S practises are typically poor in developing countries. A study conducted on the contemporary status of H&S in Malawi and Botswana revealed that management commitment is poor, supervision lacks, and H&S training is non-existent (Chiocha and Smallwood, 2011: 77; Musonda and Smallwood, 2008: 61). Furthermore, an abundance of emerging contractors lack the capacity to implement H&S systems in their organisations. There is an overall perception that H&S is the responsibility of the site manager, when in fact, the duties befall upon all stakeholders.

Not only do organisations face significant Cost of Accidents as a result of neglecting H&S, but also, reduced productivity, and a poor reputation of the construction industry as a whole. Construction site personnel are directly affected by poor H&S in the work place, and interestingly enough, desire optimal levels of H&S. Arslan and Kivrak (2009: 338) and Abrey and Smallwood (2014: 9) argue that poor morale and dissatisfaction befalls when training is neglected, H&S is lacking, supervision disregards H&S practises, excessive site

hazards and filthy working conditions prevail, and poor site housekeeping occurs. Consequently, a poor H&S atmosphere on site will engender organisational stressors. It is imperative that H&S performance is improved in South Africa, which faces its own particular set of problems.

Although construction site personnel are mostly at risk of physical hazards and risks pertained to the nature of construction work, they are similarly being threatened by occupational and non-occupational diseases, such as, *inter alia*, HIV and AIDS, respiratory problems like tuberculosis, and skin infections, such as for instance, dermatitis, especially among the older employees (Haupt *et al*., 2005: 16). Again, the abovementioned could cause stress among construction site personnel. Salient findings from a Master's study conducted by Deacon (2003: 136) revealed that construction site personnel are generally not as healthy as they perceive to be. As such, OH provision is essential to prevent or alleviate the above mentioned diseases.

2.9 CONCLUDING REMARKS

This chapter provides an overall understanding of occupational stress and how it links to various professions. It is evident that stress is a problem for most working individuals. However, certain professions warrant a prevalence of higher stress manifestation.

The stress prevalent in the construction industry is noteworthy and opens up an interesting field of untapped knowledge. The peculiar nature of most construction projects creates stressful events to most who partake in it. The literature review indicated that both professionals and the blue-collar workers across the globe undergo stress. Although both groups experience different forms and degrees of stress from varying sources of stressors, it is noteworthy that construction site personnel suffer a lot more, especially from more physical symptoms. What has further been brought to the researcher's attention is the fact that construction site personnel also suffer strikingly more from CED, depression, substance abuse, and severe headaches than their professional counterparts, which is a major problem.

It can be theorised that the abovementioned employees are more likely to be injured on site, as they are not behaving and acting rationally. The literature review further revealed that typical recommendations have been made to counteract stress. These include, EAPs,

stress management and measurement, and promoting H&S, but none of these have been recorded in action. Furthermore, construction site personnel's ability to manage stress through cognitive means is not sufficient. It is imperative that stress be measured in industry, a stress management intervention be tailored, and overall H&S be promoted, by example, providing training to construction site personnel, and setting H&S goals and rewards. This will reduce stress, and so mitigate risks associated to stressful behaviour on site, as also, stress related health problems. Although work is stressful, the occurrence of stress may also be contributable to living standards, which needs to be accounted for.

The macro environment also needs to be factored into the equation. The South African government's legislation, as also, private organisation's policies do not cover the topic of stress at all, in contrast to some Western societies.

Lastly, the common occurrence of MSDs and ergonomic problems in developing countries also contributes to this study area. The prevalence of lower back problems and other stresses and strains are sure to contribute to stress. The nature of construction is still very 'hands on', and MSDs and ergonomic problems cannot be ignored. Furthermore, many South African construction site personnel suffer from diseases, viruses, and bacteria, especially the elderly, and the question may be asked – "does this not contribute to stress?"

The unique nature of the civil engineering sector of the construction industry is largely un-documented with regards to stress, nationally and internationally, which is why this study was intended.

2.10 SUMMARY

This chapter presents the literature pertaining to the study, namely, stress and injury among construction site personnel. Stress is a dependant variable, which is affected by various other independent variables, such as stressors and strains. Construction site personnel are feeling stressed due to typical stressors such as, work overload, long hours, and aspects of the job. Construction is an environment that consists of high severity stressors, when compared to other industries. Consequently, the industry is faced with poor worker commitment, poor worker health, and reduced performance. The job demand-control-support theory of stress has been applied to the construction industry with

supporting validating findings. Furthermore, construction site personnel are more stressed than their ‘white-collar’ professional counterparts.

Stress also causes strain symptoms, such as the emotional symptom of depression. When induced over an extended period of time, this may lead to an injury to take place due to clouded judgement. Hence, the outcome of injury is dependent on an individual’s level of stress experienced, and how well his resources are utilised to adapt. Stress is also not managed within the organisation, and more time off, work-family balance, and management support needs to be provided, as typical examples. The measurement of stress will also contribute to control measures implemented by an organisation’s management.

Legislation and policies regarding stress are lacking in a South African context, when compared to developed countries. Furthermore, the implementing agent, namely, the DoL do not have the capacity to successfully implement such a strategy.

The construction industry is also severely affected by poor ergonomics, MSDs, and a lack of H&S interventions, which is coupled to a stressful working environment. This summary brings a closing to the chapter, and the following chapter will describe the intended research methodology and proposed method of data collection.

CHAPTER 3: RESEARCH DESIGN

3.1 INTRODUCTION

The South African government laid the foundation for an OH legislative framework to be built upon, however, there is not enough regulation to ensure its effective implementation, not only among government departments, but also among private organisations. A vast amount of literature is available, nationally, and internationally, which addresses the field of OH thoroughly, as also, recommendations in terms of stress management interventions. However, no literature is currently available regarding the stress of civil engineering construction personnel, and stress management interventions that have actually been implemented in practice.

The primary aim of this study was to identify the dangers posed to civil engineering construction site personnel and other stakeholders involved as a result of accidents, injuries, and poor overall mental health due to working while feeling stressed. The secondary aim of the study was to make recommendations to the civil engineering construction industry with regards to potential stress management interventions, and to prepare for a related doctoral study.

3.2 RESEARCH METHODOLOGY

3.2.1 NATURE OF THE STUDY

The nature of the study was empirical, and exploratory. The research design made use of descriptive statistics to best describe the data. Data was gathered by means of a questionnaire survey. A quantitative analysis enabled testing of the hypotheses, which is presented in Chapter 4.

3.2.2 RESEARCH OBJECTIVES

The research objectives, previously recorded in Chapter 1 are summarised hereunder, namely to:

- Determine whether site agents and foremen are stressed based on the job demand-control-support theory;
- Determine whether site agents are more stressed than foremen;

- Determine whether injuries and MSDs are predicted by poor ergonomics and working while feeling stressed;
- Determine whether use is made of stress management resources;
- Determine whether H&S and HIRA practices are promoted to a greater extent than that of stress management interventions;
- Establish what physical, mental, and socio-economic stressors affect site personnel in the civil engineering sector of the construction industry, by means of a questionnaire survey;
- Provide recommendations to manage and reduce stress, and
- Identify gaps in OH&S legislation with regards to stress management in the construction industry.

3.2.3 THE DATA

3.2.3.1 THE PRIMARY DATA

Primary data was obtained by means of questionnaire responses from the population sample in question.

3.2.3.2 THE SECONDARY DATA

The secondary data was obtained from sources such as textbooks, journals, conference papers, theses, articles, and the World Wide Web. The data was searched for through various search engines at the Nelson Mandela Metropolitan University's library. The latter, include, *inter alia*, of the following:

- EBSCOhost;
- Emerald Insight;
- Sabinet;
- Sage;
- Science Direct;
- Springer Link, and
- Taylor and Francis.

3.2.4 THE DATA COLLECTION TOOLS

3.2.4.1 QUESTIONNAIRE

One of the instruments that the researcher used was a structured questionnaire covering the following aspects – stress, stress management, employee wellness, H&S practices, HIRAs, and ergonomics. The self-tailored questionnaire was based on information derived from the literature study, such as critical stressors to a vast array of employees from not only the construction industry, but various others as well. Furthermore, the questionnaire was partially designed based on the Hopkins Symptom Checklist, which is an effective tool used to identify anxiety and depression in trauma and torture victims, as also, partially on a workplace stress questionnaire frequently used in the USA, to help employees determine their stress levels.

3.2.4.2 QUESTIONNAIRE VALIDITY AND CALIBARATION

It is important to validate and calibrate a research questionnaire prior to the sampling of data. Collingridge (2014: 5-10) describes the questionnaire validation and calibration process as follows. Firstly, a questionnaire is checked for face validity, this is a process by where a questionnaire is presented to an expert in a particular field, who will peruse it thoroughly prior to approval, or by submission to a psychometrician, who is an expert in questionnaire construction. For the purpose of this study, face validity will be proved by the researcher's supervisor. Secondly, calibration of the questionnaire needs to be performed. This requires a pilot study to be conducted on as many participants as deemed practically possible. Thirdly, underlying components need to be identified by a principal components analysis, which highlights what factors are being measured by your questions. Fourthly, consistency of responses needs to be checked. A standard test of consistency is the determination of the Cronbach's alpha coefficient. Finally, revising and adjusting the questionnaire if necessary.

For the purpose of this study a principal components analysis, as also, the determination of the Cronbach's alpha coefficient were not conducted. However, a pilot study was conducted among several construction workers to test validity and reliability.

3.2.4.3 QUESTIONNAIRE DESIGN

A closed-end questionnaire consisting of a five point Likert scale was adopted. This consisted of various questions, which were answered by respondents and intensity measured according to the above mentioned scale. The questionnaire consisted of three sections covering demographics, stress, stressors, stress management, H&S interventions, HIRAs, injuries, and ergonomics. The questions were designed to gather the following data:

- Personal data, which included, *inter alia*, age, occupation, level of education, and employment information;
- Stress related data, which included, *inter alia,* physical, organisational and socio-economic stressors, depression, physical and psychological stress symptoms, stress management, and employee wellness;
- H&S data, which included, *inter alia,* HIRAs, H&S interventions and occurrences, and
- MSDs and ergonomics, which included, *inter alia*, anatomic regions affected, and prevalence of poor ergonomics.

3.3 SAMPLE DESIGN

The sample selection was based on the following:

- Primary sample unit: civil engineering construction firms in the NMBM;
- Sample element: site agents and foremen working in the civil engineering sector of the construction industry, and
- Sample frame: all civil engineering construction site agents and foremen working in the NMBM.

3.3.1 SAMPLING METHODOLOGY

An empirical study was conducted among 15 medium to large civil engineering contractors extracted from the local business directories and municipal databases, and who operated within the boundaries of the NMBM, taking into consideration they had a Construction Industry Development Board grading of 5CE (civil engineering), or higher. These contractors were reputable organisations, with an established footprint within the

study area, consequently providing a satisfactory representation of the study population. Findings were based on data collected from the researcher's organisation, telephone directories, and client stakeholders. A self-administered questionnaire was delivered by hand and by e-mail, which consisted of three sections. A total of 6 questionnaires – 3 directed at site agents and an additional 3 directed at foremen were distributed per contractor, which equates to a grand total of 90. A completion time of one month was allowed for, where after 21 completed questionnaires were returned to the sender, which equates to a response rate of 23.3%. This was suspected, due to the lack of willingness of construction personnel to complete the questionnaire. Some of the reasons for non-completion were:

- "I do not have time.";
- "This will take too long.";
- "I have lost the copies you sent – please can you provide more.", and
- "I will look at the questionnaire at a later stage."

Although it is theorised that this sample would be homogeneous in nature due to most individuals operating under seemingly similar conditions, a wide spread sampling area would increase the accuracy of the findings, yet result in a costly endeavour. All of the contractors' main operations were based in the NMB Metropolitan area, however, their operational boundaries stretched as far as the Eastern Cape Province's perimeter. A telephonic interview with each contractor's human resources department indicated the estimated number of site agents and foremen employed within the NMBM, as depicted in Table 1 below:

Table 1: Site agents and foremen within the NMBM

Sample frame	**No**	**%**
Site agents	65	37.1
Foremen	110	62.9
Total	175	100

Contact time with the contractors was arranged at eight o'clock in the morning, the probability being that more of the participants would be available during this time, contributed to the early 'start up' times of most contractors. Due to logistical and geographical constraints the researcher did not sample construction site personnel

operating outside the catchment area of the NMBM. However, a minimum of 15, and a maximum of 25 participants were anticipated.

3.4 THE PILOT STUDY

A pilot study was conducted in June 2015, prior to the principal study. Five construction workers from a civil engineering contractor's site in proximity to the researcher's office were approached. The information obtained from the pilot study was not included within this study, albeit, used to validate the intended research questionnaire. It was determined that the majority of the sample were significantly illiterate, and struggled to understand the basic concepts of the questionnaire. Furthermore, the majority of the sample refused to participate in the survey. Also, a possibility of significant bias was evident due to previously mentioned illiterate construction workers, language barriers, and a tendency of the participants to answer the questionnaire in the same manner as their peers. As such, it was decided to substitute the population sample strata of construction workers with site agents and foremen.

3.5 DATA ANALYSIS METHOD

Data was analysed using Microsoft Excel, and summarised and presented in Chapter 4 in the form of mean scores (MSs), frequency distributions, percentages, and rankings. The data was arranged according to the sequence of questions utilised in the questionnaire. Descriptive statistics, such as the MS are popular tools used to present averages and variances respectively, and was incorporated into the analysis of the data.

