

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

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### ABSTRACT

The construction industry as a whole has been suffering from mental stress due to a range of stressors imposed on the work force, resulting in behavioural habits which are not conducive to a healthy lifestyle, physical symptoms signalling burnout, chronic stress, and depression. An empirical study was conducted among medium to large civil engineering contractors in the Nelson Mandela Bay Metropole the sample stratum including site agents and foremen. The salient findings include: using unreliable and old tools, using dirty toilet facilities, and working on an untidy site are the most significant physical stressors; limited time spent with loved ones, tight deadlines, inadequate reward system, and work-life imbalance are the most significant organisational stressors; headaches, tense muscles, and smoking cigarettes are the most significant behavioural activities and physical sensations experienced; tired, weak and no energy, restless and on edge, and irritable are the most significant sensations of stress; feeling sad or down, restlessness, and decrease / increase in appetite are the most significant symptoms of depression. The objective of the study was to ascertain what stressors are imposed on a sample of site agents and foremen in the civil engineering sector of the construction industry. Further to the aforementioned, the study intended to identify what forms of strain, as also, the degree of stress and depression experienced by the work force. It can be concluded that a vast array of stressors negatively affect the civil engineering sector of the construction industry. Subsequently resulting in stress, depression, and mental / physical strain.

**Keywords:** civil engineering, construction, contractors, stress

### 1. INTRODUCTION

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 Service (Louw and Vivier, 2010; Wang *et al.*, 2011). Similarly, the construction industry is very stressful. Construction professionals have to multi-task on multiple projects, deal with

different tasks across multiple projects, and make professional judgements under conditions of uncertainty, as also, take strain from long working hours, face work / family imbalance, frustration, and burnout (Bowen *et al.*, 2012). Consequently, the construction industry as a whole is facing severe occupational health challenges, most notably due to the mismanagement of stress, which in turn is coupled to financial and legislative burdens to construction firms and other stakeholders.

A study conducted among 172 construction workers in the United States of America revealed that 75% had some form of musculoskeletal disorder (MSD), and that 16% consequently suffered from mental distress and burnout (Jacobsen *et al.*, 2013). 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).

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; Jacobsen *et al.*, 2013; Kim. 2013).

The objective of the study was to clarify what physical and organisational stressors are imposed on a sample of site agents and foremen in the Nelson Mandela Bay Metropole (NMBM). Further to the aforementioned, the study intended to identify what behavioural activities and physical sensations (forms of strain), as also, what sensations of stress and depression are existent among the work force. The motivation for the study was based on the fact that currently limited studies have been conducted to identify stress in the civil engineering sector of the construction industry. This was achieved through conducting a literature review and evaluation of empirical data using existing stressor / strain / stress measurement techniques obtained from contemporary theoretical models used within the construction industry.

## **2. LITERATURE REVIEW**

### **2.1 The Stress Dilemma**

South Africans are significantly stressed. Racial tension and political pressures have created a 'unique' context that leads to stressful events (Bowen *et al.*, 2012). Furthermore, many organisations still do not understand the chronic effect of stress on employees and their organisations.

What is stress? Stress is the body's reaction to demands and changes that requires it to adapt physically, mentally, and emotionally (Werner *et al.*, 2014). 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.

The three main components of stress is 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. 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.

A healthy work environment is established even when demands are high, as long as control in the environment is high too, however, this needs to be further complemented by strong social support. In contrast, high work demand, poor work control, and weak social support create the ideal circumstances for the development of stress (Karasek, 1979).

