IMPACT OF EMPLOYEES SAFETY CULTURE ON ORGANISATIONAL PERFORMANCE IN SHELL BONNY TERMINAL INTEGRATED PROJECT (BTIP)

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ABSTRACT

The paper focuses on the impact of employees' safety culture on organizational performance (improved management/employees safety practices, enhanced productivity, increased profitability and reduced accident/ incident rate) in shell bonny terminal integrated project. It defines employees' safety culture as a product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the level of commitment, style and proficiency of an organization's safety management system. It assumes that inculcation of employees' safety culture on the workforce at the task level using behavior-based safety culture approach (enforcement and education) has an influence on employees' safety performance as well as on company performance: enhancement of productivity, profitability and loss control through reduction of accident/incident rate. The paper posits that: if construction companies in Shell Bonny terminal integrated project (BTIP) inculcate safety culture in their workforce through changing employees' attitude to safety, there will be an improvement in employees' obedience to safety rules and regulations thus enhancing better safety performance. The better safety performance of employees will lead to few accidents, damages, liabilities, legal costs, medical costs etc. through reduction of safety risks and creation of better opportunities for rehabilitation of employees after injury. The better safety performance of the company will bring about better productivity, profitability, efficiency, quality, good corporate image and innovative capacity. The paper concludes that inculcation of employees' safety culture on the workforce at the task level in the Shell Bonny terminal integrated project (BTIP) will improve employees' safety practices at work thus enhancing their productivity, profitability and loss control. It therefore recommends among others: for visible top management commitment to construction employees safety culture, establishment of monthly safety incentive schemes for employees, training/retraining of employees on safe work procedure, increase in site safety audits and focusing of monthly safety meetings on employees' attitudinal change towards safety.

Keywords: *employees safety culture, behavior-based safety, organizational performance, safety performance, task-level.*

1.1 Introduction

The need to modernize and automate the existing facilities at the Shell Petroleum Development Company (SPDC) Bonny oil and gas terminal necessitated the award and execution of the bonny terminal integrated project (BTIP). The project consists of the rehabilitation of existing crude oil storage tanks and construction of new ones, construction of new residential and office buildings, construction and installation of new gas turbines, booster pumps, emulsion treatment plant and an automated central control system. It also includes the laying of two new 48inches crude export pipelines to the offshore crude loading platform (CLP).

The BTIP contract with an estimated value of US$2.2 billion is being executed by three major construction companies namely Hyundai Heavy Industries Nigeria Ltd (HHI), Dec oil and Gas Company Nigeria Ltd and Zakhem oil services Nigeria Ltd. The civil and the mechanical aspects of the BTIP   is being executed by HHI, the Tank rehabilitation aspect is undertaken by Zakhem oil services while the construction of new tanks is being executed by Dec oil and gas Ltd. Though a safety management system was incorporated into the project design and construction contract document as specified in Nigeria's Mineral Oils (Safety) Regulations 1997, the increasing rate of construction accidents/incidents within the last six months of 2006 in the BTIP, raised several thought provoking questions as to the existence of a safety culture in the BTIP.

Safety culture first made its appearance in the 1987 OECD Nuclear Agency report (INSAG, 1988) on the 1986 Chernobyl disaster. The report introduced the concept to explain the organizational errors and operator violations that laid the conditions for the nuclear disaster. It is loosely used to describe the corporate atmosphere or culture in which safety is understood to be, and is accepted as, number one priority (Cullen, 1990). It is defined as the shared values and beliefs that interact with an organization's structures and control systems to produce behavioural norms (Uttal, 1983). Turner, Pidgeon, Blockley and Toft (1989), defined it as 'the set of beliefs, norms, attitudes, roles, and social and technical practices that are concerned with minimizing the exposure of employees, managers, customers and members of the public to conditions considered dangerous or injurious'. The Advisory Committee for Safety in Nuclear Installations, subsequently adopted by the UK Health and Safety Commission (HSC,1993), defined it as, the product of individual and group values, attitudes, competencies, and patterns of behaviour that determine the commitment to, and the style and proficiency of, an organization's health & safety programmes while a behaviour -based safety culture approach concentrates on workers who are the most likely to be injured in construction projects by revising the organization's employees safety culture and re-orientating employee's safety attitude.