3.6 LIMITATIONS OF THE STUDY

Participation in the study was exclusively by civil engineering construction personnel. Organisations were contacted telephonically, to establish a convenient time to visit the construction sites, or offices in question. Upon arrival, arrangements were made verbally with the respective person in charge, to enlighten them of the study's intension, as also, its purpose, and contribution to the body of knowledge within the civil engineering sector of the construction industry.

All in all, the survey met minimal resistance. However, higher involvement by the civil engineering construction site personnel could have taken place if geographical constraints

were not as severe, as also, lesser time constraints. Furthermore, the use of an incentive, such as, a ‘lucky draw prize’ would have increased the return rate, albeit subject to bias.

3.6.1 COMMUNICATION BARRIERS

The majority of the participants were fluent in English, however, several individuals preferred correspondence in Xhosa and Afrikaans, utilising these languages as primary means of communication. Hence, the possibility remained that some misinterpretation could have occurred on behalf of the respondents, albeit, the questionnaire was structured practically and simplified in order to minimise this.

3.6.2 PHYSCIAL CONSTRAINTS

Apart from the construction sites located outside the study boundary, no physical constraints were encountered accessing the construction sites / offices within the study boundary.

3.6.3 BIAS

Every effort possibly was made to reduce and prevent the prospect of bias, however, the occurrence of bias remains probable.

3.7 RESEARCH ETHICS

Each contractor was contacted telephonically, to receive permission and consent of the participants in the study.

The questionnaire design ensured no reference was made to employee names for privacy purposes. Furthermore, each questionnaire was given a unique reference code in order to identify specific participants at a later stage, if further data were needed.

3.8 SUMMARY

Chapter 3 provides a summary of the sampling methodology followed in the study. A questionnaire was designed to extract information pertaining to demographics, stress, stressors, depression, H&S, MSDs, and ergonomics from respondents. The sample included site agents and foremen working for medium to large civil engineering

contractors in the NMBM. A pilot study was conducted among several general construction workers, which assisted in refining certain elements of the questionnaire. Data was analysed and presented in the form of descriptive statistics. And lastly, the limitations, communication barriers, physical constraints, bias, and ethics are discussed in this chapter. Chapter 4 to follow presents the analysed data in a structured form, and the coupled discussion on the findings.

CHAPTER 4: RESEARCH RESULTS AND FINDINGS

4.1 INTRODUCTION

This chapter represents a quantitative analysis of the survey data derived from the questionnaire responses. All sections of the questionnaire, as depicted below, were answered by all the participants, in other words, site agents and foremen. The research findings were used to address each sub-problem, as also, test the intended hypotheses.

4.2 RESULTS

Data retrieved from the questionnaire responses were evaluated based on a Likert type five-point scale.

Participants were presented with various statements, which can be summarised as follows:

Table 2: 14 statements pertaining to physical work stressors;
Table 3: 33 statements pertaining to organisational work stressors;
Table 4: 9 statements pertaining to socio-economic stressors;
Table 5: 16 statements pertaining to respondents' prevalence of behavioural patterns and physical sensations of stress;
Table 6: 9 statements pertaining to the prevalence of common sensations of stress;
Table 7: 10 statements pertaining to the prevalence of common sensations of depression;
Table 8: 14 statements pertaining to the frequency of H&S and risk management occurrences;
Table 9: 18 statements pertaining to the frequency of ergonomic problems, and
Table 10: 30 statements pertaining to the extent to which pain is experienced in anatomic regions.

The data emanating from the research questionnaire survey was analysed and interpreted by means of the calculation of descriptive statistics in the form of frequency distributions and a measure of central tendency in order to calculate MSs. A Likert point scale was adopted in the questionnaire to form scale ranges from 1 to 5, 1 being not at all / never, to 5 very much / hourly, to allow the calculation of MSs as follows:

$$MS = (1n_1 + 2n_2 + 3n_3 + 4n_4 + 5n_5) / (n_1 + n_2 + n_3 + n_4 + n_5 - n_6)$$

Furthermore, given that the difference between the lower and upper ends of the five points on a Likert scale is equal to 4 (5 - 1), the extent of the ranges is determined by dividing 4.00 by 5, which equates to 0.80. The ranges relative to the MS categories are thus defined as follows:

> 4.20 ≤ 5.00 – Greater extent to very much / very much;
> 3.40 ≤ 4.20 – Some extent to a greater extent / greater extent;
> 2.60 ≤ 3.40 – Lesser extent to some extent / some extent;
> 1.80 ≤ 2.60 – Not at all to a lesser extent / lesser extent, and
≥ 1.00 ≤ 1.80 – Not at all to a lesser extent.

As also, MSs for ranges according to frequency:

> 4.20 ≤ 5.00 – Daily to hourly / hourly;
> 3.40 ≤ 4.20 – Weekly to daily / daily;
> 2.60 ≤ 3.40 – Monthly to weekly / weekly;
> 1.80 ≤ 2.60 – Never to monthly / monthly, and
≥ 1.00 ≤ 1.80 – Never to monthly.

Table 2 indicates the extent to which respondents experience physical stressors during their working hours, and how stressful they perceive them, in terms of percentage responses to a scale of 1 (Not at all) to 5 (Very much), and MSs between a minimum value of 1.00 and a maximum value of 5.00. It is notable that the statements 'Using dirty and unhygienic toilet facilities', 'Using unreliable, unsuitable, and old tools', 'Working on an untidy and unhealthy site', 'Working with poor H&S equipment', and 'Not being able to wear H&S gear when on site' have MSs > the midpoint score of 3.00, which indicates that civil engineering construction site agents and foremen rate their exposure to physical stressors affecting their H&S on site as very much, as opposed to not at all. The remaining statements have MSs < 3.00, which indicates that civil engineering construction site agents and foremen rate their exposure to general non H&S related physical stressors on site as not at all, as opposed to very much. It is notable that no stressors have MSs > 4.20 ≤ 5.00 – greater extent to very much / very much.

These findings support the perception that hygienic toilet facilities are paramount, as unhygienic toilets are not only a major health risk, but also a violation of a person's human rights. Similarly, correct, safe and functioning tools provide for safer work practises, which are equally as important to avert the effects of unsatisfactory working conditions (Abrey and Smallwood, 2014: 8). Consequently, all construction industry stakeholders should take note of the aforementioned, and endeavour to provide construction site personnel with the required resources to function, including sanitary toilet facilities. Furthermore, poor H&S on site hampers an individual's ability to satisfy his second level security needs in terms of Maslow's hierarchy of needs, namely H&S, and which if left deferred will result in the inability to manage stress effectively (Werner *et al*., 2014: 86).

An illustration of the physical stressors per MS range offers further understanding to percentage responses in terms of the physical stressors experienced:

- > 3.40 ≤ 4.20 (some extent to a greater extent / greater extent): four (28.6%) out of fourteen physical stressors fall within this range;
- > 2.60 ≤ 3.40 (lesser extent to some extent / some extent): three (21.4%) out of fourteen physical stressors fall within this range;
- > 1.80 ≤ 2.60 (not at all to a lesser extent / lesser extent): six (42.9%) out of fourteen physical stressors fall within this range, and

- ≥ 1.00 ≤ 1.80 (not at all to a lesser extent): one (7.1%) out of fourteen physical stressors falls within this range.

Although the notion of repetitive work is a known cause of stress among construction workers, it is not as predominant among white-collar construction personnel, therefore ranked lower. The statement 'Not being able to wash your hands and legs after work' equates to your cleanliness and personal hygienic needs, and 'Changing sites or job tasks frequently' relates to your control of the working environment. These findings were reported in the literature review and need to be addressed.

It is notable that the statement 'Not being able to wear H&S gear when on site' is less stressful than the previous' range's statement 'Working with poor H&S equipment'. The reason for the latter being more stressful might be contributable to the fact that construction site personnel find poor H&S equipment a more significant and direct threat to their H&S, while H&S gear gets overlooked and regarded as a burden, which needs to be merely complied with.

Civil engineering construction work regularly takes place on muddy and dusty terrains, which is inconvenient to most. Physically demanding work not only gets carried out by construction workers, as site agents and foremen also get involved with the handling and lifting of heavy equipment, such as for example, water pumps and generators. Construction workers lack the competence / experience to operate small plant, as most are untrained temporary workers. The stressors 'Noise from tools and machines', 'Working in hot weather', and 'Working with concrete and other chemical products' were anticipated, as the literature highlighted these as potential causes of concern. The use of vibratory equipment is deemed as not at all to a lesser extent experienced. However, it is theorised that majority of the respondents do not work with vibratory equipment on a regular basis.

Table 2: Extent to which physical stressors are experienced

Physical stressor	Response (%)						MS	Rank
	Unsure	Not at all……Very much						
		1	2	3	4	5		
Using dirty and unhygienic toilet facilities	0.0	0.0	14.3	23.8	9.5	52.4	4.00	1=
Using unreliable, unsuitable, and old tools	0.0	0.0	14.3	23.8	9.5	52.4	4.00	1=
Working on an untidy and unhealthy site	0.0	0.0	9.5	23.8	33.3	33.3	3.90	3
Working with poor H&S equipment	0.0	4.8	9.5	28.6	23.8	33.3	3.71	4
Not being able to wear H&S gear when on site	0.0	19.0	9.5	19.0	19.0	33.3	3.38	5
Performing repetitive work	0.0	14.3	23.8	23.8	33.3	4.8	2.90	6=
Not being able to wash your hands and legs after working	4.8	23.8	14.3	19.0	9.5	28.6	2.90	6=
Changing sites or job tasks frequently	0.0	28.6	19.0	23.8	23.8	4.8	2.60	8
Working in dust, mud, or dirt	0.0	23.8	28.6	33.3	14.3	0.0	2.38	9
Performing physically demanding work	0.0	23.8	42.9	19.0	14.3	0.0	2.24	10
Noise from tools and machines	0.0	28.6	38.1	23.8	4.8	4.8	2.19	11
Working in hot weather	0.0	23.8	47.6	19.0	9.5	0.0	2.14	12
Working with concrete and other chemical products	0.0	42.9	23.8	23.8	9.5	0.0	2.00	13
Working with vibratory equipment	4.8	38.1	42.9	9.50	4.8	0.0	1.71	14

Table 3 indicates the extent to which respondents experience organisational stressors during their working hours, and how stressful they perceive them in terms of percentage responses to a scale of 1 (Not at all) to 5 (Very much), and MSs between a minimum value of 1.00 and a maximum value of 5.00. It is notable that with the exception of the statements 'Limited time spent with family and friends', 'Tight deadlines', 'Inadequate reward system', and 'Work-life imbalance', all organisational stressors have MSs < the midpoint score of 3.00, which indicates that civil engineering construction site agents and foremen rate their extent to which organisational stressors are experienced at not at all, as opposed to very much. It is notable that no stressors have MSs > 4.20 ≤ 5.00 – greater extent to very much / very much.

The MSs > the midpoint score of 3.00 are of significance, as it corroborates with the findings of Bowen *et al*. (2012: 401), who observed construction professionals' inability to achieve a work-family balance, and that the stressor is one of the three most difficult / significant stressors to manage. Construction stakeholders need to take note, as social support at the workplace, as also, the home environment would assist employees to cope with stressful work situations. Karasek's demand, control, and social support theory is strongly supported here. More and more construction professionals report increasingly tighter deadlines, diminished social support at work, and a lack of recognition of work done from their superiors.

An illustration of the organisational stressors per range offers further understanding to percentage responses in terms of the organisational stressors experienced:

- > 2.60 ≤ 3.40 (lesser extent to some extent / some extent): thirteen (39.4%) out of thirty-three organisational stressors fall within this range, and
- > 1.80 ≤ 2.60 (not at all to a lesser extent / lesser extent): twenty (60.6%) out of thirty-three organisational stressors fall within this range.

The findings reported in Table 3 follow fairly predictable lines: It is obvious that most respondents do not expect their employers to make a significant attempt to improve their work condition in terms of work life vis-à-vis personal life. Employers need to focus on leadership development, as also, motivational team building exercises.