## **2.2 Causes of Stress in Construction**

A study conducted among 369 engineers registered professionally with the Engineering Council of South Africa disclosed that 16% were significantly stressed and 68% moderately stressed (Rothmann and Malan, 2006). 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 work control and social support. In comparison, architects, construction managers, and quantity surveyors also suffer from high levels of stress. According to Bowen *et al.* (2012), 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) 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. Furthermore, the study conducted by Bowen *et al.* (2014) among 177 quantity surveyors reported high stress levels in 24% of the sample. Long hours, tight deadlines, work / family imbalance, and demanding work were reported. Another study conducted by Tiwary *et al.* (2013) reported analogous findings, stating that chronic energy deficiency and exhaustion was present in more than half of the study's participants pointing to possible stress / burnout. When stressed, it is common to experience periods of restlessness, coupled with bouts of energy followed by periods of acute energy deficiency (Willows, 2005). Furthermore, the prevalence of headaches among stressed construction site personnel can subsequently lead to clouded judgement and injury on site (Abbe *et al.*, 2011). There is a myriad of potential stressors affecting the construction industry. Other notable stressors include dirty and unhygienic toilet facilities, poor conditions on site, repetitive work, physically demanding work, working with concrete and other chemical products, exposure to noise and vibratory equipment, working in the elements, limited time spent with friends, communication barriers, poor career growth potential, poor H&S on site, high job demands, lack of resources, inadequate equipment, and lack of social support at work (Abrey and Smallwood, 2014; Oyewobi *et al.*, 2011; Tiwary *et al.*, 2013; Bowen *et al.*, 2012).

### **2.3 Outcomes of Stress**

The most comprehensive study regarding depression and injury was conducted among Chinese construction site personnel, which indicated that they were more than twice as likely to be injured in comparison to the general population. Up to 16% of the sample were significantly depressed and had some form of mental disorder (Jacobsen *et al.*, 2013). Depression is one of the main outcomes of stress. The cognitive state of depression not only puts yourself, but fellow employees at risk of injury due to absent mindedness, not thinking 'clearly', or in a worst case, suicidal ideations (Goldenhar *et al.*, 2003). Oyewobi *et al.* (2011) further established in their research that typical forms of behavioural symptoms / strains are headaches, anger, trouble sleeping, tension, back pain, sadness, stomach aches, and substance abuse.

### **2.4 Stress Management**

Stress can only be managed or reduced, as it cannot be eliminated completely from the life of an adult (Wahab, 2010). The management of stress in the workplace is important, to prevent costly employee health benefits and claims, rising consumer costs, and also, reduced profits.

Stress is not managed in organisations, however, various recommendations have been proposed as to how stress could be managed (Oyewobi *et al.*, 2011; Wahab, 2010; Leung *et al.*, 2012). Moreover, employees resort to coping strategies representative of an unhealthy lifestyle, to alleviate their levels of stress experienced. Two typical examples are excessive smoking and drinking (Tiwary *et al.*, 2013).

A study conducted among workers in the banks of Pakistan indicated poor management of stress due to a management flaw (Ali *et al.*, 2013). The findings stated a need for an adequate reward system, freedom of autonomy, time off, organisational change, and reduced role conflict.

According to Oyewobi *et al.* (2011), recommendations to actively implement stress management include, *inter alia*, fair wages, support from peers, work-offloading, social support with superiors and colleagues, and promotion of recreational / social activities.

## **3. RESEARCH METHOD AND SAMPLE STRATUM**

An exploratory empirical study was conducted among 15 medium to large civil engineering contractors extracted from the local business directories and municipal databases, taking into consideration they had a Construction Industry Development Board (cidb) grading of 5CE (civil engineering), or higher. The research design was based on a survey to collect and analyse data, and to draw conclusions regarding similarities / differences with respect to current theories. The population consisted of civil engineering construction firms' site agents and foremen employed within the NMBM. A sample size of 21 was adopted by means of a non-probability sampling procedure. The primary data collection tool was a self-administered questionnaire delivered by hand and by e-mail, which consisted of three sections. A total of 6 questionnaires were distributed per site to give a grand total of 90. Subsequently, 21 were returned and included in the analysis of the data, which equates to a response rate of 23.3%. The data were analysed by means of the Statistical Package for the Social Sciences Software for Macintosh, in order to

produce descriptive statistics in the form of mean scores (MSs) and standard deviations.

**4. RESEARCH FINDINGS**

Table 1 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. The statements ‘Using unreliable and old tools, ‘Using dirty toilet facilities, and ‘Working on an untidy site’, rank as the three most significant physical stressors, which indicates that civil engineering construction site agents and foremen rate their exposure to their physical environment affecting their occupational hygiene and safety on site as frequent as opposed to infrequent.

