

# A REVIEW OF CONSTRUCTION SAFETY, CHALLENGES AND OPPORTUNITIES - OMAN PERSPECTIVE

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## ABSTRACT

*Data from a number of industrialized countries show that construction workers are 3 to 4 times more likely than other workers to die from accidents at work. In the developing world, the risks associated with construction work may be 3 to 6 times greater. Construction is one of the world's biggest industrial sectors, including the building, civil engineering, demolition and maintenance industries and in Oman it account 10% of the total GDP. Statistic indicates that a total of 723,000 residents were working in construction industry in 2014. Construction workers build, repair, maintain, renovate and demolish houses, office buildings, factories, hospitals, roads, bridges, tunnels, stadiums, docks, airports and more. During the course of their work they are exposed to a wide variety of hazards on the job, including dusts and vapours, asbestos, awkward working positions, heavy loads, adverse weather conditions, work at heights, noise, vibration from tools, among many others. In most developed countries, organizations have significantly reduced the risk of injuries and fatalities by understanding the impact of construction safety on their performance. This involves the development and implementation of construction safety rules and laws by the organizations itself and by authorities responsible for this purpose. Such safety rules and laws are based on the studies of organization safety cultural and post-accident investigations. Statistics indicates that worker deaths in America are down on average, from about 38 worker deaths a day in 1970 to 12 a day in 2014 and worker injuries and illnesses are down from 10.9 incidents per 100 workers in 1972 to 3.3 per 100 in 2013. This paper presents the challenges and opportunities available for Oman to improve the construction safety performance of the organization by developing and implementing standard safety rules and laws. The research methodology includes the comparison of existing construction safety in Oman with some of the developed countries. The paper further describe how Oman can improve construction safety by developing specific safety rules and regulation and their enforcement through inspection of construction site under an independent authority of health and safety.*

**Keywords:** Construction Industry; Risk; Worker; Safety Performance; Safety Rules and Laws.

## 1. INTRODUCTION

Statistic published by International Labor Organization indicates that at least 108 thousand workers are killed on construction site every year, a figure which represents about 30 percent of all occupational fatal injuries. Data from a number of industrialized countries show that construction workers are 3 to 4 times more likely than other workers to die from accidents at work. In the developing world, the risks associated with construction work may be 3 to 6 times greater. Many more workers suffer and die from occupational diseases arising from past exposure to dangerous substances, such as asbestos. Construction is one of the world's biggest industrial sectors, including the building, civil engineering, demolition and maintenance industries. It accounts for a large proportion of GDP for many countries for example, 10 percent in the U.K., 17 percent in Japan, and 10 percent in Oman. Statistics published in daily Times of Oman dated June 09, 2014, a total of 723,000 residents were working in construction industry. In most developing countries, construction is among the fastest growing areas of the labor market, continuing to provide a traditional entry point for laborers. It is, however, one of the most dangerous

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industries. Construction workers build, repair, maintain, renovate and demolish houses, office buildings, factories, hospitals, roads, bridges, tunnels, stadiums, docks, airports and more. During the course of their work they are exposed to a wide variety of hazards on the job, including dusts and vapours, asbestos, awkward working positions, heavy loads, adverse weather conditions, work at heights, noise, vibration from tools, among many others. The causes of accidents and ill-health in the sector are well known and almost all are preventable. A report published in Daily Times (2015) states that there is no official statistics of how many company workers get hurt in the course of their duties but according to the individual Health and Safety Environment's (HSE) records of top 10 contractors, more than 3,700 of them needed medical treatment in 2014. The injured workers who get hospitalized made up nearly 10 per cent of the total workers on this list. Sadly, about 18 percent of them died either at the sites or in hospitals last year. In comparison to the previous year, 246 more workers got injured in 2014 but for obvious reason, company directors do not want this part of the record to be made public. According to the results of the occupational safety and health (OSH) review study conducted by the ILO and the ILO Regional Office in Beirut at the end of 2007, Oman has not ratified any of the core OSH Conventions, notably Conventions No. 155 (Occupational Safety and Health Convention, 1981) and No. 161 (Occupational Health Services Convention, 1985), nor the latest Convention No. 187 (Promotional Framework for Occupational Safety and Health Convention, 2006). Traditional measures of safety are after-the-fact measures; namely, that safety is measured after injuries have already occurred. These measures are labelled reactive, trailing, downstream, or lagging indicators because they rely on retrospective data. Focusing on these measures e.g., accident rates and compensation costs often means that the “success of safety is measured by the levels of system failure” (Cohen, 2002).