Table 3: Extent to which organisational stressors are experienced

Organisational stressor	Response (%)						MS	Rank
	Unsure	Not at all.....……Very much						
		1	2	3	4	5		
Limited time to spend with my family and friends	0.0	4.8	28.6	14.3	28.6	23.8	3.38	1
Tight deadlines	0.0	9.5	23.8	23.8	19.0	23.8	3.24	2
Inadequate reward system	0.0	0.0	42.9	14.3	38.1	4.8	3.05	3=
Work-life imbalance	0.0	14.3	19.0	23.8	33.3	9.5	3.05	3=
Communication barriers	4.8	14.3	9.5	42.9	14.3	14.3	2.90	5=
Lack of resources	4.8	14.3	14.3	28.6	28.6	9.5	2.90	5=
High job demand	0.0	14.3	28.6	19.0	28.6	9.5	2.90	5=
Inadequate feedback regarding work done	0.0	14.3	28.6	23.8	23.8	9.5	2.86	8
Current work load	0.0	9.5	28.6	42.9	9.5	9.5	2.81	9
Poor career growth potential	4.8	14.3	33.3	14.3	14.3	19.0	2.76	10
Low job social support	0.0	19.0	33.3	19.0	14.3	14.3	2.71	11=
Poor salary / wage	0.0	23.8	23.8	23.8	14.3	14.3	2.71	11=
Looking after the H&S of fellow employees	4.8	14.3	19.0	38.1	14.3	9.5	2.71	11=
Lack of commitment from my employer	0.0	23.8	23.8	38.1	4.8	9.5	2.52	14=
Inability to express my opinion on job tasks given	0.0	23.8	28.6	28.6	9.5	9.5	2.52	14=
Lack of social activities	0.0	23.8	33.3	23.8	9.5	9.5	2.48	16=
Insufficient time off	0.0	33.3	19.0	23.8	14.3	9.5	2.48	16=
Long work hours	0.0	28.6	23.8	23.8	19.0	4.8	2.48	16=
Low job control	0.0	23.8	28.6	28.6	14.3	4.8	2.48	16=
Relationship between me and my peers	0.0	23.8	28.6	28.6	14.3	4.8	2.48	16=

Frequent travelling	0.0	33.3	28.6	14.3	14.3	9.5	2.38	21
Fear of losing my job	0.0	42.9	23.8	9.5	4.8	19.0	2.33	22
High degree of organisational change	0.0	23.8	38.1	23.8	14.3	0.0	2.29	23
Nature of my work	4.8	19.0	42.9	23.8	0.0	9.5	2.24	24=
Work atmosphere	0.0	42.9	14.3	23.8	14.3	4.8	2.24	24=
Nature of business operations	4.8	19.0	38.1	28.6	9.5	0.0	2.19	26
Lack of respect from my peers	0.0	33.3	38.1	14.3	9.5	4.8	2.14	27
Inadequate training and mentoring by my employer	0.0	33.3	33.3	23.8	9.5	0.0	2.10	28
Inadequate freedom of autonomy	0.0	47.6	23.8	14.3	4.8	9.5	2.05	29=
Lack of respect from my superior	19.1	14.3	19.0	38.1	9.5	0.0	2.05	29=
Witnessing of injuries / accidents take place	0.0	42.9	28.6	19.0	4.8	4.8	2.00	31=
Relationship between me and my superior	4.8	47.6	19.0	14.3	0.0	14.3	2.00	31=
Communication between me and my superior	4.8	47.6	23.8	14.3	4.8	4.8	1.81	33

Table 4 indicates the extent to which the respondents experience socio-economic stressors. The factors are presented in terms of percentage responses to a scale of 1 (Not at all) to 5 (Very much), and MSs between a minimum value of 1.00 and a maximum value of 5.00. It is notable that with the exception of the statement 'Level of crime', all the socio-economic stressors have MSs < the midpoint score of 3.00, which indicates that civil engineering construction site agents and foremen rate their extent to which socio-economic stressors are experienced as not at all, as opposed to very much. However, the statement 'Level of crime', which has a MS > the midpoint score of 3.00, is of significance, as South Africa suffers from one of the highest crime rates in the world, and this evidently impacts negatively on the mental and physical wellbeing of the majority of the South African population. It is notable that no stressors have MSs > 4.20 ≤ 5.00 – greater extent to very much / very much.

An illustration of the socio-economic stressors per range offers further understanding to percentage responses with regards to the socio-economic stressors experienced:

- > 3.40 ≤ 4.20 (some extent to a greater extent / greater extent): one (11.1%) out of nine socio-economic stressors fall within this range;
- > 2.60 ≤ 3.40 (lesser extent to some extent / some extent): one (11.1%) out of nine socio-economic stressors fall within this range, and
- > 1.80 ≤ 2.60 (not at all to a lesser extent / lesser extent): seven (77.8%) out of nine socio-economic stressors fall within this range.

Although not deemed as significant, the existence of non-occupational stressors still affect the individual at their workplace, as also, home environment, and consequently increases sensitivity to the more commonly occurring occupational stressors leading to 'enhanced' stress levels. It is notable that both the statements 'Financial stability', and the previously mentioned 'Poor salary / Wage' have similar MSs of 2.90 and 2.71 respectively, albeit, the former with a slightly higher MS. This implies that respondents might not be completely dissatisfied with their salaries, but experience greater difficulties administrating their overall finances. It is imagined that a dirty and polluted environment is referred to in a general public sense, additionally, more exercise and a better education is desired by the respondents. It is notable that access to clean water and sanitation, and health facilities are reported as a stressor. However, this once again is likely referred to public service delivery in a general sense. Lastly, the statements 'Nutritional intake', as also, 'Relationship with friends' indicates respondents' general wellness would not necessarily benefit from a more balanced diet, whereas spending less time with friends was expected to be not as vital as that of spending time with family / loved ones.

Table 4: Extent to which socio-economic stressors are experienced

Socio-economic stressor	Response (%)						MS	Rank
	Unsure	Not at all……...……..…Very much						
		1	2	3	4	5		
Level of crime	0.0	9.5	19.0	23.8	14.3	33.3	3.43	1
Financial stability	0.0	19.0	23.8	23.8	14.3	19.0	2.90	2
Dirty and polluted neighbourhood	0.0	42.9	9.5	23.8	4.8	19.0	2.48	3=
Level of exercise	0.0	33.3	19.0	23.8	14.3	9.5	2.48	3=

Access to clean water and sanitation	0.0	38.1	23.8	9.5	9.5	19.0	2.48	3=
Current level of education	0.0	28.6	23.8	33.3	14.3	0.0	2.33	6
Access to health facilities	0.0	42.9	19.0	19.0	4.8	14.3	2.29	7
Nutritional intake	4.7	33.3	23.8	28.6	4.8	4.8	2.10	8
Relationship with friends	0.0	57.1	9.5	23.8	9.5	0.0	1.86	9

Table 5 indicates the extent to which respondents experience behavioural patterns and physical sensations of stress, in terms of percentage responses to a scale of 1 (Not at all) to 5 (Very much), and MSs between a minimum value of 1.00 and a maximum value of 5.00. It is notable that with the exception of the statements 'Tense muscles', and 'Headaches', all the behavioural patterns and physical sensations of stress have MSs < the midpoint score of 3.00, which indicates that civil engineering construction site agents and foremen rate their extent to which behavioural patterns and physical sensations of stress are experienced at not at all, as opposed to very much. An outcome of stress is tense muscles. Stress invokes constant raised shoulders and puts pressure on jaw muscles, affecting the nutrition in the muscles resulting in constant pain (Kvarnstrom, 1997: 2). Furthermore, the prevalence of headaches among stressed construction site personnel can subsequently lead to clouded judgement and injury on site (Abbe *et al*., 2011: 116). It is notable that no behavioural patterns / physical sensations have MSs > 4.20 ≤ 5.00 – greater extent to very much / very much.

An illustration of the behavioural patterns and physical sensations per range offers further understanding to percentage responses in terms of the behavioural patterns and physical sensations experienced:

- > 2.60 ≤ 3.40 (lesser extent to some extent / some extent): two (12.5%) out of sixteen behavioural patterns / physical sensations fall within this range;
- > 1.80 ≤ 2.60 (not at all to a lesser extent / lesser extent): three (18.8%) out of sixteen behavioural patterns / physical sensations fall within this range, and
- ≥ 1.00 ≤ 1.80 (not at all to a lesser extent): eleven (68.7%) out of sixteen behavioural patterns / physical sensations fall within this range.

Although marginally, it is still notable that the respondents use substances to some degree to cope or deal with stress, as was noted in the work of Tiwary *et al*. (2013: 216-217), which is a concern. However, being a self-contained matter, it is possible that these behavioural patterns / physical sensations could have been subject to bias, and consequently of higher severity than what was observed.

Table 5: Extent to which behavioural patterns and physical sensations are experienced

Sensation / Activity	Response (%)						MS	Rank
	Unsure	Not at all……....Very much						
		1	2	3	4	5		
Tense muscles	0.0	9.5	23.8	33.3	23.8	9.5	3.00	1=
Headaches	0.0	0.0	42.9	23.8	23.8	9.5	3.00	1=
Smoke cigarettes	0.0	61.9	0.0	9.5	23.8	4.8	2.10	3
Consume excessive coffee	0.0	47.6	23.8	14.3	9.5	4.8	2.00	4
Consume excessive alcohol	4.8	42.9	23.8	19.0	9.5	0.0	1.86	5
Breathlessness	0.0	71.4	9.5	9.5	4.8	4.8	1.62	6
High blood pressure	0.0	66.7	19.0	4.8	9.5	0.0	1.57	7
Dizziness	0.0	71.4	14.3	9.5	4.8	0.0	1.48	8=
High cholesterol	9.5	61.9	19.0	0.00	0.0	9.5	1.48	8=
Nausea	0.0	66.7	23.8	9.5	0.0	0.0	1.43	10
Trembling hands	0.0	85.7	4.8	4.8	4.8	0.0	1.29	11=
Asthma	4.8	76.2	4.8	14.3	0.0	0.0	1.29	11=
Heart disease	4.8	90.5	4.8	0.0	0.0	0.0	1.00	13=
Take drugs	4.8	95.2	0.0	0.0	0.0	0.0	1.00	13=
Diabetes	4.8	95.2	0.0	0.0	0.0	0.0	1.00	13=

Epilepsy	4.8	95.2	0.0	0.0	0.0	0.0	1.00	13=

Table 6 indicates the extent to which respondents experience sensations of stress with statements regarding sensations experienced, and how frequently they occur, which provides an early identification of stress. The factors were presented in terms of percentage responses to a scale of 1 (Not at all) to 5 (Very much), and MSs between a minimum value of 1.00 and a maximum value of 5.00. It is notable that all the common sensations of stress have MSs < the midpoint score of 3.00, which indicates that civil engineering construction site agents and foremen rate their extent to which common sensations of stress are experienced as not at all, as opposed to very much. It is notable that no common sensations of stress have MSs > 4.20 ≤ 5.00 – greater extent to very much / very much.

An illustration of the common sensations of stress per range offers further understanding to percentage responses in terms of the common sensations of stress experienced:

- > 2.60 ≤ 3.40 (lesser extent to some extent / some extent): two (22.2%) out of nine common sensations of stress fall within this range, and
- > 1.80 ≤ 2.60 (not at all to a lesser extent / lesser extent): seven (77.8%) out of nine common sensations of stress fall within this range.

The nine statements presented in Table 6 give an early indication of stress, and the total average MS of 2.40 states that on average, the respondents are experiencing stress to a degree of not at all to a lesser extent / lesser extent.

Table 6: Extent to which common sensations of stress are experienced

Sensation	Response (%)						MS	Rank
	Unsure	Not at all…..……..…Very much						
		1	2	3	4	5		
Tired, weak, or no energy	0.0	23.8	28.6	19.0	9.5	19.0	2.71	1
Restless, or on edge	0.0	28.6	14.3	23.8	33.3	0.0	2.62	2
Irritable	0.0	23.8	23.8	28.6	23.8	0.0	2.52	3
Wake up during the night	0.0	33.3	14.3	33.3	9.5	9.5	2.48	4=
Difficulty in sleeping	0.0	33.3	28.6	4.8	23.8	9.5	2.48	4=
Tension	0.0	19.0	28.6	42.9	9.5	0.0	2.43	6
Difficulty in concentrating	0.0	23.8	38.1	28.6	9.5	0.0	2.24	7
Anxiety	0.0	38.1	19.0	33.3	9.5	0.0	2.14	8
Sleep excessively	0.0	47.6	19.0	23.8	4.8	4.8	2.00	9

Table 7 indicates the extent to which respondents experience sensations linked to depression. The factors were presented in terms of percentage responses to a scale of 1 (Not at all) to 5 (Very much), and MSs between a minimum value of 1.00 and a maximum value of 5.00. It is notable that all the common sensations of depression have MSs < the midpoint score of 3.00, which indicates that civil engineering construction site agents and foremen rate the extent to which common sensations of depression are experienced as not at all, as opposed to very much. It is notable that no common sensations of depression have MSs > 4.20 ≤ 5.00 – greater extent to very much / very much.

An illustration of the common sensations of depression per range offers further understanding to percentage responses in terms of the common sensations of depression experienced:

- > 1.80 ≤ 2.60 (not at all to a lesser extent / lesser extent): six (60.0%) out of ten common sensations of depression fall within this range, and

- ≥ 1.00 ≤ 1.80 (not at all to a lesser extent): four (40.0%) out of ten common sensations of depression fall within this range.

It is notable that the findings of Abbe *et al*. (2011: 116) uncovered that the feeling of sadness was related to overall experience for all the participants in their study, and corresponds to the above-mentioned. The ten sensations presented in Table 7 gives an early indication of the prevalence of depression. The total average MS is 1.79, which is ≥ 1.00 ≤ 1.80, and not at all to a lesser extent. This was anticipated, as depression is generally expected to be more severe among blue-collar construction workers' harsher working environments, as opposed to the target population. However, it is still an early warning sign that needs to be brought to attention.