**Table 1. Extent to which physical stressors are experienced.**

Physical stressor	U	Response (%)					MS	SD	Rank
		Not at all.....		Very much					
		1	2	3	4	5			
Using unreliable and old tools	0.0	0.0	14.3	23.8	9.5	52.4	4.00	1.10	1
Using dirty toilet facilities	0.0	0.0	14.3	23.8	9.5	52.4	4.00	1.18	2
Working on an untidy site	0.0	0.0	9.5	23.8	33.3	33.3	3.90	1.00	3
Working with poor H&S equipment	0.0	4.8	9.5	28.6	23.8	33.3	3.71	1.19	4
Not being able to wear H&S gear	0.0	19.0	9.5	19.0	19.0	33.3	3.38	1.53	5
Performing repetitive work	0.0	14.3	23.8	23.8	33.3	4.8	2.90	1.18	6
Not being able to clean yourself	4.8	23.8	14.3	19.0	9.50	28.6	2.90	1.70	7
Changing sites or job tasks	0.0	28.6	19.0	23.8	23.8	4.8	2.60	1.29	8
Working in dust, mud or dirt	0.0	23.8	28.6	33.3	14.3	0.0	2.38	1.02	9
Performing physical work	0.0	23.8	42.9	19.0	14.3	0.0	2.24	1.00	10
Noise from tools and machines	0.0	28.6	38.1	23.8	4.8	4.8	2.19	1.08	11
Working in hot weather	0.0	23.8	47.6	19.0	9.5	0.0	2.14	0.91	12
Working with concrete products	0.0	42.9	23.8	23.8	9.5	0.0	2.00	1.05	13
Use of vibratory equipment	4.8	38.1	42.9	9.50	4.8	0.0	1.71	0.90	14

(Source: The Authors)

Correct, safe and functioning tools, as also, ensuring a tidy site provides for safer work practises, which are equally as important to avert the effects of an unsatisfactory physical working environment. The findings of the study align with those emanating from the study conducted by Abrey and Smallwood (2014), which determined that poor maintenance of equipment combined with unhealthy and unsafe working conditions are the most significant stressors construction workers

experience in the NMBM. In comparison, the findings of the study align with the work of Lamari and Chi (2014), which developed a Stressor-Stress-Performance relationship, explaining a positive relationship between a poor working environment, poor workplace safety, and risk exposure relative to emotional and physical stress.

Similarly, the provision of hygienic toilet facilities is paramount, as unhygienic toilets are not only a major health risk, but also a violation of a person's human rights. This finding aligns with the work of Bowen *et al.* (2014), who state that a lack of cleanliness of female toilet amenities may be caused due to a less supportive organisational climate, and discrimination at work, which in turn manifests to stress. It is notable that the present study's target population, consisting exclusively of males, are in agreement of the aforementioned. The control over project and construction managers' physical environment is an imperative factor, which may moderate stress. Bowen *et al.* (2015) are of the opinion that relocating to new projects is a significant contributor to stress for site-based professionals. Consequently agreeing with the findings of the present study, as the lack of control over hygiene in the working environment is a significant stressor, resulting in occupational stress to employees.

Table 2 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 the statements 'Limited time spent with loved ones', 'Tight deadlines', 'Inadequate reward system', and 'Work-life imbalance', all have MSs > the midpoint score of 3.00, which indicates that civil engineering construction site agents and foremen rate the extent to which organisational stressors pertaining to work-life imbalance, job demand, and job support are experienced as frequent, as opposed to infrequent.

The intensity of the organisational stressors spending limited time with loved ones, coupled with work-life imbalance are significant, and have been researched by various authors in the construction industry. Consequently, the study corresponds with the findings of Bowen *et al.* (2014), who concluded that work-family imbalance was the most significant stressor observed in a sample of both male and female construction professionals. The work of Mostert (2011) highlights the importance of minimising work-home interference (WHI). According to Mostert (2011), job demands, and lack of resources lead to WHI, which in turn is strongly associated with burnout. Construction stakeholders need to take note, as social support at the workplace, as also, the home environment will assist employees to cope with stress more effectively during stressful work situations.