In recent years, there has been a movement away from safety measures purely based on retrospective data or “lagging indicators,” such as accident rates, toward so-called “leading indicators” such as site investigation and measurements of safety climate (Flin *et al.*, 2000). In view of the importance of Occupational Health and Safety (OHS), countries such as the United Kingdom (UK), Singapore and Hong Kong (HK) have adopted a self-regulatory approach to safety, whereby proprietors (including contractors) are required to develop, implement and maintain safety management systems (Rowlinson, 1997; Wilson and Koehn, 2000). The practice of safety in construction in the USA is regulated by governmental agencies such as the Occupational Safety and Health Administration (OSHA), and in UK it is regulated by Health and Safety Executive (HSE) which provides strict rules and regulations to enforce safety and health standards on job sites. Some construction companies realize the importance of reducing their accident rates not only for humanitarian reasons, but also because of the many financial benefits which flow from the safe conduct of the work. Other companies do not have a strong belief in safety. This has serious repercussions when any unfortunate incidents occur. Good management should always insist that every engineer, supervisor and laborer must be familiar with all basic safety aspects and practices that guard those around the sites from accidents and injuries.

This paper present a thorough review of construction safety in Oman, focusing on the current status of safety, regulation of health and safety, enforcement and recommendation how the safety can be further improved by establishing a health and safety regulatory authority involving all stakeholder.

### ***1.1. CONSTRUCTION PARTIES SAFETY RESPONSIBILITIES***

The responsibility for safety on any construction project should be shared between all the parties involved in the project, namely, the owner, the designer or architect and the contractor. The owner, as part of his safety responsibilities, must ensure that the designer designs a safe project. He must also ensure that the contractor has a safety program. The owner should include the safety program as an element of the bidding technicalities. The architect or designer contributes towards ensuring the safety of the project by properly designing the temporary and permanent work from the safety point of view. The temporary works must be designed so that they provide a safe means of access to and about the construction work. The permanent work must be designed so that it is stable and safe for the users. Contractors should provide a safe environment for workers by meeting all safety requirements during construction processes, beginning with site preparation and ending with completion of the work. Regulatory and contractual requirements place the primary responsibility for construction site safety on the constructor (Behm, 2006). For instance, the Federal OSHA regulations place the responsibility for worker safety on the

constructor as the primary employer. Project owners who make safety a priority also place the responsibility for construction site safety directly on the constructor, by showing preference for pre-qualified contractors who have good safety records, lower insurance rates, and comprehensive safety programs.

Research into the root causes of construction accidents has also focused on the role of the constructor. Abdelhamid and Everett (2000) evaluated construction accidents in the United States and developed a model for tracing the root causes of accidents. Their research addressed activities and conditions at the construction site but did not consider potential root causes in the project concept and design phases. The authors attributed unsafe conditions to four main causes: management action/inaction, unsafe acts of workers and co-workers, events not directly human related (such as equipment failure and natural disasters), and unsafe conditions that are a natural part of the construction site (such as uneven terrain and concealed ditches). Abdelhamid and Everett's approach is consistent with conventional accident root-cause analysis, focusing solely on the actions and inactions of the constructor, rather than adopting a broader view of accident causality that looks at upstream influences, including the design process.