Table 7: Extent to which common sensations of depression are experienced

Sensation	Response (%)						MS	Rank
	Unsure	Not at all……..……..…Very much						
		1	2	3	4	5		
Sad or down	0.0	33.3	33.3	14.3	9.5	9.5	2.29	1
Restlessness	0.0	38.1	28.6	9.5	19.0	4.8	2.24	2
Decrease / Increase in appetite	0.0	42.9	19.0	28.6	4.8	4.8	2.10	3
Don't enjoy things I used to	0.0	42.9	28.6	19.0	9.5	0.0	1.95	4
Loss of interest	0.0	38.1	38.1	19.0	4.8	0.0	1.90	5
Decrease / Increase in weight	0.0	52.4	23.8	14.3	4.8	4.8	1.86	6
Feeling worthless	0.0	57.1	19.0	19.0	4.8	0.0	1.71	7
Talk or move slowly	0.0	66.7	28.6	4.8	0.0	0.0	1.40	8
Hurt myself	0.0	85.7	9.5	4.8	0.0	0.0	1.19	9
Suicidal intentions	4.8	85.7	4.8	0.0	4.8	0.0	1.14	10

Table 8 indicates the frequency of H&S and risk management occurrences of respondents' sites, giving a yardstick to the degree of H&S promotion in the civil engineering sector of the construction industry. The factors were presented in terms of percentage responses to a scale of 1 (Not at all) to 5 (Very much), and MSs between a minimum value of 1.00 and a maximum value of 5.00. It is notable that with the exception of the statements 'Workers monitor each other's H&S ', 'Workers proceed with dangerous tasks', 'HIRA training', and 'Accidents on site', all of the H&S and risk management interventions / occurrences have MSs > the midpoint score of 3.00, which indicates that civil engineering construction site agents and foremen rate their extent to which of H&S and risk management interventions / occurrences take place as very much, as opposed to not at all. It is notable that the statement 'H&S induction' has a MS > 4.20 ≤ 5.00 – greater extent to very much / very much, which indicates that the civil engineering sector of the construction industry is proactive regarding H&S interventions.

An illustration of the H&S and risk management interventions / occurrences per range offers further understanding to percentage responses in terms of the frequency of H&S and risk management interventions / occurrences:

- > 4.20 ≤ 5.00 (greater extent to very much / very much): one (7.1%) out of fourteen H&S and risk management interventions / occurrences fall within this range;
- > 3.40 ≤ 4.20 (some extent to a greater extent / greater extent): seven (50.0%) out of fourteen H&S and risk management interventions / occurrences fall within this range;
- > 2.60 ≤ 3.40 (lesser extent to some extent / some extent): three (21.5%) out of fourteen H&S and risk management interventions / occurrences fall within this range;
- > 1.80 ≤ 2.60 (not at all to a lesser extent / lesser extent): two (14.3%) out of fourteen H&S and risk management interventions / occurrences fall within this range, and
- ≥ 1.00 ≤ 1.80 (not at all to a lesser extent): one (7.1%) out of fourteen H&S and risk management interventions / occurrences fall within this range.

It is notable that the majority of the statements scored seemingly high MSs, apart from the statement 'Accidents on site'.

Table 8: Frequency of H&S and risk management occurrences

Occurrence	Response (%)						MS	Rank
	Unsure	Not at all……...……Very much						
		1	2	3	4	5		
H&S induction	0.0	0.0	4.8	19.0	19.0	57.1	4.29	1
Correct use of equipment / body position when instruction is given to execute a task	0.0	0.0	4.8	19.0	47.6	28.6	4.00	2=
Safe work procedures	0.0	0.0	0.0	28.6	42.9	28.6	4.00	2=
Toolbox talks	0.0	0.0	9.5	19.0	42.9	28.6	3.90	4
Participation in H&S strategies	0.0	0.0	4.8	33.3	33.3	28.6	3.86	5
Reference to H&S upon instruction to a worker to undertake a task	4.8	0.0	9.5	19.0	47.6	19.0	3.62	6
Method statements	0.0	0.0	28.6	19.0	28.6	23.8	3.48	7
Hazard identification and risk assessments (HIRAs)	4.8	4.8	14.3	19.0	33.3	23.8	3.43	8
Reporting of injuries	0.0	19.0	19.0	19.0	14.3	28.6	3.14	9
Pre-activity HIRAs	9.5	0.0	28.6	14.3	28.6	19.0	3.10	10
Workers monitor each other's H&S	0.0	4.8	42.9	19.0	19.0	14.3	2.95	11
Workers proceed with dangerous tasks	4.8	14.3	23.8	33.3	23.8	0.0	2.57	12
HIRA training	14.3	14.3	23.8	23.8	19.0	4.8	2.33	13
Accidents on site	0.0	47.6	42.9	4.80	4.8	0.0	1.67	14

Table 9 indicates the frequency at which ergonomic problems are experienced by respondents. MSs were computed vis-à-vis frequencies, and ranked accordingly, where 5 is 'Hourly', and 1 is 'Never'. It is notable that with the exception of the statements 'Noise', 'Bending and twisting the back', 'Repetitive movements', and 'Working in cold conditions', all of ergonomic problems have MSs < the midpoint score of 3.00, which indicates that civil engineering construction site agents and foremen rate their frequency to which of ergonomic problems occur as never, as opposed to hourly. It is notable that no ergonomic problems have MSs > 4.20 ≤ 5.00 – daily to hourly / hourly. It is notable that the respondents experience a wide range of ergonomic problems on a daily basis. The exposure to noise is significant, as prolonged exposure to noise may cause hearing impairment, hypertension, ischemic heart disease, annoyance, and sleep disturbance (Passchier-Vermeer and Passchier, 2000: 126-129). Furthermore, excessive noise is stressful, as was revealed by the findings of Smallwood and Ehrlich (1999: 355). Bending and twisting the back was reported as a major problem facing the construction industry in the literature review. Furthermore, repetitive movements promote muscle tension, fatigue, and subsequent stress or injury, whereas, the back is one of the most injured / exposed body parts among construction workers. It is notable that the statement 'Working in cold conditions' is reported as more common than 'Hot conditions', and might be seen as more stressful to respondents.

An illustration of the ergonomic problems per range offers further understanding to percentage responses in terms of the frequency of ergonomic problems experienced:

- > 3.40 ≤ 4.20 (weekly to daily /daily): three (16.7%) out of fourteen ergonomic problems fall within this range;
- > 2.60 ≤ 3.40 (monthly to weekly / weekly): eight (44.4%) out of fourteen ergonomic problems fall within this range;
- > 1.80 ≤ 2.60 (never to monthly / monthly): six (33.3%) out of fourteen ergonomic problems fall within this range, and
- ≥ 1.00 ≤ 1.80 (never to monthly): one (5.6%) out of fourteen ergonomic problems fall within this range.

The statements 'Same position for long periods', and 'Use of body force' is problematic in an ergonomic sense, and not just a concern among blue-collar construction workers, as is the general thinking.

The statement ‘Working while hurt or injured’ is notable, as respondents might be weary of the possible outcomes regarding ‘work while injured’. It is crucial to note that the aforementioned ergonomic problems affect not only the respondents, but the civil engineering sector of the construction industry as a whole on a daily basis, and needs to be managed. For example, reaching away, or work above shoulder height contributes to a significant amount of work-related musculoskeletal disorders (WMSDs), and subsequent stress.

Table 9: Frequency of ergonomic problems

Ergonomic problem	Response (%)						MS	Rank
	Unsure	Never	Monthly	Weekly	Daily	Hourly		
Noise	0.0	0.0	0.0	9.5	71.4	19.0	4.10	1
Bending and twisting the back	0.0	0.0	19.0	23.8	42.9	14.3	3.52	2
Repetitive movements	4.8	4.8	9.50	14.3	57.1	9.5	3.43	3
Working in cold conditions	4.8	0.0	14.3	33.3	47.6	0.0	3.19	4
Hot conditions	9.5	0.0	14.3	38.1	38.1	0.0	2.95	5
Reaching away from the body	4.8	19.0	14.3	9.5	52.4	0.0	2.86	6
Use of body force	4.8	19.0	14.3	23.8	33.3	4.8	2.76	7
Same position for long periods	4.8	19.0	19.0	19.0	33.3	4.8	2.71	8=
Working in humid conditions	4.8	4.8	33.3	33.3	19.0	4.8	2.71	8=
Awkward positions	4.8	9.5	23.8	42.9	19.0	0.0	2.62	10=
Working in wet conditions	4.8	0.0	47.6	28.6	14.3	4.8	2.62	10=
Reaching overhead	4.8	19.0	23.8	28.6	19.0	4.8	2.52	12=
Climbing and descending	0.0	23.8	28.6	23.8	19.0	4.8	2.52	12=
Handling heavy materials	4.8	14.3	28.6	38.1	9.5	4.8	2.48	14
Handling heavy equipment	4.8	23.8	23.8	23.8	19.0	4.8	2.43	15
Working with vibratory equipment	4.8	38.1	14.3	33.3	9.5	0.0	2.05	16

Working in cramped positions	4.8	42.9	28.6	14.3	4.8	4.8	1.86	17
Working while hurt or injured	4.8	76.2	4.8	4.8	9.5	0.0	1.38	18

Table 10 indicates the extent to which pain is experienced in anatomic regions. MSs were computed vis-à-vis frequencies, and ranked accordingly, where 5 is 'Hourly', and 1 is 'Never'. It is notable that all of the anatomic regions experiencing pain have MSs < the midpoint score of 3.00, which indicates that civil engineering construction site agents and foremen rate their frequency to which of anatomic regions experience pain as never, as opposed to hourly. It is notable that no anatomic regions have MSs > 4.20 ≤ 5.00 – daily to hourly / hourly.

An illustration of the anatomic regions experiencing pain per range offers further understanding to percentage responses in terms of the frequency of anatomic regions experiencing pain:

- > 1.80 ≤ 2.60 (never to monthly / monthly): one (3.3%) out of thirty anatomic regions experiencing pain fall within this range, and
- ≥ 1.00 ≤ 1.80 (never to monthly): twenty-nine (97.7%) out of thirty anatomic regions experiencing pain fall within this range.

It is notable that the statements 'Head', and 'Neck' are reported, as this could relate to sensations of headaches, and tense muscles, which is linked to the outcomes of stress. WMSDs have been common since the beginnings of construction, dating back to near 2500 BC, during the construction of the pyramids of Giza. Although the prevalence of WMSDs are not as common as would be expected among blue-collar construction workers, it is still present among white-collar construction workers, such as, foremen and site agents, demonstrating involvement in a 'hands on' manner is a normal work function within the civil engineering sector of the construction industry. Furthermore, the above mentioned findings relate to those of Guo *et al*. (2004: 28), who found that the neck, shoulders, hands, and wrists were affected by more than 10% of the observed sample. Also, the exposure to ergonomic problems, as depicted in Table 9 correlates with the findings in Table 10 below. Although minute, the respondents still show signs of WMSDs due to the work they do, as also, the fact that majority experience tense muscles, the possibly of augmenting the current ergonomic areas experiencing pain is highly likely.

Table 10: Extent to which pain is experienced in anatomic regions

Anatomic region	Response (%)						MS	Rank
	Unsure	Never	Monthly	Weekly	Daily	Hourly		
Head	4.8	38.1	19.0	23.8	14.3	0.0	2.05	1
Neck	4.8	47.6	19.0	19.0	9.5	0.0	1.81	2
Right shoulder	0.0	57.1	28.6	9.5	0.0	4.8	1.67	3
Left shoulder	4.8	61.9	19.0	9.5	0.0	4.8	1.52	4
Left wrist	4.8	61.9	19.0	9.5	4.8	0.0	1.48	5=
Right ankle	0.0	71.4	14.3	9.5	4.8	0.0	1.48	5=
Pelvis	4.8	61.9	23.8	4.8	4.8	0.0	1.43	7
Left knee	4.8	66.7	23.8	0.0	0.0	4.8	1.38	8=
Left hand (palm)	4.8	66.7	14.3	14.3	0.0	0.0	1.38	8=
Right hand (palm)	4.8	66.7	14.3	14.3	0.0	0.0	1.38	8=
Right wrist	0.0	71.4	19.0	9.5	0.0	0.0	1.38	8=
Right foot	9.5	66.7	14.3	4.8	4.8	0.0	1.29	12=
Right upper leg (thigh)	0.0	71.4	28.6	0.0	0.0	0.0	1.29	12=
Chest	4.8	71.4	19.0	0.0	4.8	0.0	1.29	12=
Right knee	4.8	66.7	28.6	0.0	0.0	0.0	1.24	15=
Right upper arm	4.8	71.4	19.0	4.8	0.0	0.0	1.24	15=
Left forearm	4.8	71.4	19.0	4.8	0.0	0.0	1.24	15=
Right forearm	4.8	71.4	19.0	4.8	0.0	0.0	1.24	15=
Left ankle	4.8	76.2	14.3	0.0	4.8	0.0	1.24	15=
Left foot	9.5	71.4	14.3	0.0	4.8	0.0	1.19	20=

Left upper arm	9.5	66.7	19.0	4.80	0.0	0.0	1.19	20=
Left lower leg	4.8	76.2	14.3	4.80	0.0	0.0	1.19	20=
Right lower leg	4.8	76.2	14.3	4.80	0.0	0.0	1.19	20=
Left upper leg (thigh)	4.8	76.2	19.0	0.00	0.0	0.0	1.14	24=
Left eye	4.8	76.2	19.0	0.00	0.0	0.0	1.14	24=
Right eye	4.8	76.2	19.0	0.00	0.0	0.0	1.14	24=
Left ear	4.8	81.0	14.3	0.00	0.0	0.0	1.10	27=
Right ear	4.8	81.0	14.3	0.00	0.0	0.0	1.10	27=
Left elbow	4.8	85.7	9.50	0.00	0.0	0.0	1.05	29=
Right elbow	4.8	85.7	9.50	0.00	0.0	0.0	1.05	29=

Statements pertaining to questions 2.2 to 2.11 asked respondents more general questions regarding stress and stress management. The salient findings are included hereunder:

Question 2.2: Does your organisation provide stress management interventions?

Table 11: Extent to which stress management interventions are organised

Response (%)		
Unsure	**Yes**	**No**
42.9	14.2	42.9

Table 11 indicates that 42.9% of the respondents were unsure of whether stress management interventions are organised in their organisations, and 42.9% were certain that no stress management interventions are organised. The fact that more than two thirds of the respondents are neither aware of, nor informed of stress management interventions is notable.