The organisational stressors tight deadlines and inadequate reward system pertains to the control over job demands and support in the workplace. The findings of the present study is supported by the study of Bowen *et al.* (2013), who assert that stress is significantly related to numerous demand stressors, *inter alia*, tight deadlines, among a sample of South African quantity surveyors. More notably is the fact that the stressors were significant to the independent variable of gender (affecting males more). In comparison, the stressor time management, as reported by Hamid and Afshar (2014) is an organisational stressor affecting project managers in Malaysia. The present study further aligns with an Australian study conducted among

civil engineers, which indicated that the engineers felt rewards were not in line with their contribution to their organisations (Lingard, 2003). The Australian study asserts that job-redesign, in respect of the aforementioned, could be a preventative strategy in preventing burnout. Another study associates with the findings of the present study.

**Table 2. Extent to which organisational stressors are experienced**

Organisational stressor	U	Response (%)					MS	SD	Rank
		Not at all.....Very much							
		1	2	3	4	5			
Limited time spent with loved ones	0.0	4.8	28.6	14.3	28.6	23.8	3.38	1.28	1
Tight deadlines	0.0	9.5	23.8	23.8	19.0	23.8	3.24	1.34	2
Inadequate reward system	0.0	0.0	42.9	14.3	38.1	4.8	3.05	1.02	3
Work-life imbalance	0.0	14.3	19.0	23.8	33.3	9.5	3.05	1.24	4
High job demand	0.0	14.3	28.6	19.0	28.6	9.5	2.90	1.26	5
Lack of resources	4.8	14.3	14.3	28.6	28.6	9.5	2.90	1.37	5
Communication barriers	4.8	14.3	9.5	42.9	14.3	14.3	2.90	1.37	5
Poor feedback on work done	0.0	14.3	28.6	23.8	23.8	9.5	2.86	1.24	8
Current work load	0.0	9.5	28.6	42.9	9.5	9.5	2.81	1.08	9
Poor career growth potential	4.8	14.3	33.3	14.3	14.3	19.0	2.76	1.51	10
Looking after the H&S of others	4.8	14.3	19.0	38.1	14.3	9.5	2.71	1.31	11
Low job social support	0.0	19.0	33.3	19.0	14.3	14.3	2.71	1.35	12
Poor salary / wage	0.0	23.8	23.8	23.8	14.3	14.3	2.71	1.38	13
Lack of employer commitment	0.0	23.8	23.8	38.1	4.8	9.5	2.52	1.21	14
Lack of control over job tasks	0.0	23.8	28.6	28.6	9.5	9.5	2.52	1.25	15
Low job control	0.0	23.8	28.6	28.6	14.3	4.8	2.48	1.17	16
Relationship with peers	0.0	23.8	28.6	28.6	14.3	4.8	2.48	1.17	16
Lack of social activities	0.0	23.8	33.3	23.8	9.5	9.5	2.48	1.25	16
Long work hours	0.0	28.6	23.8	23.8	19.0	4.8	2.48	1.25	16
Insufficient time off	0.0	33.3	19.0	23.8	14.3	9.5	2.48	1.36	16
Frequent travelling	0.0	33.3	28.6	14.3	14.3	9.5	2.38	1.36	21
Fear of losing my job	0.0	42.9	23.8	9.5	4.8	19.0	2.33	1.56	22
Organisational change	0.0	23.8	38.1	23.8	14.3	0.0	2.29	1.01	23
Nature of my work	4.8	19.0	42.9	23.8	0.0	9.5	2.24	1.22	24
Work atmosphere	0.0	42.9	14.3	23.8	14.3	4.8	2.24	1.30	25
Nature of business operations	4.8	19.0	38.1	28.6	9.5	0.0	2.19	1.03	26
Lack of respect from my peers	0.0	33.3	38.1	14.3	9.5	4.8	2.14	1.15	27
Inadequate employer training	0.0	33.3	33.3	23.8	9.5	0.0	2.10	1.00	28
Lack of freedom of autonomy	0.0	47.6	23.8	14.3	4.8	9.5	2.05	1.32	29
Lack of respect from my superior	19.1	14.3	19.0	38.1	9.50	0.00	2.05	1.32	29
Witnessing of injuries / accidents	0.0	42.9	28.6	19.0	4.80	4.80	2.00	1.14	31
Relationship with superior	4.8	47.6	19.0	14.3	0.00	14.3	2.00	1.48	32
Communication with supervisor	4.8	47.6	23.8	14.3	4.80	4.80	1.81	1.21	33

(Source: The Authors)

The study, conducted in the Palestine construction industry, disclosed that construction project professionals were experiencing stress due to numerous organisational stressors, *inter alia*, unfair rewards from a lack of funds, and tight budgets, to associate with the aforementioned Australian study (Enshassi *et al.*, 2015). Consequently Karasek's job demand-control-support theory is strongly supported in the present study. 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. The findings reported in Table 2 follow fairly predictable lines: It is indicative 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, motivational team building exercises, and instruments to improve the work-home relationship.