One recent study of causal factors in construction accidents looked at the designer's role. Haslam *et al.* (2003) studied the causes of 100 construction accidents in the United Kingdom, and found that permanent works designers (synonymous with "design professionals" in the United States) could have reduced the risk associated with the accidents in almost half of the cases. The authors also developed a construction accident causality model that described immediate causes, shaping factors, and originating influences in construction accidents. They concluded that the permanent works design influences the workers' activities, the site, and the materials and equipment specified for construction.

## **2. STATUS OF HEALTH AND SAFETY**

Research conducted by Smallwood (2004b) in selective construction project measuring different projects parameter found that health and safety is the least important project parameter among five different other as shown in Table 1. It should be noted that the perceived importance of H&S is likely to influence the adopting of H&S as a value, as opposed to a priority. The adopting of H&S as a value is important as priorities change, and hence the importance of the status of H&S. However, the adopting of H&S as a value is a prerequisite for addressing and optimizing the other constituents of H&S culture. Giving less priority and importance to health and safety by construction organization shows the unawareness of cost of accidents and such action can lead the organizations to high number of accidents. The cost of accidents can be categorized as being either direct or indirect. Direct costs tend to be those associated with the treatment of the injury and any unique compensation offered to workers as a consequence of being injured and are covered by workmen's compensation insurance premiums. Indirect costs which are borne by contractors include reduced productivity for both the returned worker(s) and the crew or workforce; clean-up costs; replacement costs; costs resulting from delays; supervision costs; costs related to rescheduling; transportation, and wages paid while the injured is idle (Hinze 1994). Recent research conducted in the United Kingdom (UK) determined indirect costs to be 11 times the direct costs - 11:1 (Movement for Innovation, 2003). Research conducted in South Africa determined the indirect costs to be 14.2 times the direct costs (Smallwood, 2000). Research conducted in the United States of America indicates the total cost of accidents constitutes, inter alia, 6.5 % of the value of completed construction (The Business Roundtable, 1995) and in the UK approximately 8.5 % of tender price (Anderson, 1997).

Rowlinson (1997) maintains H&S performance cannot be measured in economic terms, but only in social terms. Consequently, the appropriate level of expenditure on H&S should be based upon economic, political and social considerations. However, various authors quantify the cost of prevention. The Business Roundtable (1995) cites research conducted in the USA, which determined that the cost of administering an H&S programme usually amounts to 2.5 % of direct labour costs. Based upon two projects undertaken by a South African general contractor and given that direct labour costs typically constitute 25 % of the total project, the cost of administering an H&S programme was estimated to amount to 0.65 % (25 % x 2.5 %) of the total project cost (Smallwood, 2000a).

Research conducted by Lai (Tang, Lee and Wong, 1997) in Hong Kong revealed that most contractors set aside an amount of less than 0.5 % and some even less than 0.25 % of the contract sum for investing in

H&S on their contracts. During recent research conducted among a group of ‘best practice H&S’ general contractors the question: ‘On average, approximately what percentage does the cost of H&S constitute of total project cost?’ was asked. Eight general contractors responded. Two GCs (25 %) recorded percentages, namely 3 % and 0.5 %, and six (75 %) identified ranges: three (37.5 %) ‘0 – 1 %’ and three (37.5 %) ‘> 1 – 2 %’ (Smallwood, 2004a). The health and safety statistics for 2014-15 mentioned the Health and Safety Executive (HSE, UK), indicate that a total of 27.3 million working days were lost due to work related ill health or injury. This further result to an estimated cost of £14.3 million. Although the contribution of construction industry towards the total GDP value for Oman and Great Britain are the same, however such analysis are not available in Oman since there is no such organization to deal with this.

The cost of prevention is of relevance to designers, particularly where they are the principal agent, because of the following. First, in terms of the Construction Regulations, clients may appoint designers or other consultants as their agents to fulfil their responsibilities. Given that clients are required to ensure that principal contractors have made adequate allowance for H&S, the cost of prevention is important. A further issue is that should the allowance for H&S be inadequate, based upon the negative effect of inadequate or the lack of H&S on the other performance parameters, overall project performance could be impaired.

