The interest in safety awareness among construction companies has greatly increased in the past decade. The ever-increasing cost of medical treatment and the potential for lawsuits can lead to higher insurance premiums, which in turn tend to have a negative impact on a company's profit. Safety in construction sites is a major concern in Egypt, and little research has been conducted on the subject. The objective of this paper is to identify the factors affecting safety performance in large construction companies in Egypt. Sixty three factors were identified from international literature and grouped into twelve major categories. A questionnaire survey was conducted on large construction contractors in Egypt and the collected data was analyzed using an importance index to rank the safety performance factors. The rank concordance between the grades of companies was tested using Kendall’s coefficient, and the responses among grades were found to have high agreement. It was concluded that the most important factors affecting safety performance are safety awareness of company’s top management, safety awareness of project managers, and safety inspections.

Keywords: contractors, Egypt, health and safety; performance.

INTRODUCTION

The construction industry is considered one of the most hazardous industries throughout the world. Accidents and injuries can bring great losses to individuals, organizations and societies. Safety is not a luxury but a necessity, and can prevent unnecessary loss of property, injury, or death (Koehn, et al. 1995). The interest in safety awareness among construction companies has greatly increased in the past decade. The ever-increasing cost of medical treatment and the potential for lawsuits can lead to higher insurance premiums, and thus have a negative impact on a company's profit (Wilson and Koehn 2000). In some countries, a contractor’s safety performance record can be considered in contractor qualification. Moreover, the suffering as a result of an accident both to injured parties and their families cannot be measured in economic terms, even if the injured parties have been adequately compensated by insurance. Several international studies have researched the factors affecting safety performance in construction companies. However, this subject in Egyptian construction remains under-researched. Therefore, this paper aims to identify the factors affecting the construction safety performance in Egypt. The identification of these factors can contribute to creating awareness and/or improving of the factors, which in turn can lead to the improvement of the overall performance of companies and the industry. Safety management systems are more likely to be well structured, documented and applied in large companies that have the managerial ability to
develop and implement such systems (Tam et al. 2002 and Hinze and Harrison 1981). Therefore, the scope of this research is large contracting companies in Egypt, and is expressed as companies registered in the first three grades of the Egyptian Federation for Construction and Building Contractors (EFCBC).

**LITERATURE REVIEW**

Research on safety has received broad attention in construction engineering and management literature. Studies have shown the connection between the quality of work environment and occupational safety (Mattila, et al. 1994b). Further studies identified the connections between good construction site management practice and safety (Mattila, et al. 1994a). Kangari (1995) surveyed the top 100 large U.S.A. construction firms to study their attitude toward risk management. The survey results showed that contractors assigned safety risk the highest importance rating and recommended that construction contractors continuously measure and control their safety performance. In a research carried out by Jannadi (1995) on the impact of human relations on the safety of construction workers. It was found that an effective use of human relations would improve safety programs and make safe behaviour a habit for workers. It was also found that safety performance of each worker was very much related to his attitude towards his fellow employees, foreman, and employer. One more conclusion from the study was that management's attitude towards worker's welfare can also play a major role in developing safe behaviour among the workers and thus a safe performance in the workplace. The study also showed that competition among workers, fatigue, and working under pressure had a tremendous impact on safety. Workers who worked against deadlines which were almost impossible to meet, competed with other crew members, and worked overtime had more injuries.

Koehn, et al. (1995) concluded in their research that in developing countries laws to protect labourers may not be strictly enforced. Also, contractors and their employees tend to ignore basic safety rules and regulations. In addition, safety programs and inspection procedures have often not been established and/or utilized to protect workers and reduce onsite hazards. Moreover, Workers are generally unskilled or semiskilled, poorly paid, temporarily employed, exhibit low production (productivity) rates, and often migrate in a group from one place to another in search of work. Typically, labourers are not trained in safe work practices, and there tends to be a lack of management commitment to safety programs and various safety procedures. A study on the construction safety in Egypt conducted by Madany (1998) discussed the main safety problems facing construction safety in Egypt and categorized them into economic, technical, and enforcement problems.