Table 3 indicates the extent to which respondents experience behavioural activities 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 the statements 'Headaches', and 'Tense muscles' have MSs equal to the midpoint score of 3.00, which indicates that civil engineering construction site agents and foremen rate their extent to which the stressors are experienced as very much, as opposed to not at all.

The prevalence of headaches among stressed construction site personnel is significant, as it may subsequently lead to clouded judgement and injury on site (Abbe *et al.*, 2011). Enshassi *et al.* (2015) assert that headaches are one of the key job stress and burnout symptoms among project managers and site engineers working in the Gaza Strip. This is notable, as it collaborates to the findings of the present study based in South Africa, which proposes that behavioural activities and physical symptoms of stress may be universal.

Another 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). According to Love *et al.* (2009), contractors' mental health and work stress is inferior to that of consultants, as a result of high job demands and inadequate workplace conditions on-site. Poor mental health was predicted by measuring behaviours consistent with emotional distress, which included, *inter alia*, 'facial muscle tensions' among the respondents. This finding aligns with the present study, and proposes that civil engineering site agents and foremen similarly suffer from poor mental health, more so than that of civil engineering consultants. Furthermore, a questionnaire survey conducted among medical secretaries revealed that high work demands were related to perceived stress, which in turn was related to severe muscle tension, most notably in the neck and shoulder region. This is notable, as the present study reported the head, neck, and shoulders as the anatomic regions experiencing most discomfort.

Although marginally, it is nonetheless 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), which is of concern. Previous studies reporting on substance use suggest contradicting findings. According to Aitken and Crawford (2007), substance use was the least used coping strategy among project managers. In contrast, Bowen *et al.* (2014) proposed a conceptual model, in which alcohol and tobacco use (substance use) associated to the terminal outcome of occupational stress among construction professionals. In comparison to the study by Bowen *et al.* (2014), a study conducted in Nigeria revealed that based upon a sample of 105 construction workers, 9.5% reportedly smoked to alleviate their stress (Wahab, 2010).

**Table 3. Extent to which behavioural and physical sensations / activities are experienced**

Sensation / Activity	Response (%)						MS	SD	Rank
	U	Not at all.....Very much							
		1	2	3	4	5			
Headaches	0.0	0.0	42.9	23.8	23.8	9.5	3.00	1.05	1
Tense muscles	0.0	9.5	23.8	33.3	23.8	9.5	3.00	1.14	2
Smoke cigarettes	0.0	61.9	0.0	9.50	23.8	4.8	2.10	1.48	3
Consume excessive coffee	0.0	47.6	23.8	14.3	9.5	4.8	2.00	1.22	4
Consume excessive alcohol	4.8	42.9	23.8	19.0	9.5	0.0	1.86	1.11	5
Breathlessness	0.0	71.4	9.5	9.5	4.8	4.8	1.62	1.16	6
High blood pressure	0.0	66.7	19.0	4.8	9.5	0.0	1.57	0.98	7
High cholesterol	9.5	61.9	19.0	0.0	0.0	9.5	1.48	0.87	8
Dizziness	0.0	71.4	14.3	9.5	4.8	0.0	1.48	1.29	9
Nausea	0.0	66.7	23.8	9.5	0.0	0.0	1.43	0.68	10
Trembling hands	0.0	85.7	4.8	4.8	4.8	0.0	1.29	0.78	11=
Asthma	4.8	76.2	4.8	14.3	0.0	0.0	1.29	0.78	11=
Heart disease	4.8	90.5	4.8	0.0	0.0	0.0	1.00	0.32	13
Take drugs	4.8	95.2	0.0	0.0	0.0	0.0	0.95	0.22	14=
Diabetes	4.8	95.2	0.0	0.0	0.0	0.0	0.95	0.22	14=
Epilepsy	4.8	95.2	0.0	0.0	0.0	0.0	0.95	0.22	14=

(Source: The Authors)

Table 4 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.