Question 2.3: Does your organisation provide employee wellness interventions?

Table 12: Extent to which employee wellness interventions are provided

Response (%)		
Unsure	**Yes**	**No**
33.3	28.6	38.1

Table 12 indicates that 33.3% of the respondents were unsure of whether employee wellness interventions are provided in their organisations, and 38.1% were certain that no employee wellness interventions are provided. Once more, the fact that two thirds of the respondents are neither aware of, nor informed of employee wellness interventions is a concern to the construction industry.

Question 2.4: The extent to which lack of stress management / employee wellness interventions stress respondents.

Table 13: Extent to which a lack of stress management / employee wellness interventions results in stress

Response (%)						MS
Unsure	**Not at all.....Very much**					
	1	**2**	**3**	**4**	**5**	
47.6	19.0	9.5	9.5	14.2	0.0	2.36

Table 13 indicates the extent to which a lack of stress management / employee wellness interventions results in stress, where the lack of stress management / employee wellness interventions were presented in terms of percentage responses to a scale of 1 (Not at all) to 5 (Very much). It is notable that the extent to which stress management / employee wellness interventions are stressful has a MS < the midpoint score of 3.00, which indicates that civil engineering construction site agents and foremen rate their extent to which a lack of stress management / employee wellness interventions are stressful as not at all, as opposed to very much. Furthermore, the extent to which a lack of stress management / employee wellness interventions stresses respondents is > 1.80 ≤ 2.60, which is not at all to a lesser extent / lesser extent. The fact that respondents find the lack

of stress management / employee wellness interventions as stressful is notable, and organisations need to implement the necessary steps to facilitate employees with such facilities.

Question 2.5: How stressed do you currently feel?

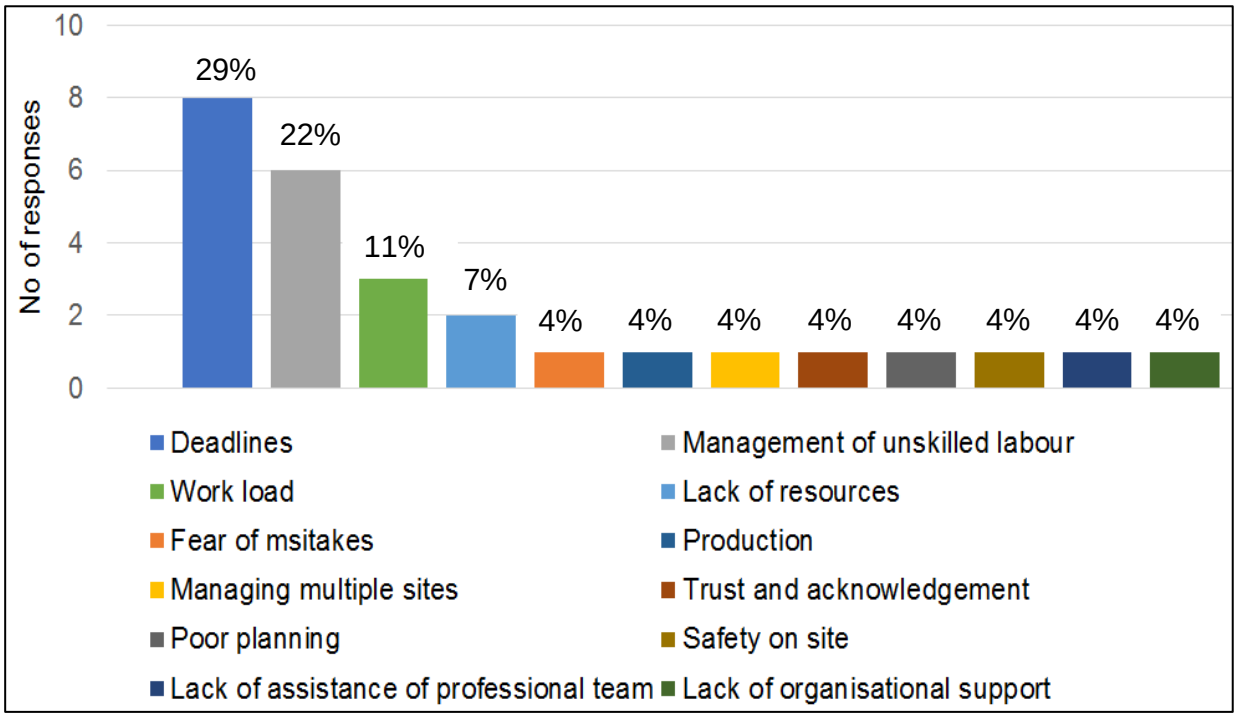
Table 14: Extent to which stress is experienced

Response (%)						MS
Unsure	Not at all.....Very much					
	1	2	3	4	5	
0.0	9.5	28.6	47.6	14.3	0.0	2.67

Table 14 indicates the extent to which stress is experienced by respondents. The stress experienced was presented in terms of percentage responses to a scale of 1 (Not at all) to 5 (Very much). It is notable that the extent to which stress is experienced has a MS < the midpoint score of 3.00, which indicates that civil engineering construction site agents and foremen rate their extent to which stress is experienced as not at all, as opposed to very much. Furthermore, the extent to which respondents are stressed is > 2.60 ≤ 3.40, which is a lesser extent to some extent / some extent. Given the opportunity to express their degree of stress experienced vis-à-vis the similar findings from Table 6, it can be concluded that some stress is evident among site agents and foremen in the civil engineering sector of the construction industry.

Question 2.6: What do you find most stressful at work?

Figure 7: Frequency of most stressful encounters



Question 2.6 asked respondents what they found as being most stressful at work. Figure 7 indicates that the respondents find 'Meeting deadlines' as most stressful to them. 'Management of unskilled labour', 'Work load', and 'Lack of resources' followed thereafter. As per Karasek's theory, deadlines and work load are factors of job demand, while lack of resources is a factor of job control. It is notable that the third component, social support, only scored one response vis-à-vis the findings from Table 3, which depicts the lack of social support as especially stressful.

Question 2.7: Do you find it difficult to manage your stress?

Table 15: Extent to which stress is managed

Response (%)						**MS**
Unsure	**Not at all.....Very much**					
	1	**2**	**3**	**4**	**5**	
0.0	28.6	19.0	42.9	9.5	0.0	2.33

Table 15 indicates the degree of difficulty experienced by respondents in terms of managing their stress in terms of percentage responses to a scale of 1 (Not at all) to 5 (Very much). It is notable that the degree of difficulty experienced in terms of managing stress has a MS < the midpoint score of 3.00, which indicates that civil engineering construction site agents and foremen rate their extent to which stress is managed as not at all, as opposed to very much. Furthermore, the extent to which stress is managed is > 1.80 ≤ 2.60, which is not at all to a lesser extent / lesser extent. It must be noted that the fact that the respondents were unaware of stress management / employee wellness interventions, as also, internal coping strategies to help deal with their stress is alarming.

Question 2.8: What do you do to alleviate your stress?

Figure 8: Extent of coping strategies adopted versus number of respondents

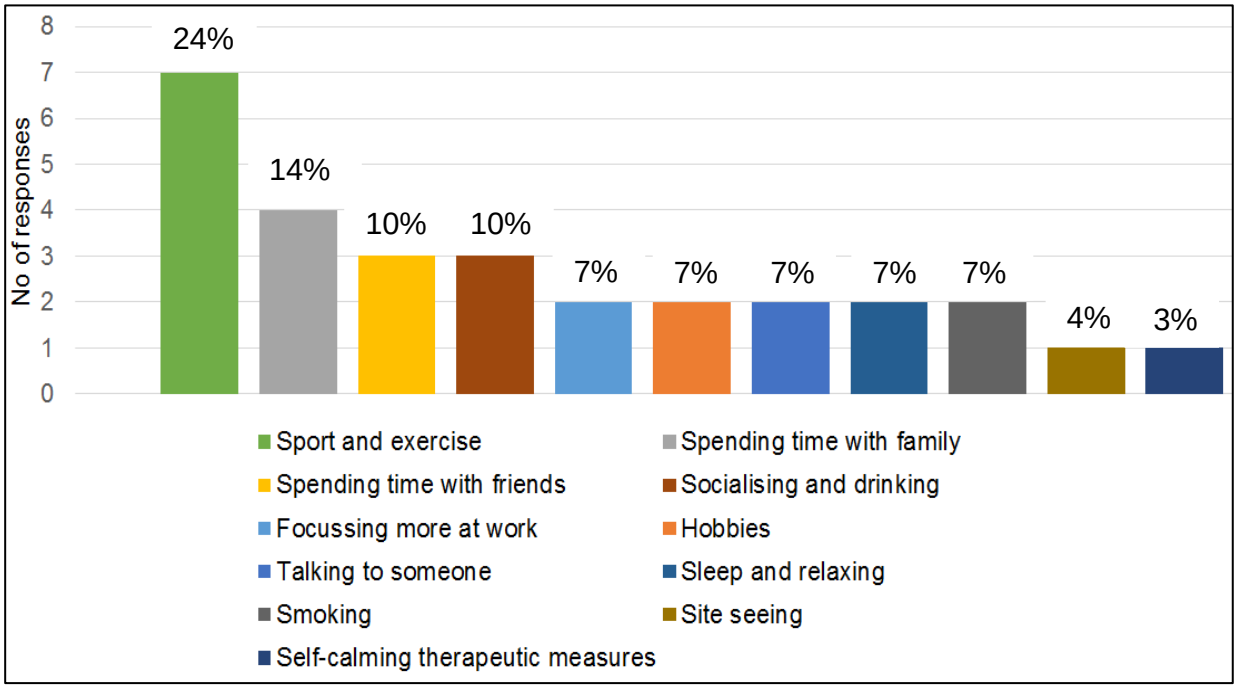


Figure 8 indicates that the majority of the respondents use sports and exercise as internal coping strategies to deal with unwanted stress. Furthermore, it was expected that spending time with family would be a high priority mechanism used to cope with stress. Lastly, the statements ‘Spending time with friends’, and ‘Socialising and drinking’ orderly followed after that of second place, largely attributed to the young age of the sampled respondents.

Question 2.9: Do you have poor self-confidence?

Table 16: Extent to which poor self-confidence is experienced

Response (%)						MS
Unsure	Not at all.....Very much					
	1	2	3	4	5	
0.0	38.1	38.1	14.3	9.5	0.0	1.95

Table 16 indicates the extent to which poor self-confidence is experienced at work in terms of percentage responses to a scale of 1 (Not at all) to 5 (Very much). It is notable that the extent to which poor self-confidence is experienced has a MS < the midpoint score of 3.00, which indicates that civil engineering construction site agents and foremen rate their extent to which poor self-confidence is experienced as not at all, as opposed to very much. Furthermore, the extent to which poor self-confidence is experienced is > 1.80 ≤ 2.60, which is not at all to a lesser extent / lesser extent. It is notable that some respondents perceive themselves as having poor self-confidence, which results in poor commitment to their organisations, potentially leading to stress and physical or mental ill health, as also, loss of production.

Question 2.10: Do you make use of internal coping strategies to regulate stress?

Table 17: Extent to which internal coping strategies are used

Response (%)						MS
Unsure	Not at all.....Very much					
	1	2	3	4	5	
23.8	23.8	9.5	28.6	14.3	0.0	1.86

Table 17 indicates the extent to which internal coping strategies are used to relieve stress in terms of percentage responses to a scale of 1 (Not at all) to 5 (Very much). It is notable that the extent to which internal coping strategies are used has a MS < the midpoint score

of 3.00, which indicates that civil engineering construction site agents and foremen rate their extent to which internal coping strategies are used as not at all, as opposed to very much. Furthermore, the extent to which internal coping strategies are used is > 1.80 ≤ 2.60, which is not at all to a lesser extent / lesser extent. It is important to educate the civil engineering sector of the construction industry in terms of the potential use of internal coping strategies to reduce stress, as the use of internal coping strategies could be cost effective, and also efficient. Furthermore, the fact that almost half of the respondents were neither aware, nor made use of internal coping strategies whatsoever, points to a lack of awareness in industry.

Question 2.11: Do you lack commitment to your current employer?

Table 18: Extent to which respondents lack commitment

Response (%)						**MS**
Unsure	**Not at all.....Very much**					
	1	**2**	**3**	**4**	**5**	
4.80	71.4	9.5	14.3	0.0	0.0	1.33

Table 18 indicates the extent to which respondents lack commitment to their organisations in terms of percentage responses to a scale of 1 (Not at all) to 5 (Very much). It is notable that the extent to which commitment is lacking has a MS < the midpoint score of 3.00, which indicates that civil engineering construction site agents and foremen rate their extent to which commitment is lacking as not at all, as opposed to very much. Furthermore, the extent to which commitment is lacking is ≥ 1.00 ≤ 1.80, which is not at all to a lesser extent. It is notable that some individuals lack commitment to their organisations, as this relates to the work of Karasek (1979: 288). However, the researcher is under the impression that bias may be evident due to a fear of disciplinary action, or the perspective of being viewed as disrespectful to their employers, and in actual fact, lacking more commitment than what is perceived to be.

4.3 DEMOGRAPHICS

Question 1: What is your gender?

Table 19: Gender of respondents

Gender	Response (%)
Male	100.0
Female	0.0

Table 19 indicates that all the respondents were male. This can be attributed to the fact that a limited number of females enter the construction industry.