Many authors have discussed the factors affecting safety performance in international literature. Table 1 summarizes the factors affecting the safety performance identified in each literature. These factors resulted in sixty three factors used in the study and shown in Table 2. The factors were summarized into twelve major categories that are illustrated in Table 3.
Table 1: Factors affecting Safety Performance in International Literature

<table>
<thead>
<tr>
<th>Literature</th>
<th>Factors affecting Safety Performance</th>
</tr>
</thead>
</table>
Time devoted to safety issues for the company safety coordinator.  
Number of informal safety inspections made by the company safety coordinator.  
Meetings with the field safety representatives and craft workers.  
Length and detail of the company safety program.  
Safety training for new foremen and safety coordinators.  
Specialty contractor safety management.  
Company safety expenditures.  
Increased project manager experience level.  
More supportive upper management attitude towards safety.  
Reduced project team turnover (team stability).  
Increased time devoted to safety for the project safety representative.  
More formal meetings with supervisors and specialty contractors.  
More informal safety meetings with supervisors.  
A greater number of informal site safety inspections.  
Increased budget allocation to safety awards. |
Provision of safety booklets.  
Provision of safety equipment.  
Providing safety environment.  
Appointing a trained safety representative on site.  
Minimizing worker turnover. |
| Hinze and Gambatese (2003) | Implementing employee drug testing with various factors initiating the testing.  
Training with the assistance of contractor associations.  
Growth in company size. |
| Fang, et al. (2004a) | Frequency of a crew’s receiving safety inspection.  
Frequency of a foreman’s presence in safety meeting.  
Frequency of a foreman’s reporting safety related matters to manager.  
Frequency of a foreman’s announcing safety related matters to workers.  
Frequency of a foreman’s correcting workers’ unsafe actions.  
Frequency of a worker’s smoking on the site.  
Frequency of a worker’s breaking safety regulations.  
Hours of safety education per year a worker receives.  
Frequency of a worker’s partners reminding him of personal safety.  
Frequency of a crew’s receiving notices of hazard removal.  
Frequency of a crew’s breaking safety regulations.  
Frequency of a crew’s suffering safety penalty.  
Frequency of a project manager’s presence in safety meeting.  
Frequency of a project manager’s hearing safety reports.  
Frequency of a project manager’s discussing safety matters with subcontractors.  
Days of safety education per year a safety officer receives.  
Hours of safety education per year a foreman receives.  
Frequency of a foreman’s reminding new workers of safety regulations.  
Ratio of workers whose occupational experience is less than 1 year to total workers on site. |
| Fang, et al. (2004b) | Quantity of safety supervisors.  
Involvement of contractor top management.  
Authority of safety supervisor.  
Authority of foremen.  
Size of the crew.  
Safety investment.  
Worker compensation insurance.  
Safety investment on personal protective equipment.  
Factors related to the relationship between management and labor on site. |
Lack of training.  
Poor safety awareness of project managers.  
Reluctance to input resources to safety.  
Reckless operations. |
| Ng, et al. (2005) | Implementation of safety management system in accordance with legislation.  
Compliance with occupational safety and health legislation, codes and standards.  
Definition of safety responsibility. |
### Literature Factors affecting Safety Performance

- Development of safety policy.
- Provision of safe working environment.
- Development of emergency plan and procedures.
- Development of safety committee.
- Definition of safety responsibility to all site personnel.

**Fung, et al. (2005)**
- Effective accident reporting.
- High line management commitment.
- Active supervisor's role.
- Active personal role.

**Teo, et al. (2005)**
- Understanding and implementation of safety management system.
- Understanding and participation in occupational health and safety management system.
- Understanding and implementation of permit-to-work system.
- Quality of subcontractors.
- Understanding and implementation of safety procedures.
- Carrying out work in a safe manner.
- Carrying out work in a professional manner.
- Type and method of construction.
- Management’s attitude towards safety.
- Supervisors and worker’s attitude towards safety.
- Contextual characteristics of workers.
- Monetary incentives.
- Non-monetary incentives.
- Disciplinary action.

### QUESTIONNAIRE SURVEY

#### Questionnaire Development and Design

The questionnaire was designed to achieve the research objectives. It consisted of an introduction and two parts. The introduction gives a description of the survey, its purpose and objectives. The first part of the questionnaire is related to general information about the companies. The respondents were requested to answer general information pertaining to their classification and experience in construction. The second part of the questionnaire included the list of the factors affecting safety performance in the construction industry. The respondents were asked to evaluate the degree of impact of the factor on safety performance based on a five-point Likert scale, from very low to very high. Respondents were invited to state any other factors that affect safety performance and to rate these factors.