The first ranked statement is ‘Tired, weak, or no energy’, which suggests the respondents are taking strain due to their work obligations. This finding aligns with the work of Pinto *et al.* (2014), which emphasised that exhaustion, a dimension of burnout, leads to ultimate burnout. It is notable that Pinto *et al.* (2014) propose that more women than men are suffering from the chronic effects of exhaustion. Another study similarly suggested that the dimension of exhaustion explained most of the variance in a regression analysis pertaining to burnout, which reinforces the significance (Yip *et al.*, 2008).

The second ranked statement ‘Restless’ is a notable finding, as previous work has mostly focussed on sleep disturbances among nursing and medical workers, following a different time arrangement, as opposed to the construction industry. According to Fischer *et al.* (2006), nursing staff in a medial setting suffer from stressful working conditions due to myriad of work-related stressors, *inter alia*, shift work, poor lighting, lifting objects, and verbal abuse. The work conditions of nursing staff share similarities with those of employees in the construction industry. Bowen *et al.* (2014) assert that limited research has been conducted regarding the strain variable of sleep disturbance, and its effect on construction project consultants, which consequently reinforces its importance within in the civil engineering sector of the construction industry, which remains largely undocumented.

The third ranked statement ‘Irritable’ similarly is notable, as the respondents are of the opinion that work is interfering with their family life. This finding aligns with the work of Leung *et al.* (2009), who suggest that construction project managers in Hong Kong are taking strain as a result of a poor work and home environment, which in turn causes irritation, coupled with interpersonal stressors among project stakeholders. Another study among women professionals suggest that work pressures is causing a spill over effect, which results in feeling irritable at home (Sirajunisa and Panchanatham, 2010).

**Table 4. Extent to which Common Sensations of Stress are Experienced**

Sensation	U	Response (%)					MS	SD	Rank
		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	1.45	1
Restless	0.0	28.6	14.3	23.8	33.3	0.0	2.62	1.24	2
Irritable	0.0	23.8	23.8	28.6	23.8	0.0	2.52	1.12	3
Wake up during the night	0.0	33.3	14.3	33.3	9.5	9.5	2.48	1.33	4
Difficulty in sleeping	0.0	33.3	28.6	4.8	23.8	9.5	2.48	1.44	5
Tension	0.0	19.0	28.6	42.9	9.5	0.0	2.43	0.93	6
Difficulty in concentrating	0.0	23.8	38.1	28.6	9.5	0.0	2.24	0.94	7
Anxiety	0.0	38.1	19.0	33.3	9.5	0.0	2.14	1.06	8
Sleep excessively	0.0	47.6	19.0	23.8	4.8	4.80	2.00	1.18	9

(Source: The Authors)

Table 5 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.

The first ranked statement ‘Sad or down’ is a significant finding. According to Abbe *et al.* (2011), the psychological feeling of sadness was a significant overall experience among a sample of construction workers. Furthermore, Abbe *et al.* (2011) proclaimed that sadness was significantly positively correlated to increased work experience, and insomnia. Also, injury outcomes were significantly correlated to headaches and sadness. The prevalence of sadness, insomnia, and headaches align with the findings of the present study, however, it must be noted that close to fifty percent of the present study’s respondents have less than three years’ experience. This is noteworthy, as the feeling of sadness would hence have been expected to be to a lesser extent. The work of Haynes and Love (2004) disclose a noteworthy finding. According to Haynes and Love (2004), avoidance coping, which is an emotion-focused coping method, causes depression among construction project managers. In contrast, active coping, which is a problem-focussed coping method, reduces depression. The prevalence of depression in the present study therefore questions which coping method is utilised, as also its effectiveness.