Question 2: What is your marital status?

Table 20: Marital status of respondents

Marital status	Response (%)
Single	28.8
Married	47.5
Divorced	0.0
Living together	23.7
Widow (er)	0.0

Table 20 indicates that almost half the respondents were married, and the other half divided between single and living together. No respondents were divorced or widowers. The fact that the majority of the respondents are either single, married, or living together may be attributed to the relatively young age of the respondents.

Question 3: How many children do you have?

On average there are 0.95 children per respondent, or rounded up to one child.

Question 4: What is your job title?

Table 21: Job title of respondents

Job title	Response (%)
Site agent	52.4
Foreman	47.6
Other	0.00

Table 21 indicates that the split between site agents and foremen is almost equal. It is notable that the majority of the work force encountered were classified as either of the two. The role of site agent stretched as far as site manager, and in some circumstance even contracts manager, depending on the nature of the company's operations. Almost all staff, apart from the labour force, were classified as foremen to varying levels of experience. In some instances, small teams were led by 'boss boys', or 'gang leaders'. However, the majority did not have the required capacity to be classified as a foreman.

Question 6: What is your job description?

The respondents in the category of site agent described their daily duties as managing of sites / site manager functions, general duties of a site agent, documentation, civil engineering construction, and estimation. The respondents in the category of foremen described their daily duties as general duties of a foreman, namely setting out, site surveying, booking of labour / plant / material, site supervision, quality control, and general civil works.

Question 7: What is your age?

Table 22: Age of the respondents

Age group (%)			
19 - 29	**30 - 39**	**40 - 49**	**≥ 50**
52.4	23.8	23.8	0.0

Table 22 indicates that a fair percentage (52.4%) of young adults are employed in the civil engineering sector of the construction industry. This can be attributed to the low barriers to entry, and attractive remuneration for the level of education required.

Question 8: What is your level of school education?

All the respondents had a grade twelve matric certificate. This is notable, as it suggests that the civil engineering sector of the construction industry is realising the importance of having a base level of education, especially employees in low to middle management.

Question 9: Do you have a post school qualification?

Table 23: Post school qualification of respondents

Response (%)		
Unsure	Yes	No
0.0	85.7	14.3

Table 23 indicates that the majority of the respondents had some form of post school qualification. Although this is a positive sign in terms of empowering the civil engineering sector of the construction industry with knowledge, no one held a degree qualification or higher. Furthermore, there is a lack of H&S and training in the field of project management.

Question 10: What type of post school qualification do you have?

Table 24: Type of qualification of respondents

Qualification type	**Response (%)**
Certificate: Civil	5.0
National Certificate: Draughting	5.0
National Diploma: Civil Engineering	65.0
National Diploma: Mechanical Engineering	5.0

Labour Intensive Construction Manager: NQF 5	5.0
Certificate: Risk Management	5.0
Certificate: GCC 2010	5.0
Certificate: Marketing Management	5.0
Total:	100.0

Table 24 indicates that the majority of the respondents possess a National Diploma in civil engineering, which is foreseeable considering the sample relates to the civil engineering sector of the construction industry. It is notable that two individuals possess a National Diploma in mechanical engineering, and a National Certificate in draughting, which is not industry specific, *per se*. In general, there is a need to develop and promote the training of the industry through structured short courses specifically aimed at empowering individuals with their daily job tasks.

Question 11: What is your employment status?

Table 25: Employment status of respondents

Employment status	**Response (%)**
Permanent	100.0
Contract	0.0
Other	0.0

Table 25 indicates that all the respondents are permanently employed, which indicates industry might be departing a ‘bear market’, and so creating opportunities within the civil engineering sector of the construction industry. Furthermore, a permanent post will reduce stress in individuals who would otherwise be concerned about career futures.

Question 13: How long have you been employed by your current employer?

Table 26: Respondents' length of time employed by current employer

Years (%)			
0 - 3	**4 - 7**	**7 - 10**	**> 10**
57.1	23.8	4.8	14.3

Table 26 indicates that majority of the respondents were employed for three years or less by their present employers, which proposes that there is a high turnover rate in the civil engineering sector of the construction industry. Possible causes could be a lack of incentives that promote empowerment and retention of organisations' key site staff.

Question 14: How long have you been employed in construction?

Table 27: Respondents' length of time employed in the construction industry

Years (%)			
0 - 3	**4 - 7**	**7 - 10**	**> 10**
19.1	19.1	38.1	23.8

Table 27 indicates that the majority of the respondents were employed in construction for seven years or more, especially the site agents. This suggests there is a good level of experienced middle managers. However, the foremen were primarily young, inexperienced, and often employed as students.

4.4 SUMMARY

This chapter presented the research results and the subsequent findings. Site agents and foremen are exposed to various forms of stressors. The most significant physical stressor that they experience is the use of dirty and unhygienic toilet facilities. The most significant organisational stressor that they experience is limited time spent with family and friends, and lastly, the most significant socio-economic stressor that they experience is level of crime.

All of the respondents experience sensations of tense muscles, headaches, low energy levels, and sadness as most significant, which proposes that the respondents are stressed and depressed to some degree.

All of the respondents promote H&S induction as the preferred H&S intervention, where stress management and employee wellness interventions are non-existent. Furthermore, all of the respondents indicated that this was not a concern to them, even though they agree that their stress is managed poorly, do not make use of coping techniques, and are feeling stressed to some degree.

Job deadlines are the most significant stressors according to the respondents, and the preferred moderator of stress is playing sport and exercising. All of the respondents agreed that they have good confidence, and no lack of commitment to their employees. However, the respondents might have responded in this manner to remain ethical to their organisation, and a further investigation might yield contrasting results.

The respondents are all male, mostly married, young, qualified, and permanent employees. It is notable that most of the respondents have only been employed by their current employers for less than three years, even though most are experienced workers in the civil engineering sector of the construction industry. Chapter 5 to follow presents the problem statement, and testing of the hypotheses.

CHAPTER 5: PROBLEM STATEMENT AND TESTING THE HYPOTHESES

5.1 INTRODUCTION

The chapter to follow provides a description of the problems specific to the study.

5.2 SUB-PROBLEM ONE

Civil engineering construction site agents and foremen experience mental stress.

The majority of the respondents displayed behavioural symptoms associated with stress, typically headaches and tense muscles. On average, the respondents scored combined MSs of 2.40 and 1.79 for the stress and depression detection sections in the questionnaire respectively. Construction site personnel are showing signs and symptoms of stress and depression, which should be managed by means of a management intervention, or through internal coping strategies that are effective, as also, beneficial to one's health.

5.3 SUB-PROBLEM TWO

Civil engineering construction site agents and foremen experience injuries, including MSDs.

The majority of the respondents experienced some form of MSD. Almost a quarter experience pain in their right knee, shoulder, and thigh on a monthly basis. This could be primarily attributed to poor ergonomics as a result of the 'hands on' working conditions. Furthermore, the findings from the questionnaire revealed that the respondents are suffering from injuries to some degree.

5.4 SUB-PROBLEM THREE

Civil engineering construction organisations experience difficulty in implementing stress management interventions.

71.4% of the respondents agreed that employee wellness interventions were not implemented at their organisations, or were uncertain of the term in general. Some 85.8% of the respondents agreed that stress management interventions were not implemented at

their organisations, or were similarly uncertain of the term in general. This could be attributed to the fact that the management of stress is still seen as ‘taboo’ in a South African context. However, some organisations, other than that of the construction industry have embraced the concept of employee wellness interventions, to uphold international standards, albeit, not as much for stress management.

5.5 SUB-PROBLEM FOUR

Civil engineering construction site personnel face stressful working conditions to various degrees of intensity, which causes some with specific roles in the organisation to experience more difficulty in coping with stress.

Civil engineering construction site personnel are exposed to a myriad of work-related stressors on a daily basis, which range from working in areas with high potential for crime, H&S hazards, extreme weather, problems with labour, plant and equipment, and various additional factors related to the organisation itself. Consequently, the stressors lead to stress. However, some civil engineering construction site personnel take strain due lacking the resources required to deal with the stressors effectively, and as such, appraising the situation as more stressful than what it is.

5.6 HYPOTHESIS TESTING

The statistical analysis based on the findings of the survey are summarised hereunder:

Hypothesis 1: Civil engineering construction site agents and foremen are mentally stressed due to high job demands, low job control, and low job social support.

The majority of the respondents agreed that lack of time spent with family and friends, deadlines, inadequate reward system, the use of unhygienic toilet facilities, working with old tools, and working on an untidy / unhealthy site were the top three most stressful organisational and physical scenarios respectively. This suggests the respondents have high job demands as per the deadlines, low job control due to the use of unhygienic, as also, unhealthy site conditions, which may be attributed to a management flaw. However, a number of other factors, such as, frequent travelling and communication barriers suggest respondents have limited control over their work environments. The respondents

do not receive feedback from their employers, and agree more time spent with family and friends is important to them, suggesting they have low job social support. The findings relate to the work of Coetzer and Rothmann (2006: 37), who assert that low levels of stress can only be achieved when job demands are low, and job control and job support is high. The majority of the respondents confirmed that they experience symptoms of stress and depression, such as for example, tense muscles, headaches, low energy levels, sadness, excessive smoking, drinking, and excessive consumption of coffee. Even though respondents might have better physical than mental health in comparison to blue-collar construction workers, stress is nevertheless affecting them negatively. These findings relate to the work of Jacobsen *et al*. (2013: 1197), and Zheng *et al*. (2010: 588), who have identified that construction site personnel are highly stressed, and showing similar signs of strain. Lastly, some of the respondents lack commitment to their employees, which is an outcome of stress (Karasek, 1979: 288).

Hypothesis 1 is thus supported.

Hypothesis 2: Civil engineering construction site agents and foremen suffer from injuries and MSDs due to poor ergonomics and working while feeling stressed.

Up to a quarter of the respondents agreed that they experience pain on a monthly basis in various regions of the body. Most predominantly in the knee, shoulder, thigh, and pelvis, however, most other body parts were also affected. The experience of pain recorded on an hourly basis in the respondents' knees and shoulder is alarming. The prevalence of repetitive movements, bending and twisting of the back, and reaching away from the body puts strain not only on the knees and shoulders, but on the lower back, pelvis, shoulders and arms as well. Furthermore, working in cold weather endangers stiff muscles of possible injury, while excessive noise affects the ears and head. Zhen *et al*. (2010: 588) and Jacobsen *et al*. (2013: 1197) propose that that there is a link between mental stress and injury, through which existing stress may lead to further injuries. Consequently, the respondents are suffering from stress, as presented in Hypothesis 1, and may be unaware of their H&S on site due to clouded judgement, which may lead to additional injuries and MSDs.

Hypothesis 2 is thus supported.

Hypothesis 3: The civil engineering sector of the construction industry promotes H&S practices to a greater extent than that of stress management and employee wellness interventions.

The majority of the respondents significantly promote H&S interventions on site. However, the majority of the respondents were either unsure, or of the opinion that neither stress management, nor employee wellness intervention existed in their organisation. More than half indicated that this was not much of a concern to them. Whereas, 19% agreed that it had no effect whatsoever. Up to 50% of the respondents agreed that they found it somewhat difficult to manage their stress, while the majority felt that sport and exercise helped best in this regard. However, up to 50% did not make use of, nor understood the concept of internal coping strategies. These findings correspond to the findings of Wahab (2010: 100), and Ali *et al*. (2013: 311), who assert that stress is not managed at managerial level, and individuals resort to their own rudimentary coping mechanisms to deal with stress. This suggests the civil engineering sector of the construction industry is ill-informed with regards to the effects of stress, measurement, and management thereof, in contrast to the application of H&S interventions.

Hypothesis 3 is thus supported.

Hypothesis 4: Civil engineering construction site agents are faced with more stressful working conditions than foremen, subsequently resulting in a higher state of mental stress.

The number one ranked MS for behavioural symptoms experienced among the site agents, namely ‘Tense muscles’ scored a MS of 3.30, as opposed to the MS of 2.90 for ‘Headaches’ among the foremen. Furthermore, the overall average MS for behavioural symptoms among site agents and foremen was 1.80 and 1.50 respectively. The number one ranked MS for symptoms of stress among site agents, namely ‘Irritable’ scored a MS of 3.20, as opposed to the MS of 2.50 for ‘Tired, weak or no energy’ among the foremen. Furthermore, the overall average MS for stress among site agents and foremen was 2.80 and 1.90 respectively, indicating a greater degree of variance than the former. The number one ranked MS for symptoms of depression experienced among the site agents, namely, ‘Sad or down’ scored a MS of 2.60, as opposed to a MS of 2.10 for ‘Decrease / Increase in appetite’ among the foremen. Furthermore, the overall average MS for depression among site agents and foremen was 1.90 and 1.60 respectively. The overall average MS for physical stressors experienced among the site agents and foremen was

3.00 and 2.70 respectively, while the overall average MS for organisational stressors among the site agents and foremen was 2.70 and 2.40 respectively. This asserts that site agents are apparently more stressed than foremen, which leads to the conclusion that site agents in the civil engineering sector of the construction industry not only perform management functions, but are actively involved in the technical operations on a daily basis, similar to that of the foremen, indicating they are exposed to a higher degree of stress than that of the foremen. Love *et al*. (2009: 656) argue that there are differences in the intensity of stress experienced in the construction industry according to various factors such as, *inter alia*, self-stress and work support. According to Love *et al*. (2009: 656-657) contractors, typically construction managers and foremen work sixty hours a week and up, and are subsequently more stressed than project consultants. Although this does not align entirely with the findings of the study, it none the less confirms that there are variances in levels of stress experienced among construction site personnel, for example site agents and foremen.