The influence of an enduring employee's safety culture on organisational productivity and loss control in the Nigerian construction industry cannot be over emphasized, especially in the areas of setting minimum safety management standards, safe work procedures and environmental management standards. It is assumed that an organization's employees safety culture have a direct relationship with employees' productivity in view of the fact that assigned tasks can only be safely accomplished when the work environment is safe and conducive for the execution of the assigned duties, be it construction, manufacturing or servicing, thus, any phenomenon that affects human production capacity will invariably affect organizational productivity hence improving workers wellbeing offers a company the opportunity of enhancing its performance(Galliker,2000).

The consequences of construction incidents (accidents, ill-health and environmental pollution) on workers' productivity are so grave that construction companies should be legally, morally and socially compelled to inculcate safety culture in their workforce. Construction incidents especially those involving lost time injuries (LTI) and lost workdays (LWD) usually lead to shop closure for incident investigation and reporting. This situation results in loss of man-hours, output, reputation and low workers morale. Apart from the need to reduce or eliminate accidents/incidents, construction companies should inculcate safety culture in their workforce in order to satisfy legal, social, moral and cultural obligations of the host country/community. Dorman (2000) argues that for companies to provide effective improvement of health, safety and environment conditions, the costs of ill-health/accidents must be economic, internal, variable and visible.

The extent to which employees' safety culture is viewed as a core management responsibility in construction companies depends on the answers to the questions below:

- Is employees' safety culture perceived to be a critical commercial success factor?
- Are the costs of ill-health, injury and pollution perceived to be significant?
- Do customers or regulatory bodies exert pressure or make demands on the company to achieve certain a minimum employees' safety culture at the task level?

If the answer to one or more of these questions is affirmative, it is probable that the employees' safety culture will be seen as an important commercial consideration and treated as a core management responsibility. In the case of construction companies in the BTIP, productivity/loss control has been enhanced to the extent that employees' safety culture is included and regarded as a major production input like enterprise skills in the execution of their operations. Court (2003), in his contribution to corporate employees safety culture as a safety best practice, argues that creating better work environment and preventing harm from work are the key means of improving productivity. It is against this background that it becomes pertinent to embark on a research that will ascertain the impact of employees' safety culture on organisational performance in the BTIP.

1.2 Statement of the problem

Between March and June 2006, the BTIP recorded two fatalities the first fatality occurred on 4th March 2006, in which a Zakhem worker was drowned, while carrying out marine activities, while the second fatality occurred on 12th June, 2006, in which a HHI TCN staff died as a result of injuries sustained during a winch cable puling operating. The learning points from the reports of both incidents suggested that employees' safe work procedures/safety culture were either inadequate or poorly communicated to the workers. Both incidents resulted in site closure for accident investigation, low employees morale, loss of machine/man-hours, increased employees turnover, delayed project delivery date and loss of organizational reputation all which culminated in reduced organisational performance.

1.3 Objectives of the study

The role of a well-articulated and properly communicated employees safety culture in the execution of construction activities cannot over emphasized especially in accident prevention. Since 88% of all construction accidents can be traced to the unsafe acts of people (Heinrich, 1941). People in most cases exhibit unsafe acts when they are not properly informed about the hazards/safe work procedures associated with the jobs they are expected to execute. Thus the objectives of this research are as follows:

- To ascertain the extent to which BTIP construction companies inculcates employees' safety culture in their workforce.
- To ascertain the extent to which employees safety culture influenced organisational performance (improved employees safety practices, enhanced productivity, increased profitability and reduced accident/incident rate) in the BTIP.

1.4 Research Hypotheses

In view of the above research objectives, the following null and alternative hypotheses were formulated:

H_0: Better organisational performance (improved employees safety practices, enhanced productivity, increased profitability and reduced accident/ incident rate) is not dependent on the inculcation of employees' safety culture on the workforce in the BTIP.

H_1: Better organisational performance (improved employees safety practices, enhanced productivity, increased profitability and reduced accident/ incident rate) is dependent on the inculcation of employees' safety culture on the workforce in the BTIP.

2.1 Literature Review

A literature search reveals that very few models of organisational (safety) culture exist. Those that exist, tend to adopt Schein's (1992) three-layered cultural model that assesses: (1) core underlying assumptions; (2) espoused beliefs and values; and (3) behaviours and artifacts'. For example, Glendon and Stanton (1998) used Schein's model in a theoretical attempt to locate where safety climate resides in relation to organisational safety culture. They also added breadth (i.e. the extent to which cultural elements are shared across an organisation or are localised) and time (i.e. cultural drivers have a past, a present, and a future).