The second and third ranked statements are ‘Restlessness’, and ‘Decrease / Increase in appetite’. The ranking of the statement ‘Restlessness’ was anticipated, as it is analogous to the statement ‘Restless’, as portrayed in Table 4 regarding sensations of stress. According to Leung *et al.* (2011), loss of appetite, which is a physiological outcome of stress and depression, occurs among construction project managers who engage on time-limited projects, coupled with a harsh working environment. Furthermore, Leung *et al.* (2011), assert that physiological stress, for example, loss of appetite shares a strong relationship with burnout. Additionally, physiological stress decreases organisational performance among construction project managers. These findings are notable, as it inclines that civil engineering site agents and foremen may be prone to physiological stress, as they too are working to tight deadlines as depicted in Table 2, and may be subject to burnout, consequently leading to reduced organisational performance.

**Table 5. Extent to which sensations of depression are experienced**

Sensation	U	Response (%)					MS	SD	Rank
		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	1.31	1
Restlessness	0.0	38.1	28.6	9.5	19.0	4.8	2.24	1.30	2
Decrease / Increase in appetite	0.0	42.9	19.0	28.6	4.8	4.8	2.10	1.18	3
Don't enjoy things I used to	0.0	42.9	28.6	19.0	9.5	0.0	1.95	1.02	4
Loss of interest	0.0	38.1	38.1	19.0	4.8	0.0	1.90	0.89	5
Decrease / Increase in weight	0.0	52.4	23.8	14.3	4.8	4.8	1.86	1.15	6
Feeling worthless	0.0	57.1	19.0	19.0	4.8	0.0	1.71	0.96	7
Talk or move slowly	0.0	66.7	28.6	4.8	0.0	0.0	1.38	0.59	8
Hurt myself	0.0	85.7	9.5	4.8	0.0	0.0	1.19	0.51	9
Suicidal intentions	4.8	85.7	4.8	0.0	4.8	0.0	1.14	0.73	10

(Source: The Author)

The summary of the salient findings relative to the objectives of the study follows. Civil engineering site agents and foremen within the NMBM are exposed to dirty and unhygienic toilet facilities, which is not only a concern among female construction professionals. Furthermore, the lack of control over hygiene in the work environment is a constant stressor resulting in occupational stress. The prevalence of unreliable and old tools, and exposure to an untidy site are physical stressors among civil engineering site agents and foremen, consequently resulting in poor workplace safety, risk exposure, and emotional and physical stress.

Civil engineering site agents and foremen within the NMBM are exposed to organisational stressors, namely limited time spent with family, and work-life imbalance. Stressful conditions at work results in WHI, which in turn leads to eventual burnout. Consequently, a need exists to provide social support at the work place and home environment. Furthermore, the respondents are exposed to the organisational stressors tight deadlines and inadequate reward system, pertaining to their control over job demands and supports in the workplace. Demand stressors cause stress, primarily to male construction professionals. Similarly, an inadequate

reward system provokes stress and possible burnout, where job-redesign could perform a critical role in preventing burnout. It is notable that the respondents face high job demands, low job control, and diminished social support, which agrees with the construction industry as whole when considering, *inter alia*, construction professionals, project managers, and engineers.

Civil engineering site agents and foremen within the NMBM portray behavioural activities and physical sensations of stress, namely tense muscles, headaches, and smoking cigarettes. The respondents have poor mental health, in contrast to that of consultants, which is explained by the prevalence of muscle tension. Stress due to high work demands causes tension of the face, neck, and shoulder muscles. The respondents suffer from headaches due to work stress, which may lead to clouded judgement and possible injury on site. Furthermore, headaches are a key symptom of burnout. The respondents' coping strategies are unsupportive of a healthy lifestyle, as the respondents exclusively use substances to relieve stress. Although substance use may be a terminal outcome of stress, it is not always adopted as conventional stress management tool.

Civil engineering site agents and foremen within the NMBM experience sensations of stress in the form of feeling tired, weak and no energy, feeling restless, and feeling irritable. The respondents are facing exhaustion due to their work obligations, which exposes them to a greater risk of developing burnout. Although females seemingly suffer more from exhaustion, male respondents in the present study similarly suffer from its effects. The respondents are feeling restless, which proposes that they are suffering from strain in the form of sleep disturbances, although further research is warranted in this regard. The respondents are also of the opinion that work is interfering with their family life, causing irritation, which may lead to interpersonal problems among project stakeholders.