Table 1: Degree of Importance of Various Parameters

Parameter	Response (%)					II	Rank	
	Un-Sure	Not Important . . . . . Very Important						
		1	2	3	4			5
<b>Project Quality</b>	0.0	1.0	0.0	3.1	26.8	69.1	3.63	1
<b>Public Health and Safety</b>	0.0	2.1	3.2	12.8	21.3	60.6	3.35	2
<b>Schedule (Time)</b>	0.0	1.0	0.0	15.5	38.1	45.4	3.27	3
<b>Cost</b>	0.0	2.1	3.1	10.3	35.1	49.5	3.27	4
<b>Project Health and Safety</b>	3.1	3.1	5.2	13.4	36.1	39.2	2.97	5

Source: Smallwood (2004b)

### 3. HEALTH AND SAFETY IN OMAN

Construction is a major industry of Oman contributing a major portion towards the total revenue and approximately 10% to GDP which is similar as of the United Kingdom construction industry. Currently a total of 100,000 are registered as contractor with a workforce size of 700,000 consisting of a major portion of expatriate workers. Construction industry is attractive for most of the international companies because of the high profit with low taxes and cheap workforce. The work carried out by these companies are normally of good quality because mostly it one of the consideration for their future awards, and a strict compliance from the clients. However, most of the companies do not maintain the required level of the worker safety due to several reasons including unawareness of benefits in terms of cost and productivity, lack of relevant rules, regulation and laws and enforcement of such laws by government or independent authority. Safety is further given less priority from client and designer as the primary responsibility of workers safety lies on employer i.e. contactors and normally these organizations (client and designer) save themselves by putting all safety responsibilities on contactors. A report compiled by Behm and Michael (2006) for the Centre to Protect Workers Rights wherein he analyzed 450 reports (post-accident) of construction workers’ deaths and disabling injuries and found that in 151 cases (about one-third of those studied), the hazard that contributed to the incident could have been eliminated or reduced if design-for-safety measures had been implemented. Although the contribution of construction industry to economy is similar to the developed countries, however the health and safety measures are comparatively poor. The analysis of one Daily Newspaper (2015) shows that 9 construction workers were died and 25 were injured in Oman. The public Authority of Social Insurance (2014) which registered only Omani nationals’ reports shows that 401 cases of work related injuries were disbursed which cost a total amount of 406,000 OMR (US\$ 1,051,540). The number of active insures in the Social Insurance System

was 197,510 in 2014; if a similar ratio is applied to the total workers working in construction industry of Oman will give the cost involves in construction accident of 1,428,571 OMR (US\$ 3,700,000) per year.

### **3.1 HEALTH AND SAFETY LAW (RULES AND REGULATIONS) IN OMAN**

Since the 1970s, Oman has been witnessing steady progress in the political and socio-economic fields. However, the country has had to rely on expatriates to implement its ambitious socio-economic programs of the five year consecutive development plans due to the limited number of qualified Omanis in these areas. The Ministry of Manpower is facilitating the issuance of permits for foreign workers, especially in the sectors that witness shortages in the number of qualified national workers. Expatriates work in different economic sectors; unskilled and semi-skilled expatriates are concentrated in the construction sector, which represents 32.5 per cent of the total expatriates in the private sector, according to the statistical bulletin of 2007. Articles 27, 40, 41, 87, 88, 89, 90, 98 and 99 of the Ministry of Manpower Labor Law stress both the workers and employer to abide the health and safety regulation mentioned in these articles. Oman has further four decrees; Sultanate Decree No. 40/1979: Occupational diseases and accidents compensation law, Ministerial Decree No. 10/1982: OSH regulations, Ministerial Decree No. 19/1988: OSH Act and Ministerial Decree No. 286/2008: Regulation of Occupational Safety and Health.