Hypothesis 4 is thus supported.

5.7 SUMMARY

This chapter presented the sub-problems, and subsequent testing of the hypotheses. Sub-problem one is: civil engineering site agents and foremen experience mental stress. Sub-problem two is: civil engineering site agents and foremen experience injuries, including MSDs. Sub-problem three is: civil engineering construction organisations experience difficulty in implementing stress management interventions. Sub-problem four is: civil engineering construction site personnel face stressful working conditions to various degrees of intensity, which causes some with specific roles in the organisation to experience more difficulty in coping with stress.

In order to address the above mentioned sub-problems, the following hypotheses were formulated:

Hypothesis 1 tested whether the job demand-control-support theory applies to civil engineering site agents and foremen. It is concluded that the theory applies to civil engineering site agents and foremen, and induces stress. Hypothesis 2 tested whether injuries and MSDs are caused by poor ergonomics, and due to working while stressed. It is concluded that civil engineering site agents and foremen suffer from injuries and MSDs

due to poor ergonomics, and working while stressed. Due to feeling stressed the respondent's judgements are clouded, possibly leading to injury, and subsequent MSDs. Furthermore, the nature of civil engineering construction operations invokes poor ergonomics that naturally lead to MSDs and injuries. Hypothesis 3 tested whether H&S practices are promoted to a greater extent than that of stress management interventions. It is concluded that civil engineering site agents and foremen promote H&S to a greater extent than that of stress management and employee wellness interventions due to a possible lack of awareness, and organisations that have not embraced the concept. Hypothesis 4 tested whether site agents are more stressed than foremen. It is concluded that site agents are more stressed than foremen, as site agents fulfil a more senior managerial role, and are burdened by higher responsibilities than that of the foremen. Chapter 6 to follow presents the summary, conclusions, and recommendations.

CHAPTER 6: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 SUMMARY AND CONCLUSIONS

This study is based on stress in the civil engineering sector of the construction industry, specifically focussing on contractors' site agents and foremen operating in the NMBM, and the specific stressors that affect them, and what interventions are in place to regulate stress in industry.

In essence, the study is based upon theoretical, as also, empirical findings. The study signifies that there is a need to manage stress in industry, through the process of stress identification, measurement, action planning, and managing by means of an effective stress management, or employee wellness intervention. Such interventions are more prevalent in Western societies, yet still lacking in developing nations, such as South Africa. Furthermore, for organisations to be competitive on an international landscape it is imperative that policies be developed to manage stress. As construction site personnel long for more time spent with family and friends, which was also depicted in the literature review. Organisations need to allow for time off, as such an incentive may significantly moderate the effects of a stressful environment. Stress may also be moderated by introducing strategies that focus on interpersonal relationship building among employees, and importantly, between employees and managers too.

High job demands, low job control, and low job social support are major contributors to stressed construction site personnel. Employees are often exposed to environments where they have little control over what is transpiring, and struggle with increasingly more demanding job requirements, in a fast tracked construction industry, especially the site based staff. Although physical health is of adequate quality, mental health is suffering, as depicted in the findings. This may all lead to eventual burnout, affecting physical and mental health, or in worst case, cause a fatality to take place on site. There is a need to assist construction professionals with regards to coping strategies, drawing resources both internally, and from the external environment. The fact that certain individuals cope better with stress than others is notable, and more effort needs to be made to assist those who struggle to cope with stress. Furthermore, certain individuals use unique coping strategies depending on the environment they operate in, as also, their personality type, and sensitivity to stress.

Some of the significant factors that emerged from the study are that both site agents and foremen are exposed to physical, organisational, and socio-economical stressors, and that site agents experience stressors to a greater extent owing to the fact that they have to deal with site management functions, as also, provide a significant technical input to ensure project success. Both the site agents and the foremen try to apply internal coping strategies in the form of, *inter alia*, sports and exercise, and spending time with family, however, still succumb to behavioural problems such as, smoking, drinking excessive coffee, and consumption of alcohol, and still remain at the mercy of stress. The findings of headaches, tense muscles, low energy levels, and feelings of sadness are noteworthy as was reported in the literature review, and direct symptoms of stress and depression.

H&S is important to the civil engineering sector of the construction industry and adhered to by the site agents and foremen, it also gives an individual peace of mind when properly implemented. However, construction workers seem to not follow instructions bestowed upon, proceed with dangerous tasks, and do not monitor each other's H&S, creating a dangerous work atmosphere. Furthermore, HIRA, HIRA training, and HIRA strategies are not a common practice, which is an issue to be addressed. It is also critical that the concept of stress be incorporated into contemporary South African H&S legislation, and monitored through the DoL, as is the current process for incidents relates to H&S only. Forecasting for stress, and eliminating it beforehand could find a valuable place among current HIRA strategies, by identify a stressful situation vis-à-vis individuals who struggle to cope with stress.

Although H&S and HIRA practices and interventions may lead to reduced incidents reported, a stressed individual may still be exposed to a dangerous situation unknowingly. The fact that site agents and foremen in the civil engineering sector of the construction industry are unaware of stress management and employee wellness interventions is alarming, and points to the fact that stress remains unmanaged in the South African construction industry as a whole. Overall, there is a need to implement such interventions in industry among all stakeholders.

The construction industry is still fixated in a production and profit driven mind set, all too often leading to a neglect of important aspects, as previously mentioned in this chapter. Furthermore, the cultural belief in South Africa still remains that 'feeling stressed' is seen as a weakness and something that one should be able to 'sort out' on an individual basis.

The aim of this study has been addressed by achieving the study's various objectives. The first objective was to determine whether site agents and foremen are stressed based on the job demand-control-support theory, which has been confirmed through Hypothesis 1. Firstly, Coetzer and Rothmann (2006: 37) identify that low levels of stress can only be achieved when job demands are low, and job control and job support is high, which is the prevailing circumstance regarding the site agents and foremen. Secondly, this also relates to the work of Jacobsen *et al*. (2013: 1197), and Zheng *et al*. (2010: 588), who have identified that construction site personnel are highly stressed. The second objective was to determine whether injuries and MSDs are predicted by poor ergonomics, and working while feeling stressed, which has been confirmed through Hypothesis 2. Again, Zheng *et al*. (2010: 588), and Jacobsen *et al*. (2013: 1197), propose that there is a link between mental stress and injury, through which existing stress may lead to future injuries. The third objective was to determine whether use is made of stress management resources, and whether H&S and HIRA practises are promoted to a greater extent than that of stress management interventions, which has been confirmed through Hypothesis 3. Wahab (2010: 100) describes various stress management interventions adopted by employees to manage their stress. Furthermore, Ali *et al*. (2013: 311) argue that stress is not managed at managerial level. The findings of this study corroborates to the two authors, as site agents and foremen make use of coping resources, such as hobbies and sports, and majority of the respondents also agree that stress is not managed in their organisation. The fourth objective was to establish what physical, mental, and socio-economic stressors affect site personnel in the civil engineering sector of the construction industry, which has been confirmed through the instruments adopted to measure the stressors imposed on the civil engineering site agents and foremen. These findings agree with the work of Haynes and Love (2004: 134), who indicated that construction site personnel are exposed to various stressors such as, *inter alia*, work overload, long hours, and limited time spent with family and friends. The fifth objective was to provide recommendations to manage and reduce stress, which have been addressed in the recommendations section in the chapter to follow. In essence, Wahab (2010: 100) and Oyewobi *et al*. (2011: 6) propose that, *inter alia*, hobbies, exercise, social support, time off, and fair wages be introduced to regulate stress in the construction industry, which are applicable to this study too, and the civil engineering sector of the construction industry as a whole. The sixth objective was to identify gaps in OH&S legislation with regards to stress management in the construction industry, which has been addressed in the review of the related literature, through the findings of Sieberhagen *et al.* (2009: 23-24). The seventh objective was to determine

whether site agents are more stressed than foremen, which has been confirmed through Hypothesis 4. Love *et al*. (2009: 656) argue that there are differences in the intensity of stress experienced in the construction industry according to various factors such as, *inter alia*, self-stress and work support. According to Love *et al*. (2009: 656-657) contractors, such as construction managers and foremen work sixty hours a week and up, and are subsequently more stressed than project consultants. Although this does not align exactly with the findings of the study, it none the less confirms that there are variances in stress experienced among construction site personnel, for example site agents and foremen.

6.2 RECOMMENDATIONS

The realisation of the importance of stress management in the construction industry to government stakeholders, councils, private organisations, and construction boards is of utmost importance. Policies and legislation need to be revisited to include the wellbeing of employers and employees with regards to stress. Similarly, various legislative acts need to be revised, typical examples including the OH&S Act, COIDA, and the Construction Regulations.

Tender documents prepared by engineering consultants, who are registered by professional bodies should allow for not only H&S and risk assessment, but also for stress management and employee wellness interventions.

Private organisations need to address the problem of work-family imbalance, by providing more time off to spend with family and loved ones. Organisations need to promote and implement internal coping strategies, to assist those who are facing strain to effectively deal with their stress. More support from line managers to workers should be provided, as this will increase their resources in terms of support, demand, and control in their working environment. Also, organisations need to promote teambuilding activities and exercise among workers.

Lastly, academic institutions need to incorporate stress management into their programmes' syllabus, especially in the fields of the built environment and civil engineering. Subject areas covering stress, such as human resources may potentially add value to courses offered in other departments where significant stress is experienced in their respective industries.

6.3 FUTURE RESEARCH

The following are recommendations for future research, more specifically towards a related doctoral degree:

- Research pertaining to the *status quo* with regards to what is perceived as most stressful to the South African construction industry as a whole;
- Research pertaining to what is stressful in a civil engineering consultancy's environment in South Africa as a whole;
- Research pertaining to the prevalence of stress management and employee wellness interventions in the South African construction industry as a whole, and
- Research pertaining to the implementation of a stress management model in a construction industry firm, and subsequent findings and improvements.

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SUMMERSTRAND NORTH
DEPARTMENT OF CONSTRUCTION MANAGEMENT

15 June 2015

Attention: Civil Engineering Site Agents and Foremen

Dear Madam / Sir

Re: Mental Stress among Construction Site Personnel in Port Elizabeth

I am a post graduate research student at the Nelson Mandela Metropolitan University. I am currently busy working on a research Treatise entitled 'Mental Stress among Construction Site Personnel in Port Elizabeth' as partial fulfilment for the MSc (Built Environment) degree.

I would appreciate your involvement in this research by completing the attached questionnaire and returning it to me. By responding, you would be making a major contribution to the improvement of the South African Construction Industry. Your response will also enhance the reliability of the research findings.

All data received will be treated in the strictest confidence and will only be used for the computation of statistics for inclusion in my Treatise.

Should you have any queries please contact Prof John Smallwood per e-mail: john.smallwood@nmmu.ac.za, or per mobile: (+27) 083 659 2492. Alternatively, contact the researcher per e-mail: erich@iliso.com, or per mobile: (+27) 076 994 8889.

Thanking you in anticipation of your response.

Erich Haydam
MSc (Built Environment) Student

John Smallwood, PhD (Construction Management)
Professor, and Head, Department of Construction Management
Programme Director, MSc (Built Environment) Programme

MENTAL STRESS IN CONSTRUCTION

SECTION A: DEMOGRAPHICS

1. Please record your gender:

Male	Female

2. Please record your current marital status:

Single	Married	Divorced	Living together	Widow (er)

3. How many children do you have?

_____

4. Please record your job title:

Site agent	Supervisor	Foreman	Other

5. If 'Other', please specify:

_____

6. What job do you currently do / is your occupation?

_____

7. How old are you?

_____ Years _____ Months

8. Please record your current level of school education:

_____

9. Do you have a post school qualification?

Yes	No

10. If ‘Yes’, please specify:

_____

11. Please record your current employment status:

Permanent	Contract	Other

12. If ‘Other’, please specify:

_____

13. Please record the length of time you have worked for your current employer:

_____ Years _____ Months

14. Please record the length of time you have worked in construction:

_____ Years _____ Months

SECTION B: STRESSORS, STRESS AND STRESS MANAGEMENT

1. On a scale of **1 (Not at all)** to **5 (Very much)**, please indicate whether the following physical stressors make you feel stressed during your working day **(please note the 'Unsure' option)**.

	Physical stressor	**Unsure**	**Not at all……..……..…....…Very much**				
			1	**2**	**3**	**4**	**5**
1.1	Working in hot weather	U	1	2	3	4	5
1.2	Using dirty and unhygienic toilet facilities	U	1	2	3	4	5
1.3	Noise from tools and machines	U	1	2	3	4	5
1.4	Working with vibratory equipment	U	1	2	3	4	5
1.5	Working in dust, mud, or dirt	U	1	2	3	4	5
1.6	Using unreliable, unsuitable, and old tools	U	1	2	3	4	5
1.7	Working on an untidy and unhealthy site	U	1	2	3	4	5
1.8	Working with poor H&S equipment	U	1	2	3	4	5
1.9	Not being able to wear H&S gear when on site	U	1	2	3	4	5
1.10	Performing physically demanding work	U	1	2	3	4	5
1.11	Performing repetitive work	U	1	2	3	4	5
1.12	Changing sites or job tasks frequently	U	1	2	3	4	5
1.13	Working with concrete and other chemical products	U	1	2	3	4	5
1.14	Not being able to wash your hands and legs after working	U	1	2	3	4	5

2.1 On a scale of **1 (Not at all)** to **5 (Very much)**, please indicate whether the following organisational stressors make you feel stressed during your working day **(please note the 'Unsure' option)**.