Guldenmund (1998) conceptualizes safety culture as a three-level model, whereby each level might be examined separately or together. The `core' is thought to reflect unspecified basic underlying assumptions that permeate the whole organisation. The middle level consists of publicly declared beliefs and values that are operationalized as attitudes while the most superficial level reflects behaviours and artifacts. Because attitudes have specific objects, he placed the target of these attitudes into hardware, software, people and behaviour taxonomy. He further suggests that behaviours might encompass inspections, accidents and near-misses while safety posters and personal protective equipment could be construed as artifacts.

> *Furnham and Gunter (1993) explored Schein's cultural model and asserted that the underlying assumptions need to be manifest in some ways: either by inference to the way beliefs and values are expressed or by observing behaviours and artifacts. Johnson and Scholes (1999) reinforced this argument by stating that underlying assumptions are the representations in organisational action of what is taken for granted. It seems sensible, therefore, to assume that any organisation's underlying assumptions are reflected in their policies, structure, control systems and styles of management (Thompson and Luthans, 1990).*

As currently conceptualized, neither model appears to account for the dynamic nature of safety culture. Instead, they seem to reflect a linear sequence of cause and effect in so far as the core assumptions dictate people's beliefs and values, which in turn dictate behaviour and the artifacts that reflect the core assumptions. To a large extent this one-way linear sequence, mirrors both Azjen and Fishbein's (1980) and Eagly and Chaiken's (1993) model of attitude and behaviour relationship. However, this simple cause and effect model has been shown to be inadequate in many ways as it is known that changing behaviour can, and often does, change attitude (Bandura, 1986). Johnson (1992) amalgamates both Schein's (1990) and Hofstede's (1990) culture models and presents a `cultural web' that examines culture by asking questions about the dominant paradigm (underlying assumptions) and controls of an organisation. Unlike the previous two models of culture based on Schein's work discussed above, Johnson has translated his model into a practical, interpretative tool for assessing culture. As such he has provided a means with which to qualitatively examine the prevailing safety culture at any moment in time, while specifically linking the web to the organisation's political, symbolic and structural aspects. Geller (1997) also proposes a `Total Safety Culture' model that encompasses `the safety triad' that recognises the dynamic and interactive relationships between person, environment and behaviour. Moreover, he advocates for the10 principles or values that form the basis of a total safety culture.

Reason (1997) proposes culture as comprising of various other sub-cultures. Sub-culture can be used interchangeably to refer to a sub-group of people (i.e. department, workgroup) and an aspect of culture itself (e.g. safety culture is a sub-culture of corporate culture) and equates safety culture with an `informed culture, which is dependent in turn upon a `reporting culture' that is underpinned by a `just culture. Reason's approach can also be subsumed within the psychological (e.g. just cultures), behavioural (e.g. reporting cultures) and situational (i.e. flexible and learning culture) elements of the reciprocal model. Simultaneously, a flexible culture' is required if the organisation is to reconfigure itself in the light of certain kinds of dangers, which in turn will require a `learning culture'. In other words an informed culture (equivalent to a safety culture) comprises of many types of situational specific cultures (all of which are not safety related), which interact with each other to create the informed culture.

Although underspecified in many respects, the model appears to represent a goal-setting paradigm, in that to engineer a safety culture (super-ordinate goal) it has to be broken down into a series of sub-goals (i.e. develop reporting, just, flexible and learning cultures). Each of these is again dependent upon achieving a further series of sub-goals. In this case, the vast majority of goals and sub-goals relate to management information systems. However, Reason does include other aspects of `traditional' safety management in his model.

In summary, researchers use Schein's three-layered model via the `cultural web' to examine the qualitative aspects of safety culture and their meanings and their findings could be used to develop quantitative tools that exhibit `point-to-point correspondence' of `matched' factors. Alternatively, quantitative researchers adopt the qualitative approach to discover the meanings behind the patterns that emerge from their quantitative research. In either event, the findings of both approaches may shed more light on the concept of safety culture beyond those obtained from using only one of these models.