#### **3.1.1 REGULATION OF OCCUPATIONAL SAFETY AND HEALTH (MINISTERIAL DECREE NO. 286/2008)**

Based on the stipulation of the Labour Law, which entitles the Minister of Manpower to issue regulations, occupational safety and health has been regulated under the Ministerial Decision No. 286/2008, namely the Regulation of Occupational Safety and Health for Establishments Governed by the Labour Law. This Regulation is regarded as the framework legislation in OSH at the level of the Sultanate. It supersedes the Occupational Health and Industrial Safety Precautions issued by Ministerial Decision No.19/1982, which address general provisions regarding safety at work and the protection of the health of the workers in private-sector establishments. The Precautions consist of two chapters and fourteen Articles which cover:

- General provisions;
- Dangers of machinery;
- Working conditions (lighting, ventilation, drinking water, eating places, toilet facilities, sleeping quarters, fire);
- Health hazards;
- Safety supervisors for establishments employing 100 or more workers;
- Accidents;
- Construction work;
- Hoisting and hauling machines;
- Mines and quarries

Apart from presence of OHS laws which need to be updated as agreed in the memorandum of understanding between ILO and Oman (2010), there need to be specific rules, regulations relevant and applicable to construction industry and a regulatory authority to review and update and implement those rules and regulations in Oman.

### **3.2 OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM**

In recent years, governments, enterprises and international organisations have all been giving greater attention to the need to adopt systematic models for managing OSH. The so-called OSH management systems approach provides a promising strategy for augmenting traditional command and control approaches with performance improvement tools, more effective health and safety auditing concepts, and schemes for management systems.

The need for a global approach to OSH management was recognized as a logical and necessary response to increasing economic globalization, while the benefits of systematic models of managing OSH became apparent as a result of the impact of ISO standards for quality and the environment. Current management science theories suggest that performance is better in all areas of business, including OSH, if it is measured and continuous improvement sought in an organized fashion. Drawing from the principles defined in the ILO Guidelines on occupational safety and health management systems, 2001, Convention

No. 187 applies a similar approach to the management of national OSH systems to ensure they are improved through a continuous cycle of policy review, evaluation and action for improvement. The different steps in the OSH Management Cycle of continuous improvement are illustrated in Figure 1.

Small construction organisations normally don't have awareness of safety and health management systems and its benefits, therefore the possibilities of risk and accidents are more. Many researcher claims that small enterprises have special problems with work environment which lead the organisations towards high risk with a lower ability of controlling the risk (Hasle and Limborg, 2006). In Oman, 6,000 companies which employed a work force of 310,000 are registered as grade one and above are having company, staff ratio of 1:52. These construction organizations are carrying 95% of major construction projects in the country if assumed are having awareness of safety and health management systems and it is applied in their organizations, is not enough to reflect that the whole country workforce safety and health performance. The problem still exists with the 94,000 organisations that are registered as grade two and below and having a workforce size of 389,000, which gives a company, staff ratio of 1:4 only. This is the major challenge to ensure proper safety and health systems in such organisations. The government along with concerned stakeholder needs to develop strategies for implementation of safety and health systems in these small construction organizations to improve safety performance.