#### Sample Selection

The survey sample was selected from the Egyptian Federation for Construction and Building Contractors (EFCBC). The Egyptian EFCBC classifies contractors into seven grades according to size and capabilities. The list of the first three grades that are qualified and registered in the EFCBC are mostly large construction companies that reside in Cairo and Alexandria, and was therefore used as the sampling frame. Random numbers were used to choose companies from the sampling frame, and thus the sampling method was random sampling. The sample size to conduct this study was determined from the following formula (Shash and Abdul-Hadi 1993):

\[ n = \frac{n^*}{1 + \frac{n^*}{N}} \]

Where: \( n \) = sample size; \( N \) = total population; \( n^* \) = sample size for non-finite population (\( S^2 / V^2 \)). \( V \) = the standard error of sampling distribution (taken 0.05) and \( S \) = the maximum standard deviation in the population elements. For a total error of 0.1 at confidence level of 95%, \( S^2 = P \times (1 - P) = 0.5 \times 0.5 = 0.25 \). \( P \) = the proportion of

---

664
population elements that belong to the defined class, the maximum value is chosen at $P = 0.5$.

According to the Egyptian EFCBC the number of contractors in Cairo and Alexandria for the first three grades is 358 contractors, which is the whole population. The size of the sample is determined by using the formula given in equation (1), and then the minimum sample size of companies is 79 companies.

**Sampling Approach**
The questionnaire was asked to be answered by the safety professional / supervisor (if any) or by the project manager in the company. The questionnaire was personally handed over to the respondents, and an interviewer was available to answer any questions relating to the questionnaire. The questionnaire was actually distributed to a sample of 117 classified companies in Egypt. A total of 80 companies replied which represents about 68% of the total questionnaires. The number of companies from the first grade was 32, from the second grade was 23 and from the third grade was 25. This high response rate was achieved due to the personal administration of the questionnaire.

**EVALUATION OF FACTORS AFFECTING SAFETY PERFORMANCE**
The factors identified in the literature review were measured for their degree of impact on safety performance in the construction industry. Respondents were requested to respond on five-point Likert scale of very high, high, moderate, low, and very low. A scoring system was used to transform the Likert scale into a quantitative variable, where very high scored 5 points and very low 1 point. An importance index ($I$) was then computed for each factor according to the following formula (Assaf, et al. 1995):

$$I = \sum_{i=1}^{5} \left( a_i x_i / 5 \right)$$

Where: $I$ = importance index; $a_i =$ constant expressing the score of the i-th response ($a_i = 1,2,3,4,5$ for $i = 1,2,3,4,5$, respectively); $i =$ response category index where $i = 1,2,3,4,5$; $x_i =$ Frequency of the i-th response given as a percentage of the total responses for each factor ($x_1 =$ frequency of “very low impact” responses, $x_2 =$ frequency of “low impact” responses, $x_3 =$ frequency of “moderate impact” responses, $x_4 =$ frequency of “high impact” responses, $x_5 =$ frequency of “very high impact” responses)

The importance index and the corresponding ranking of each factor for the first, second and third grade companies were calculated using the formula given in equation (2) and results are shown in Table 2.

The most important factors identified by first grade companies affecting safety performance were “Safety awareness of project managers”, “Safety awareness of company's top management”, and “Employee experience” with importance indices ranging from 84.4 to 82.5. The least important factors identified by first grade companies were “Percentage of new Employees on site”, “Conducting periodically random drug testing”, and “Employee marital status”. The importance indices of these factors ranged from 57.5 to 63.1. In the second grade companies, the most important factors identified were “Safety awareness of project managers”, “Safety awareness of company's top management”, and “Safety inspection by safety supervisor”.