	Organisational stressor	**Unsure**	**Not at all……..…..…..……...…..……Very much**				
			1	**2**	**3**	**4**	**5**
2.1.1	Communication between me and my superior	U	1	2	3	4	5
2.1.2	Inadequate training and mentoring by my employer	U	1	2	3	4	5
2.1.3	Inadequate feedback regarding the work I have performed	U	1	2	3	4	5
2.1.4	Work atmosphere	U	1	2	3	4	5
2.1.5	Relationship between me and my peers	U	1	2	3	4	5
2.1.6	Relationship between me and my superior	U	1	2	3	4	5
2.1.7	Inability to express my opinion on job tasks given to me	U	1	2	3	4	5
2.1.8	Looking after the H&S of fellow employees	U	1	2	3	4	5
2.1.9	Lack of commitment from my employer	U	1	2	3	4	5
2.1.10	Witnessing of injuries / accidents in the last six months	U	1	2	3	4	5
2.1.11	Current work load	U	1	2	3	4	5
2.1.12	Fear of losing my job	U	1	2	3	4	5
2.1.13	Poor salary / wage	U	1	2	3	4	5
2.1.14	Nature of my work	U	1	2	3	4	5
2.1.15	Limited time to spend with my family and friends	U	1	2	3	4	5
2.1.16	Lack of respect from my superior	U	1	2	3	4	5
2.1.17	Lack of respect from my peers	U	1	2	3	4	5
2.1.18	High job demand	U	1	2	3	4	5
2.1.19	Low job control	U	1	2	3	4	5

2.1.20	Low job social support	U	1	2	3	4	5
2.1.21	Lack of resources	U	1	2	3	4	5
2.1.22	Communication barriers	U	1	2	3	4	5
2.1.23	Nature of business operations	U	1	2	3	4	5
2.1.24	Poor career growth potential	U	1	2	3	4	5
2.1.25	Work-family imbalance	U	1	2	3	4	5
2.1.26	Frequent travelling	U	1	2	3	4	5
2.1.27	Long work hours	U	1	2	3	4	5
2.1.28	Tight deadlines	U	1	2	3	4	5
2.1.29	Inadequate freedom of autonomy	U	1	2	3	4	5
2.1.30	Insufficient time off	U	1	2	3	4	5
2.1.31	Inadequate reward system	U	1	2	3	4	5
2.1.32	High degree of organisational change	U	1	2	3	4	5
2.1.33	Lack of social activities	U	1	2	3	4	5

2.2 Does your organisation provide stress management interventions?

Unsure	**Yes**	**No**

2.3 Does your organisation provide employee wellness interventions?

Unsure	**Yes**	**No**

2.4 If you answered no to 2.2 or 2.33 above, on a scale of **1 (Not at all)** to **5 (Very much)**, does this stress you **(please note the 'Unsure' option)**?

Unsure	**Not at all……....Very much**				
	1	**2**	**3**	**4**	**5**

2.5 On a scale of **1 (Not at all)** to **5 (Very much)**, how stressed do you currently feel due to work **(please note the 'Unsure' option)**?

Unsure	**Not at all……....Very much**				
	1	**2**	**3**	**4**	**5**

2.6 What do you find most stressful at work?

_____

2.7 On a scale of **1 (Not at all)** to **5 (Very much)**, do you find it difficult to manage your stress **(please note the 'Unsure' option)**?

Unsure	**Not at all……....Very much**				
	1	**2**	**3**	**4**	**5**

2.8 What do you do to alleviate your stress?

_____

2.9 On a scale of **1 (Not at all)** to **5 (Very much)**, do you have poor self-confidence **(please note the 'Unsure' option)**?

Unsure	**Not at all……....Very much**				
	1	**2**	**3**	**4**	**5**

2.10 On a scale of **1 (Not at all)** to **5 (Very much)**, do you make use internal coping strategies to regulate your stress **(please note the 'Unsure' option)**?

Unsure	**Not at all……....Very much**				
	1	**2**	**3**	**4**	**5**

2.11 On a scale of **1 (Not at all)** to **5 (Very much)**, do you feel you lack commitment to your current employer **(please note the 'Unsure' option)**?

Unsure	**Not at all……....Very much**				
	1	**2**	**3**	**4**	**5**

3. On a scale of **1 (Not at all)** to **5 (Very much)**, please indicate whether the following socio-economic stressors make you feel stressed **(please note the 'Unsure' option)**.

	Socio-economic stressor	**Unsure**	**Not at all…….....…….…Very much**				
			1	**2**	**3**	**4**	**5**
3.1	Current level of education	U	1	2	3	4	5
3.2	Dirty and polluted neighbourhood	U	1	2	3	4	5
3.3	Access to health facilities	U	1	2	3	4	5
3.4	Level of exercise	U	1	2	3	4	5
3.5	Nutritional intake	U	1	2	3	4	5
3.6	Level of crime	U	1	2	3	4	5
3.7	Relationship with friends	U	1	2	3	4	5
3.8	Financial stability	U	1	2	3	4	5
3.9	Access to clean water and sanitation	U	1	2	3	4	5

4. On a scale of **1 (Not at all)** to **5 (Very much)**, how frequently do you experience the following sensations, or resort to the following activities **(please note the 'Unsure' option)**?

	Sensation / Activity	**Unsure**	**Not at all……...Very much**				
			1	**2**	**3**	**4**	**5**
4.1	Tense muscles	U	1	2	3	4	5
4.2	Nausea	U	1	2	3	4	5
4.3	Dizziness	U	1	2	3	4	5
4.4	Breathlessness	U	1	2	3	4	5
4.5	Headaches	U	1	2	3	4	5
4.6	Trembling hands	U	1	2	3	4	5
4.7	Consume excessive coffee	U	1	2	3	4	5
4.8	Consume excessive alcohol	U	1	2	3	4	5
4.9	Take drugs	U	1	2	3	4	5
4.10	Smoke cigarettes	U	1	2	3	4	5
4.11	High blood pressure	U	1	2	3	4	5
4.12	High cholesterol	U	1	2	3	4	5
4.13	Asthma	U	1	2	3	4	5
4.14	Diabetes	U	1	2	3	4	5
4.15	Epilepsy	U	1	2	3	4	5
4.16	Heart disease	U	1	2	3	4	5

5. On a scale of **1 (Not at all)** to **5 (Very much)**, how frequently do you experience the following sensations **(please note the 'Unsure' option)**?

	Sensation	**Unsure**	**Not at all…..…….....……..…Very much**				
			1	**2**	**3**	**4**	**5**
5.1	Anxiety	U	1	2	3	4	5
5.2	Restless, or on edge	U	1	2	3	4	5
5.3	Tension	U	1	2	3	4	5
5.4	Tired, weak or no energy	U	1	2	3	4	5
5.5	Irritable	U	1	2	3	4	5
5.6	Wake up during the night	U	1	2	3	4	5
5.7	Difficulty in sleeping	U	1	2	3	4	5
5.8	Difficulty in concentrating	U	1	2	3	4	5
5.9	Sleep excessively	U	1	2	3	4	5

6. On a scale of **1 (Not at all)** to **5 (Very much)**, how frequently do you experience the following sensations **(please note the 'Unsure' option)**?

	Sensation	**Unsure**	**Not at all…….....……Very much**				
			1	**2**	**3**	**4**	**5**
6.1	Sad or down	U	1	2	3	4	5
6.2	Loss of interest	U	1	2	3	4	5
6.3	Don't enjoy things I used to	U	1	2	3	4	5
6.4	Talk or move slowly	U	1	2	3	4	5
6.5	Restlessness	U	1	2	3	4	5
6.6	Feeling worthless	U	1	2	3	4	5

6.7	Hurt myself	U	1	2	3	4	5
6.8	Suicidal intentions	U	1	2	3	4	5
6.9	Decrease / Increase in appetite	U	1	2	3	4	5
6.10	Decrease / Increase in weight	U	1	2	3	4	5

SECTION C: H&S INTERVENTIONS, HIRAs, INJURIES AND ERGONOMICS

1. On a scale of **1 (Not at all)** to **5 (Very much)**, how frequently do the following occurrences take place in the everyday running of your construction projects **(please note the 'Unsure' option)**?

	Occurrence	**Unsure**	**Not at all……..…..…..…….Very much**				
			1	**2**	**3**	**4**	**5**
1.1	Hazard identification and risk assessments (HIRAs)	U	1	2	3	4	5
1.2	HIRA training	U	1	2	3	4	5
1.3	Toolbox talks	U	1	2	3	4	5
1.4	Reference to H&S upon instruction to a worker to undertake a task	U	1	2	3	4	5
1.5	Correct use of equipment / body position when instruction is given to execute a task	U	1	2	3	4	5
1.6	Pre-activity HIRAs	U	1	2	3	4	5
1.7	Workers monitor each other's H&S	U	1	2	3	4	5
1.8	Workers proceed with dangerous tasks	U	1	2	3	4	5
1.9	Accidents on site	U	1	2	3	4	5
1.10	Reporting of injuries	U	1	2	3	4	5
1.11	Method statements	U	1	2	3	4	5
1.12	Safe working procedures	U	1	2	3	4	5
1.13	H&S inductions	U	1	2	3	4	5
1.14	Participation in H&S strategies	U	1	2	3	4	5

2. On a scale ranging between **Never, Monthly, Weekly, Daily** or **Hourly**, please indicate how frequently you are exposed to the following problems during your working day **(please note the 'Unsure' option)**.

	Ergonomic problem	**Unsure**	**Never**	**Monthly**	**Weekly**	**Daily**	**Hourly**
2.1	Noise	U	N	M	W	D	H
2.2	Bending and twisting the back	U	N	M	W	D	H
2.3	Repetitive movements	U	N	M	W	D	H
2.4	Awkward positions	U	N	M	W	D	H
2.5	Handling heavy materials	U	N	M	W	D	H
2.6	Same position for long periods	U	N	M	W	D	H
2.7	Hot conditions	U	N	M	W	D	H
2.8	Handling heavy equipment	U	N	M	W	D	H
2.9	Reaching away from the body	U	N	M	W	D	H
2.10	Use of body force	U	N	M	W	D	H
2.11	Climbing and descending	U	N	M	W	D	H
2.12	Working in humid conditions	U	N	M	W	D	H
2.13	Reaching overhead	U	N	M	W	D	H
2.14	Working in cramped positions	U	N	M	W	D	H
2.15	Working with vibratory equipment	U	N	M	W	D	H
2.16	Working in cold conditions	U	N	M	W	D	H
2.17	Working in wet conditions	U	N	M	W	D	H
2.18	Working while hurt or injured	U	N	M	W	D	H

3. On a scale ranging between **Never, Monthly, Weekly, Daily** or **Hourly**, please indicate how frequently you experience pain in any of the following anatomic regions as a result of work **(please note the 'Unsure' option)**.

	Anatomic region	**Unsure**	**Never**	**Monthly**	**Weekly**	**Daily**	**Hourly**
3.1	Left foot	U	N	M	W	D	H
3.2	Right foot	U	N	M	W	D	H
3.3	Left knee	U	N	M	W	D	H
3.4	Right knee	U	N	M	W	D	H
3.5	Left upper arm	U	N	M	W	D	H
3.6	Right upper arm	U	N	M	W	D	H
3.7	Left hand (palm)	U	N	M	W	D	H
3.8	Right hand (palm)	U	N	M	W	D	H
3.9	Left shoulder	U	N	M	W	D	H
3.10	Right shoulder	U	N	M	W	D	H
3.11	Left lower leg	U	N	M	W	D	H
3.12	Right lower leg	U	N	M	W	D	H
3.13	Left upper leg (thigh)	U	N	M	W	D	H
3.14	Right upper leg (thigh)	U	N	M	W	D	H
3.15	Left wrist	U	N	M	W	D	H
3.16	Right wrist	U	N	M	W	D	H
3.17	Left elbow	U	N	M	W	D	H
3.18	Right elbow	U	N	M	W	D	H
3.19	Left forearm	U	N	M	W	D	H
3.20	Right forearm	U	N	M	W	D	H

3.21	Left ankle	U	N	M	W	D	H
3.22	Right ankle	U	N	M	W	D	H
3.23	Left ear	U	N	M	W	D	H
3.24	Right ear	U	N	M	W	D	H
3.25	Left eye	U	N	M	W	D	H
3.26	Right eye	U	N	M	W	D	H
3.27	Chest	U	N	M	W	D	H
3.28	Neck	U	N	M	W	D	H
3.29	Head	U	N	M	W	D	H
3.30	Pelvis	U	N	M	W	D	H

SECTION D: GENERAL

Do you have any comments in general regarding stress, stress management, employee wellness, H&S practices, HIRAs and ergonomics?

_____

_____

_____

_____

Please record your details below to facilitate contacting you, in the event that a query should arise. **Please note that the data provided in this questionnaire will be treated in the strictest confidence.**

NAME: _____ PHONE: (____) _____

EMPLOYER: _____ FAX: _____

MOBILE: (____) _____

E-MAIL: _____

Thank you for your contribution to efforts directed towards contributing to improving construction H&S in the South African construction industry.

FOR INTERVIEWER'S USE ONLY:

INTERVIEWER: _____

START: _____ END: _____

DURATION (MIN): _____

DATE: _____

PROJECT: _____