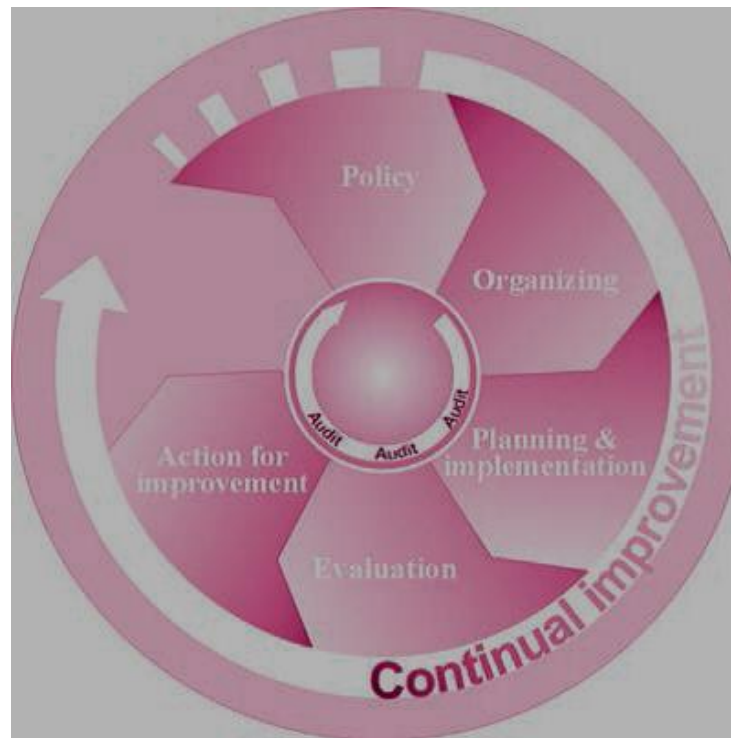


Figure 1: Guidance on Occupational Safety and Health Management Systems  
Source: ILO-OSH (2001)

#### 4. ENFORCEMENT

The ultimate purpose of the enforcing authorities is to ensure that duty holders manage and control risks effectively, thus preventing harm. The term 'enforcement' has a wide meaning and applies to all dealings between enforcing authorities and those on whom the law places duties (employers, the self-employed, employees and others). The purpose of enforcement is to:

- Ensure that duty holders take action to deal immediately with serious risks;
- Promote and achieve sustained compliance with the law;
- Ensure that duty holders who breach health and safety requirements, and directors or managers who fail in their responsibilities, may be held to account, which may include bringing alleged offenders before the courts in England and Wales, or recommending prosecution in Scotland, in the circumstances set out later in this policy.

The compliance with OHS standards will result in the elimination and reduction, of work-related illness and injury. The UK Health and Safety Commission envisages the purposes of enforcement as ensuring that duty holders deal immediately with serious risks; promoting and achieving ‘sustained compliance with the law’; and ensuring that duty holders who breach statutory provisions are ‘held to account’ through prosecution. Since its establishment in 1970, the U.S. Occupational Safety and Health Administration (OSHA) have been responsible for the enforcement of workplace safety and health standards in the United States. Between 2001 and 2010, OSHA conducted nearly a quarter million (247,997) federal inspections in construction. The proportion of construction establishments inspected by federal OSHA fluctuated, but generally showed a small upward trend. Even so, the proportion of construction companies inspected by OSHA is still low. OSHA has approximately 2,200 inspectors, including state-plan inspectors, for 8 million worksites and 130 million workers in all industries nationwide; this is equivalent to one OSHA inspector for every 3,600 worksites or 59,000 workers. Moreover, the number of construction worksites visited can be much lower than the number of inspections since multiple employers are usually working at one construction worksite. In addition, only 7% of the inspections in construction were health inspections, which is significantly lower than 20% of inspections for all industries. The number of OSHA inspections varied by construction subsector. In 2010, the majority (62%) of inspections occurred among Specialty Trade Contractors while 26% were conducted among General Contractors and 13% in Heavy Construction. Although the number of inspections was small in Heavy Construction, the proportion of establishments inspected in this sector was higher than the other two construction subsectors, considering that establishments in Heavy Construction only accounted for about 5% of the construction establishments with payroll. The health and safety statistic annual report for 2014-15 compiled by HSE (UK) indicates that there were 586 cases were prosecuted by HSE in England and Wales. 70 cases were prosecuted by Local authorities in England and Wales. 72 cases were prosecuted by the Procurator Fiscal in Scotland. 12,430 enforcement notices were issued by all enforcing authorities.