2.2 Conceptual Framework of Employees Safety Culture

According to Goetzel (1999), inculcating safety culture in employees, is directly related to the productivity and profitability of organizations. Further, he identified some interesting common success factors that are peculiar to the inculcation of safety culture in employees:

- Companies that inculcate safety culture in their employees focus on safety/productivity management, not because it is a human resource activity, because of its alignment with the business purpose of the organisation.
- Companies that inculcate safety culture in their employees consider many factors that may impact on workers' productivity in addition to those associated with specific safe work procedure.
- Safety professionals are the primary drivers and champions of employees' safety culture in industrial activities.
- Companies that inculcate safety culture in their employees emphasize safety/productivity management not just because it is cost-effective, because it means an improvement of the quality of industrial life.
- Safety data measurement and evaluation are vital for organizations that inculcate safety culture in their employees.
- Organisations that inculcate safety culture in their employees act on the belief that internal benchmarking is as important as external benchmarking.
- To support investments over time, safety culture oriented orgaisations should be able to demonstrate return on investments for specific programmes related to safety management, both prospectively and retrospectively.

2.3 Theoretical Framework of Employees Safety Culture

This paper is based on the economic effects theory of Mossink and De Greef (2002) that inculcation of safety culture in employees at the company level has positive effects on safety performance of employees as well as on corporate performance/productivity. This theory is illustrated diagrammatically in figure 1 below:
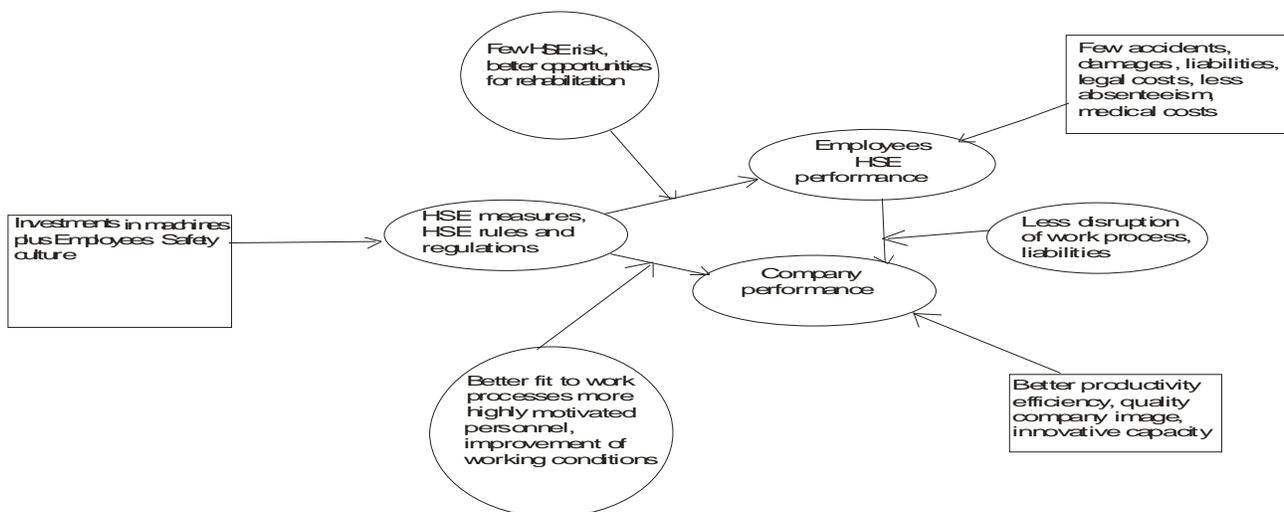
Figure1: Economic Effects of inculcation of employees' safety culture at the company level

Source: Adapted with modification from Mossink, J & De Greef, M (2002) Inventory of social economic cost of work accidents, European Agency for Safety and Health at Work.

Figure 1 is explained thus: If a company incorporates employees' safety culture into its investment in machines and technology(socio-technical investments) through behavioural-based safety (BBS) and better man/machine design (ergonomics), this situation will lead to employees' obedience to safety rules and regulations since the awareness has been created through training, enforcement and management commitment. The employees and management obedience to safety rules and regulations will make for better safety measures; this will result to better safety performance of employees, the management and the company as a whole. The better performance of employees will lead to fewer accidents, damages, liabilities, legal costs, medical costs etc., through reduction of safety risks and creation of better opportunities and rehabilitation for employees after injury.