665
<table>
<thead>
<tr>
<th>Factor No.</th>
<th>Factor Description</th>
<th>First Grade Companies</th>
<th>Second Grade Companies</th>
<th>Third Grade Companies</th>
<th>All Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Safety awareness of company's top management</td>
<td>83.75 2</td>
<td>84.35 2</td>
<td>77.60 1</td>
<td>81.90 1</td>
</tr>
<tr>
<td>1.2</td>
<td>Safety awareness of project managers</td>
<td>84.38 1</td>
<td>86.09 1</td>
<td>75.20 6</td>
<td>81.89 2</td>
</tr>
<tr>
<td>1.3</td>
<td>Availability a clear company safety policy</td>
<td>78.13 7</td>
<td>76.52 12</td>
<td>68.80 27</td>
<td>74.48 15</td>
</tr>
<tr>
<td>1.4</td>
<td>Issuing &amp; implementation of in-house safety rules, safety program or manuals including emergency plan &amp; procedure</td>
<td>78.75 5</td>
<td>73.04 33</td>
<td>68.80 27</td>
<td>73.53 21</td>
</tr>
<tr>
<td>1.5</td>
<td>Conduction of safety policy review</td>
<td>76.88 17</td>
<td>71.30 39</td>
<td>64.80 40</td>
<td>70.99 37</td>
</tr>
<tr>
<td>1.6</td>
<td>Management's attitude towards employee’s welfare</td>
<td>67.50 54</td>
<td>60.00 57</td>
<td>58.40 59</td>
<td>61.97 58</td>
</tr>
<tr>
<td>2.1</td>
<td>Issuing of safety laws, standards, regulations &amp; legislations</td>
<td>75.00 23</td>
<td>75.65 19</td>
<td>73.60 8</td>
<td>74.75 13</td>
</tr>
<tr>
<td>2.2</td>
<td>Rigorous enforcement of safety regulations</td>
<td>71.88 34</td>
<td>73.04 33</td>
<td>72.00 19</td>
<td>72.31 29</td>
</tr>
<tr>
<td>3.1</td>
<td>Size of the project</td>
<td>70.00 45</td>
<td>70.43 41</td>
<td>62.40 49</td>
<td>67.61 49</td>
</tr>
<tr>
<td>3.2</td>
<td>Ratio of site area to building area</td>
<td>71.88 34</td>
<td>61.74 54</td>
<td>57.60 61</td>
<td>63.74 54</td>
</tr>
<tr>
<td>3.3</td>
<td>Planning and organizing the site (layout) - work environment</td>
<td>70.00 45</td>
<td>70.43 41</td>
<td>65.60 38</td>
<td>68.68 47</td>
</tr>
<tr>
<td>3.4</td>
<td>Cost of the project</td>
<td>71.88 34</td>
<td>73.04 33</td>
<td>60.00 56</td>
<td>68.31 48</td>
</tr>
<tr>
<td>3.5</td>
<td>Planning and scheduling of the project</td>
<td>70.63 41</td>
<td>75.65 19</td>
<td>63.20 47</td>
<td>69.83 41</td>
</tr>
<tr>
<td>3.6</td>
<td>Application of new technology in construction</td>
<td>78.13 7</td>
<td>77.39 10</td>
<td>72.80 12</td>
<td>76.11 9</td>
</tr>
<tr>
<td>3.7</td>
<td>Type of owner</td>
<td>68.13 52</td>
<td>67.83 48</td>
<td>61.60 51</td>
<td>65.85 50</td>
</tr>
<tr>
<td>3.8</td>
<td>Complexity of the design</td>
<td>67.50 54</td>
<td>61.74 54</td>
<td>58.40 59</td>
<td>62.55 57</td>
</tr>
<tr>
<td>4.1</td>
<td>Employee age</td>
<td>70.63 41</td>
<td>70.43 41</td>
<td>68.80 27</td>
<td>69.95 40</td>
</tr>
<tr>
<td>4.2</td>
<td>Employee experience</td>
<td>82.50 3</td>
<td>78.26 8</td>
<td>68.80 27</td>
<td>76.52 8</td>
</tr>
<tr>
<td>4.3</td>
<td>Employee education</td>
<td>68.13 52</td>
<td>66.96 49</td>
<td>61.60 51</td>
<td>65.56 51</td>
</tr>
<tr>
<td>4.4</td>
<td>Employee safety training received</td>
<td>70.63 41</td>
<td>78.26 8</td>
<td>68.8 27</td>
<td>72.56 28</td>
</tr>
<tr>
<td>4.5</td>
<td>Employee marital status</td>
<td>63.13 61</td>
<td>56.52 63</td>
<td>53.60 63</td>
<td>57.75 63</td>
</tr>
<tr>
<td>4.6</td>
<td>Employee safety awareness, knowledge and involvement</td>
<td>72.50 31</td>
<td>75.65 19</td>
<td>64.80 40</td>
<td>70.98 38</td>
</tr>
<tr>
<td>4.7</td>
<td>Employee accident experience</td>
<td>71.88 34</td>
<td>73.91 30</td>
<td>70.40 23</td>
<td>72.06 30</td>
</tr>
<tr>
<td>4.8</td>
<td>Employees language and communication barriers</td>
<td>65.63 59</td>
<td>57.39 61</td>
<td>60.00 56</td>
<td>61.01 60</td>
</tr>
<tr>
<td>4.9</td>
<td>Employees culture background</td>
<td>66.25 58</td>
<td>58.26 58</td>
<td>56.00 62</td>
<td>60.17 61</td>
</tr>
<tr>
<td>4.10</td>
<td>Relation between the management and employees on the site</td>
<td>75.63 21</td>
<td>69.57 46</td>
<td>63.20 47</td>
<td>69.47 42</td>
</tr>
<tr>
<td>4.11</td>
<td>Relation between the supervisor and employees on the site</td>
<td>78.13 7</td>
<td>76.52 12</td>
<td>64.00 44</td>
<td>72.88 23</td>
</tr>
<tr>
<td>4.12</td>
<td>Interrelation between the employees on the site</td>
<td>75.00 23</td>
<td>66.96 49</td>
<td>64.80 40</td>
<td>68.92 45</td>
</tr>
<tr>
<td>4.13</td>
<td>Increased job-related pressure on workers</td>
<td>73.75 26</td>
<td>76.52 12</td>
<td>65.60 38</td>
<td>71.96 31</td>
</tr>
<tr>
<td>4.14</td>
<td>Excessive overtime work for employees</td>
<td>71.25 40</td>
<td>72.17 37</td>
<td>64.00 44</td>
<td>69.14 44</td>
</tr>
<tr>
<td>5.1</td>
<td>Number of layers of management</td>
<td>69.38 48</td>
<td>58.26 58</td>
<td>60.80 54</td>
<td>62.81 56</td>
</tr>
<tr>
<td>5.2</td>
<td>Percentage of new Employees on site</td>
<td>57.50 63</td>
<td>66.96 49</td>
<td>60.00 56</td>
<td>61.49 59</td>
</tr>
<tr>
<td>5.3</td>
<td>Definition of safety responsibility</td>
<td>76.88 17</td>
<td>74.78 24</td>
<td>70.40 23</td>
<td>74.02 18</td>
</tr>
<tr>
<td>5.4</td>
<td>Number of safety supervisors</td>
<td>65.63 59</td>
<td>75.65 19</td>
<td>72.80 12</td>
<td>71.36 36</td>
</tr>
</tbody>
</table>
The importance indices of these factors ranged from 86.1 to 84.4. The importance indices for the least important factors identified by second grade companies ranged from 56.52 to 57.39. These factors were “Employee marital status”, “Conducting periodically random drug testing”, and “Employees language and communication barriers”. In the third grade companies, “Safety awareness of company’s top management”, “Safety inspection by government Authorities”, and “Safety inspection by safety supervisor” were the most important factors affecting safety performance with an importance index of 77.6 for the three factors. The least important factors identified by third grade companies were “Employee marital status”, “Employees
culture background”, and “Ratio of site area to building area”. The importance indices of these factors ranged from 53.6 to 57.6.