Oman labour law empower the ministry of manpower to ensure the health and safety standards through ministry inspectors and in event of the existence of any danger which threatens the safety and health of the Workers, the Ministry can take necessary measures to close down the place of work wholly or partially, or to stop the operation of one or more machinery until the elimination of the causes of such danger. The ministry can further improve the process of inspections and penalties by benchmarking it system with OSHA (USA) and HSE (UK).

## **5. RECOMMENDATION FOR IMPROVEMENT OF SAFETY IN CONSTRUCTION IN OMAN**

Based on the literature review and fact related to construction industry of Oman, the following recommendations are made.

- Oman need to establish an independent Safety and Health regulatory authority to develop and enforce rules and regulations for improved safety and health for all industrial organizations including construction.
- More research is needed to be conducted to understand the current safety status.
- Construction organizations registration including renewal of registration is need to be linked with the safety and health performance of organization.
- Construction organizations specially small and medium organizations are need to be educated on safety and health benefits.
- Regulatory authorities are required to ensure appropriate safety and health system in all construction organizations.
- Construction workers are needed to be having adequate safety and health training before they are allowed to work in construction organizations.
- Construction organizations are needed to develop programs for assessment their safety and health performance.

- A proper procedure for inspection of safety and health is required to be defined for self-inspections and external inspections by regulatory organization.
- Old rules and regulations for safety and health are needed to be revised and further needed to be review periodically.
- Construction accidents are needed to be properly investigated both by construction organizations itself and externally be safety and health authority to know the root causes of the accidents and to develop strategies to minimize the accidents in future.

Based on the above recommendations, a safety model for construction in Oman is suggested as shown in Figure 2.

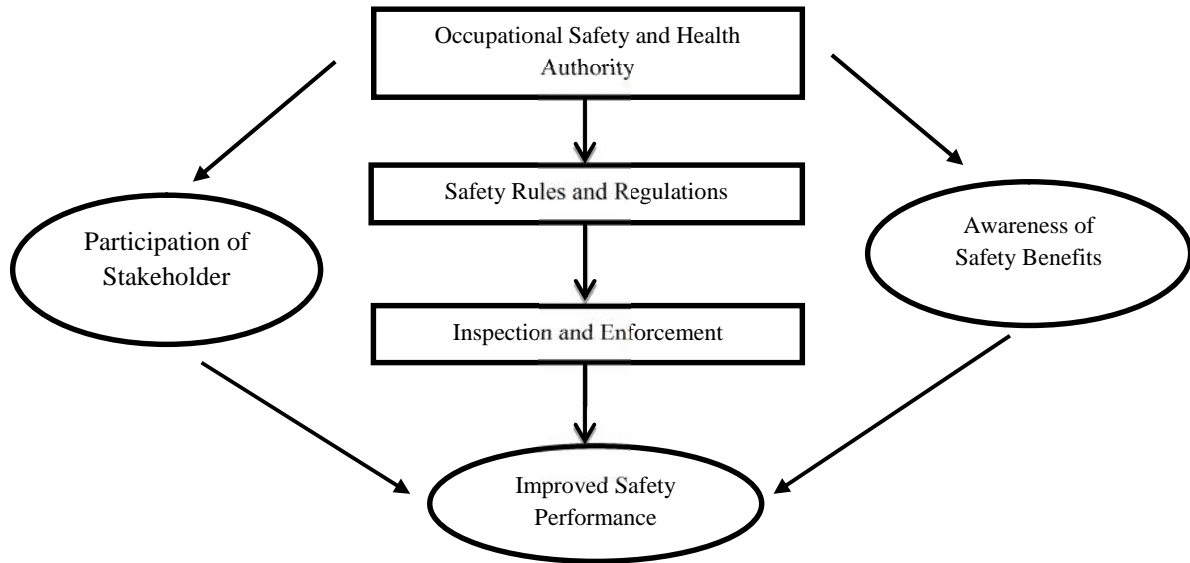


Figure 2: Safety Model for Construction

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