The better safety performance of the company will bring about better productivity, efficiency, quality, corporate image and innovative capacity due to improved employees skills via training, motivation and ergonomy hence there will be less disruption of work process and less liabilities.

Further, Mossink, J & De Greef, M (2002) stated that the economic effects of inculcation of employees safety culture at the company level are necessitated by the need to:

- Take a balanced decision with regards to the allocation of company resources.
- Bridge the gap between safety needs and management requirements and desires.
- Encompass the limited effectiveness of legislation.

However, other safety culture scholars criticized the economic approach to inculcation of safety culture in employees at the company level on the bases that inculcation of safety culture in employees is part of the social and ethical role of a company and as such should not only be based on economic parameters since it is difficult to evaluate qualitative costs such as suffering, reduction of quality of life, family problems, decrease in lifespan etc., in monetary terms.

3.1 Research Methodology

The scope of the research is limited to the three construction companies (HHI Nigeria ltd, Dec oil gas ltd and Zahkem Nigeria ltd) involved in the SPDC Bonny BTIP. An exploratory, cross-sectional survey was used in generating the primary data required for the study. The population of study consists of 40,568 workers of three categories (3,560 supervisors, 10,028 foremen and 26,980 workmen) drawn from the three BTIP construction companies. A sample of 396 workers (35 supervisors, 98 foremen and 263 workmen) determined at 5% level of significance for sample error, using Taro Yamane's (1964) formula, was selected using stratified random sampling method for the purpose of questionnaire administration. The questionnaire was designed to obtain a fair representation of the opinions of the three categories of construction workers in the three construction companies using a three -point Likert type scale. The questionnaire responses of the sample respondents were presented using tables, analyzed and interpreted using simple percentages. A total of 396 copies of the questionnaire were administered, out of which 2 were cancelled while 4 were not returned and 390 (98%) were used for analysis.

4.1 Results and Discussion

Table4.1: **Response pattern on the extent of inculcation of employees' safety culture in the three BTIP construction companies**

Category of Respondents/Workers	Responses Provided			
	Large extent	Mild extent	Poor extent	Total
Supervisors	25	8	2	35
Foremen	85	10	3	98
Workmen	221	25	11	257
Total	331	43	16	390

Source: Field Survey, 2012.

Table 4.1, indicates that a total of 331 i.e. 85% of the workers across the three categories, are of the opinion that their company to a large extent inculcates safety culture in their employees, 43 i.e. 11% of the workers are of the view that their company to a mild extent inculcates safety culture in their employees while16 workers i.e. 4% expressed a poor extent view of their companies inculcation of safety culture in their employees. We therefore conclude that there is evidence of a large extent inculcation of a safety culture in the BTIP employees as buttressed by the 85% large extent response of the sample respondents.

Table 4.2: **Response pattern on the extent inculcation of employees' safety culture influences better organisational performance (improved employees safety practices, enhanced productivity, increased profitability and reduced accident/ incident rate)**

Category of Respondents/Workers	Responses Provided			
	Very large extent	Mild extent	Poor extent	Total
Supervisors	30	3	2	35
Foremen	90	6	2	98
Workmen	225	25	7	257
Total	345	34	11	390

Source: Field Survey, 2012.

Table 4.2, indicates that a total of 345 i.e. 88% of the workers across the three categories are of the view that their company's inculcation of safety culture in their employees to a large extent influences better organisational performance (improved employees safety practices, enhanced productivity, increased profitability and reduced accident/incident rate,34 i.e. 9% of the workers are of the view that their company's, inculcation of safety culture in their employees to a mild extent influences better organisational performance while 11 workers i.e. 3% expressed a poor extent view. We therefore conclude that there is evidence that inculcation of a safety culture in the BTIP employees has to a large extent influenced better organisational performance as buttressed by the 88% large extent response of the sample respondents.

Table 4.3: **Responses on the extent better organisational performance (improved employees safety practices, enhanced productivity, increased profitability and reduced accident/incident depends on the inculcation of employees safety culture in the BTIP construction companies**

Category of Respondents/Workers	Responses Provided			
	Large extent	Mild extent	Poor extent	Total
Supervisors	20	10	5	35
Foremen	75	15	8	98
Workmen	230	20	7	257
Total	325	45	20	390

Source: Field Survey, 2012.