**Analysis for Agreement of Ranks**

As shown in the ranking of safety performance factors in the previous section, each grade of contractors considered many factors as important factors and agreed on the importance of some of those factors, and differed with regard to some other factors. The agreement on ranking for the three grades was tested by using the Kendall concordance analysis (Kaming et al. 1996). The Kendall coefficient of concordance (W) is a statistic, which can be good measure to know how good an agreement or association exists among sets of rankings. The concordance test focuses attention upon the agreement between sets of ranks rather than their differences. The Kendall coefficient of concordance (W) varies between 0 and 1 regardless of the number of sets of rankings. A coefficient of W = 1 indicates a perfect agreement and coefficient of W = 0 indicates no agreement or association. Kendall coefficient of concordance was calculated according to Kaming et al. (1996) and was found to be 0.772. The coefficient was found to be significant at the 5% level using the Chi-square test. This indicates that there is agreement among the ranks of these three grades companies. A consequence of the agreement among ranks is that the results can also be analyzed in their entirety using the overall results. The most overall important safety factor was “Safety awareness of company’s top management”. The second overall important safety factor was “Safety awareness of project managers”. The third overall important safety factor was “Safety awareness of supervisor”.

**Ranking of Major Categories of Safety Factors**

An analysis of the major categories of safety factors is shown in Table 3. The most important categories identified were “Safety inspections”, “Safety records and reports”, and “Economic Investment”, in descending order of importance. The major category of “Administrative and management commitment” was the fourth most important category although two of its constituting factors were ranked as the top two individual factors. This can be attributed to the existence of other factors in the category that did not rank high, such as “Conduction of safety policy review” and “Management's attitude towards employee’s welfare”.