Civil engineering site agents and foremen within the NMBM experience sensations of depression in the form of feeling sad or down, feeling restless, and experiencing a decrease / increase in appetite. Although sadness is expected to increase with years' experience, it is prevalent among the lesser experienced respondents in the present study. Furthermore, the feeling of sadness is related to insomnia, and injury, which is also existent in the present study. Additionally, the respondents may be utilising avoidance coping, as opposed to problem-focussed coping, due to feeling sad or depressed. The respondents are experiencing a decrease / increase in appetite, which is a physiological outcome of stress and depression, and indicative of potential burnout. Furthermore, physiological stress eventually affects organisational performance.

It is notable that the physical stressors have the greatest bearing on the respondents, followed orderly by the organisational stressors, behavioural and physical strains, symptoms of stress, and symptoms of depression. The unique stressors that have been revealed in the present study, in their physical and organisational form, are causing the respondents to experience mental stress. This is proven by the actuality that the respondents are suffering from physiological strains such as tense muscles, headaches, feeling tired, weak with no energy, restlessness, and feeling irritable. In spite of adopting coping mechanisms that are effective, the respondents are utilising smoking and possibly engaging in avoidance based coping

mechanisms in order to deal with stress. Furthermore, the lack of effective stress management strategy renders the respondents prone to burnout and injury on site.

## **5. CONCLUSIONS, RECOMMENDATIONS AND FUTURE RESEARCH**

This study is based on the experience of 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 vis-à-vis the prevalence of symptoms of strains, stress, and depression.

Civil engineering site agents and foremen are exposed to unsuitable and unhealthy physical working conditions, which is a concern to both males and females. They are also exposed to organisational stressors, which portrays a strong link to Karasek's job demand-control-support theory of stress. The respondents are showing signs of strain in the form of tense muscles, headaches, and behavioural patterns, such as smoking of cigarettes. Furthermore, the respondents are reporting initial symptoms of stress and depression in the form of feeling tired, weak, with no energy, feeling restless, and feeling irritable, feeling sad, and experiencing a decrease / increase in appetite.

A literature review supported the study by affirming that high job demands, low job control, and low social support are major contributors to stressed employees in the construction industry. Most construction professionals long for more time spent with family and friends, 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. Although physical health is of acceptable quality in terms of international health standards, early warning signs point to possible forthcoming problems, as depicted in the findings. This may all lead to eventual burnout, affecting physical health, or in worst case cause a fatality to take place on site.

The realisation of the importance of stress management in the civil engineering sector of the construction industry by government stakeholders, as also, councils, private organisations, and construction boards is of utmost importance. Policies and legislation need to be revisited, to include the wellbeing of employees in the civil engineering sector of the construction industry with regards to stress. Various legislative acts need to be revisited, typical examples include the Occupational Health and Safety Act (OH&S), Compensation for Occupational Injuries and Diseases Act (COID) 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 in the contractual requirements and bill of quantities sections. Private organisations are to endeavour to provide employee training with regards to not only creating internal coping strategies to deal with stress, but also how to manage stress more effectively at home and at work setting – a situation is only as stressful as you perceive it to be.

Furthermore, future research should aim to investigate the stress effect of dirty and unhygienic toilet facilities among males and females, to evaluate whether significant gender differences exist. The effects of a poor working environment relative to emotional and physical stress similarly needs to be further investigated in

the current setting. The level of WHI in the civil engineering sector of the construction industry is of significance, as the industry is transient in nature, which will develop burnout to various intensities. The existence of muscle tension, most notably in the face, neck, and shoulders is mostly documented in a medical setting. Consequently, future research should identify its severity and relationship to mental stress and burnout in the construction industry. The prevalence of headaches needs to be better understood, to determine how it provokes clouded judgement, and subsequent injury among site based staff. The prevalence of exhaustion, which is theorised to be predominantly associated to females, needs to be further investigated regarding male employees in the civil engineering sector of the construction industry. Future research needs to investigate what coping strategy is primarily used by civil engineering employees, the degree of insomnia and disturbances to sleep patterns experienced, and the degree of irritation experienced by construction professionals. The relationship between the variables level of work experience, sadness, insomnia, headaches, injury, and stress opens an interesting field for future research. Similarly, the relationship between the physiological outcome of loss of appetite, mental stress, depression, and its burnout effect needs to be explored vis-à-vis the civil engineering sector of the construction industry.

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