Table 4.3, shows that a total of 325 i.e.83.33 % of the workers across the three categories were of the view that better organisational performance depends to a large extent on their company's inculcation of a safety culture in their employees, 45 i.e. 11.54% of the workers expressed a mild extent view while 20 i.e. 5.13% of the workers expressed a poor extent view. We therefore conclude that there is evidence that better organisational performance depends on the inculcation of employees safety culture in the BTIP construction companies as buttressed by the 83.33% large extent response of the sample respondents.

Table 4.4: **Observed and Expected Frequencies of table 4.3**

Category of Respondents/Workers	Responses Provided			
	Large extent	Mild extent	Poor extent	Total
Supervisors	20 (29.17)	10 (4.04)	5(1.79)	35
Foremen	75(81.67)	15 (11.31)	8(5.03)	98
Workmen	230(214.17)	20 (29.65)	7 (13.18)	257
Total	325	45	20	390

Source: Field Survey, 2012.

4.2 Test of Hypothesis

(i) H_o: Better organisational performance (improved employees safety practices, enhanced productivity, increased profitability and reduced accident/ incident rate) is not dependent on the inculcation of employees' safety culture in the BTIP.

H_1:Better organisational performance (improved employees safety practices, enhanced productivity, increased profitability and reduced accident/ incident rate) is dependent on the inculcation of employees' safety culture in the BTIP.

(ii) $\alpha = \mathbf{0.05}$

(iii)**Degree of Freedom (df) = (r – 1)(c-1= (3-1)(3-1)=4**

(iv)**Chi- square critical value**$\chi^2_{0.05} = \mathbf{9.49}$

(v))**Chi- square computed value from table 4.4** $= \chi^2_1 = \sum (F_0 - Fe)^2/Fe$

Table 4.5: **Computation of Chi-square Test Statistic from table 4.3**

Fo	Fe	(Fo-Fe)	$(Fo-Fe)^2$	$(Fo-Fe)^2/Fe$
20	29.17	9.17	84.0889	2.8827
75	81.67	6.67	44.4889	0.5447
230	214.17	-15.83	250.5889	1.1700
10	4.04	5.96	35.5216	8.7925
15	11.31	3.69	13.6161	1.2039
20	29.65	-9.65	93.1225	3.1407
5	1.79	3.21	10.3041	5.7565
8	5.03	2.97	8.8209	1.7537
7	13.18	-6.18	38.1924	2.8978
				χ^2_c=**28.1425**

(vi) **Decision Rule:**

Reject H$_{o:}$ if $\chi^2_c > \chi^2_t$ or Accept H$_{o:}$ if $\chi^2_c < \chi^2_t$

Since $\chi^2_c > \chi^2_t$ i.e. 28.1425 > 9.49, we reject the null hypothesis and accept the alternative hypothesis that better organisational performance (improved employees safety practices, enhanced productivity, increased profitability and reduced accident/ incident rate) is dependent on the inculcation of employees' safety culture in the BTIP.

5.1 Conclusion

This paper has tried to address the impact of employees' safety culture on organisational performance in the BTIP, from the economic perspective.

Concisely stated, the main thrust of the economic approach to the inculcation of employees' safety culture in the BTIP construction activities at the company level is based on three principles:

- Inculcation of employees' safety culture at the company level will lead to better safety performance of employees, management and the company as a whole resulting in less disruption of work process and less liabilities.
- Better performance will lead to few accidents, damages, liabilities, legal costs, medical costs etc. through reduction of safety risks and creation of better opportunities and rehabilitation for employees after injury.
- Better company performance will lead to better productivity, profitability, efficiency, quality, corporate image and innovative capacity through improvement of employees' skills via training, motivation and ergonomy.

5.2 Recommendations

Arising from the findings of this paper, it is suggested that the management of the three BTIP construction companies in Shell Bonny terminal should take the following measures:

- Continuous training/retraining of safety personnel and the entire workforce on safe work procedures.
- Visible top management commitment to safety culture inculcation in both themselves and the workforce. Establishment of monthly safety incentive schemes for all the employees in the BTIP.
- Continuous implementation of safety regulations and industrial best practice procedures.
- Continuous review of corporate safety policies to accommodate changes in the construction environment and modern developments in hazard management.
- Focusing of daily toolbox meetings on safe work procedure.
- Increase in site safety audits and focusing of monthly safety meetings on employees' attitudinal change towards safety.

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