**Table 3**: Importance Index and Ranking of the Major Categories of Safety Performance Factors

<table>
<thead>
<tr>
<th>Major Category</th>
<th>Factor Description</th>
<th>First Grade Companies</th>
<th>Second Grade Companies</th>
<th>Third Grade Companies</th>
<th>All Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Index Rank Index Rank Index Rank Index Rank</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Administrative and management commitment</td>
<td>78.23 1</td>
<td>75.22 6</td>
<td>68.93 9</td>
<td>74.13 4</td>
</tr>
<tr>
<td>2</td>
<td>Role of Government and engineering societies</td>
<td>73.44 6</td>
<td>74.35 7</td>
<td>72.8 3</td>
<td>73.53 6</td>
</tr>
<tr>
<td>3</td>
<td>Project Nature</td>
<td>71.02 12</td>
<td>69.78 10</td>
<td>62.7 12</td>
<td>67.83 12</td>
</tr>
<tr>
<td>4</td>
<td>Historic, human and psychological climate</td>
<td>71.79 8</td>
<td>69.81 9</td>
<td>63.89 11</td>
<td>68.50 11</td>
</tr>
<tr>
<td>5</td>
<td>Organizational structure</td>
<td>71.35 10</td>
<td>70.65 8</td>
<td>66.47 10</td>
<td>69.49 10</td>
</tr>
<tr>
<td>6</td>
<td>Safety inspections</td>
<td>74.38 4</td>
<td>78.55 1</td>
<td>77.07 1</td>
<td>76.67 1</td>
</tr>
<tr>
<td>7</td>
<td>Safety meetings</td>
<td>74.38 4</td>
<td>75.36 5</td>
<td>70.93 5</td>
<td>73.56 5</td>
</tr>
<tr>
<td>8</td>
<td>Safety Records and reports</td>
<td>76.88 2</td>
<td>76.52 4</td>
<td>73.6 2</td>
<td>75.67 2</td>
</tr>
<tr>
<td>9</td>
<td>Incentive</td>
<td>71.67 9</td>
<td>78.26 2</td>
<td>69.87 8</td>
<td>73.27 7</td>
</tr>
<tr>
<td>10</td>
<td>Safety Educating and Training</td>
<td>72.75 7</td>
<td>68.17 12</td>
<td>70.08 7</td>
<td>70.33 9</td>
</tr>
<tr>
<td>11</td>
<td>Economic Investment</td>
<td>75.83 3</td>
<td>76.81 3</td>
<td>72.8 3</td>
<td>75.15 3</td>
</tr>
<tr>
<td>12</td>
<td>Medical facilities</td>
<td>71.25 11</td>
<td>69.57 11</td>
<td>70.67 6</td>
<td>70.50 8</td>
</tr>
</tbody>
</table>
CONCLUSION AND RECOMMENDATIONS

A study was conducted in this research to identify the factors affecting safety performance in large construction contractors in Egypt. A list of 63 factors was identified from international literature that set the basis of a questionnaire survey. An importance index for each factor was calculated and used to rank the factors. The Kendall concordance coefficient was used to assess the agreement among rankings in the three grades and was found to be high and significant at the 5% level, which suggests focusing the results analyses on overall rankings. The overall most important factors affecting the safety performance among the three grades were found to be “Safety awareness of company’s top management”, “Safety awareness of project managers” and “Safety inspections by safety supervisor”.

In order to improve safety performance in large construction contractors in Egypt, it is vital to increase the awareness of top management and project managers towards the importance of safety. This should be a top priority for industry associations such as the Egyptian Federation for Construction and Building Contractors that can adopt safety awareness programs and training for top management. Management must establish and enforce safety polices safety systems. They should devolve their activities by including more monitoring of safety performance at the site and supervise periodic and random safety inspections to ensure the implementation of safety standards. Furthermore, the efficiency of site safety inspections by using more qualified safety supervisors with full authority should be increased. In-house regular inspections should be carried out by competent supervisors. These inspections must be followed by prompt corrective actions. Finally, a great deal of research is required on safety in Egypt to improve safety practices in the industry. Of great importance is research in the costs of accidents and the benefits of implementing safety systems, so as to encourage contractor’s top and project management to adopt safety practices.

REFERENCES


