

## **Developing Safety Culture in Pakistan Construction Industry – An Assessment of Perceptions and Practices among Construction Contractors**

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### **Abstract**

This paper presents the findings of a study conducted to investigate the current state of adoption and implementation of safety management practices in the Pakistan construction industry. The study was undertaken via a questionnaire survey targeted to general contractors in Pakistan. Data was collected in seven key areas namely contractors' perception about safety, safety program documentation procedures used by them, safety policy, management support and responsibility structures in their organizations, training and orientation in safety provided to their employees, safety program administration and procedures in their organizations, their safety performance history, and safety implementation and improvement concerns for the industry. Based on the findings of this study, it was possible to identify the key areas of safety management implementation that require improvement. The major findings of the study are as follows. The contractors in Pakistan are generally aware of the priority of safety as well as its significance to the industry but lack commitment, cooperation, expertise and familiarity with tools to implement safety culture on their projects. Owners are the key initiators for project safety; however, contractors, generally, are not required by project owners to maintain a safety program on projects and hence safety culture on projects is not usually observed. A cultural and behavioral shift is needed in the contractors' perception about safety management implementation and improvement on projects; most contractors currently perceive proactive approaches in safety as not being much useful. Recent safety performance of Pakistan contractors has been below par; safety management implementation at site and worker levels has been below satisfactory. The major obstacles faced by contractors to the implementation and improvement of safety include, in decreasing order of significance, absence of the following: worker cooperation and behavior, familiarity and expertise with safety management techniques, safety awareness and knowledge, owner commitment, and a safety regulatory framework. The major recommendations of the study are as follows. At the industry level, safety rules and regulations need to be defined, documented and enforced. Hence the need for an administrative body for occupational safety and health implementation is evident; however, the integrity and effectiveness of such an organization is a major concern in relation to the existing adversarial business environment in the construction industry of Pakistan, which need to be addressed. A major need of the industry is to develop the attitude of project owners towards an active safety management implementation; for the same, awareness programs need to be developed and implemented. It would also be appropriate to arrange formal and informal education and training in safety in the form of graduate education and career development programs.

### **Keywords**

Safety Management, Construction Industry, Pakistan, Pakistan Engineering Council

## 1. Introduction

Globally, the construction area of civil engineering is considered to be the most hazardous (Suazo and Jaselskis, 1993). Although dramatic improvements have taken place in recent decades, the safety record in the construction industry continues to be one of the poorest (Huang and Hinze, 2006). Research shows that the major causes of accidents are related to the unique nature of the industry, human behavior, difficult work site conditions, and poor safety management, which result in unsafe work methods, equipment and procedures (Abdelhamid and Everett, 2000). Emphasis in both developing and developed countries needs to be placed on training and the utilization of comprehensive safety programs (Koehn et al., 1995).

In developed countries, recent advancement in technology, on one hand, has contributed positively to industry productivity, but on the other hand, has created a more challenging and unsafe work environment. Evidently, construction accidents and the associated damage caused to the employees, property, equipment and morale have generated negative effects on the industry profitability and, to some extent, the industry productivity. Responding to this increased safety requirement generated by technology advancement, the industry control environment in developed countries has incorporated safety as an integral part in the regulatory framework. In the U.S.A., for instance, the workers compensation rates are a function of the loss experience of a contractor, and each labor hour is affected through the reflection of those losses in the experience modification rating (EMR). On one hand, a safe contractor can create a substantial competitive advantage through superior safe experience while, on the other hand, an unsafe contractor can be liable to pay huge penalties in terms of insurance. Safety, therefore, and the effects of its absence – accidents – is now a key cost driver for construction firms in such countries. Safe work experience is also becoming a business survival issue for them, as more and more owners are reluctant to permit contractors to bid work without acceptable EMRs. Thus, the most important step in controlling costs for contractors in these countries is to run safe construction projects. Hence the contractors are compelled to implement safety as their business strategy, which has led to recent improvements in global construction safety records.

In contrast, developing countries like Pakistan have yet to respond to recent technological improvements. Lack of response to technology, however, has not resulted in safer construction sites. In fact, a larger share of construction work being performed by human resources has led to increased number of site accidents. (In Pakistan, roughly 6-7% labor is directly attached with the construction industry.) Informal assessments have identified a few major reasons for safety non-performance which include: lack of development of construction sector in the shape of mechanization and industrialization; lack of professional construction management practices which has not only led to unsafe project sites but have also resulted in construction delays, cost overruns, poor productivity and poor product and process quality; inadequate safety provisions laid by the existing regulatory environment which has failed to establish safety as a major industry objective; insufficient and incentive-less insurance mechanisms which have failed to establish safety as a business survival issue; and unfavorable business environment which has led to adversarial business relationships among stakeholders resulting in controversies, conflicts, claims and litigation and hence diverting the focus away from issues like safety.

Compared to the past, the current decade is witnessing massive infrastructure growth in Pakistan. There are numerous infrastructure development projects in progress as well as under planning which include several buildings, dams, highways, motorways, underpasses, flyovers, interchanges, water supply systems, monorails (Karachi Mass Transit Project), Gwadar Deep Sea Port & Township (Mega Port City) Project etc. All of these projects have the potential to lead the local Industry to gain glory, status and international recognition but only when appropriate efforts are extended to achieve the same. With the stage set for a golden era for development, the challenges are still higher. One of the important areas that require quick and drastic improvement is safety. It is highly essential that all occupational injuries and illnesses should be given due attention. There should be an effort to raise the level of awareness between both employees and employers of the importance of health and safety at worksites.

Prior research done in construction safety indicates the significance of conducting formal assessment exercises for safety management implementation in the construction industry in general. Such assessment exercises are particularly important in benchmarking safety performance as well as formulating safety management policies and strategies appropriate to the particular work environment under study. Consequently, this research aims to delve into the safety trends and practices in Pakistan construction industry where there has been hardly any formal assessment made of the current state of safety management implementation. The major objective of this research is to identify the areas of safety non-performance i.e. the areas of safety management implementation that require improvement.

## 2. Research Scope & Objectives

Although safety management is a collective effort of all the stakeholders including the owners, consultants, contractors, subcontractors, suppliers, regulating bodies etc., this research is targeted to assessing the contractor safety management practices.

Safety is implemented, in essence, by contractors on work sites who indeed need to adopt adequate safety related systems designed to respond to hazardous and potentially hazardous project conditions as well as designed to take the process to a safe state when predetermined conditions are violated. This is required for successful implementation of a safety management mechanism for the provision and control of work environment systems and human behavior, which together give relative freedom from those conditions and circumstances, which can cause personal injury, disease or death, or property damage (Samelson and Levitt, 1982). Hence presence of a safety culture in a contracting organization is immensely needed (Mohamed, 2003). Consequently, there is a research need to assess and improve the safety management practices of construction firms.

Hence this research assesses the safety management practices of contractors in Pakistan with the following objectives:

1. To diagnose the current safety practices among contractors associated with the construction industry of Pakistan.
2. To assess the past safety performance of Pakistan contractors.
3. To identify the key safety non-performance areas those require improvement.

## 3. Research Significance

The research work reported in this paper is part of an on-going research project under Pakistan-US Science and Technology Cooperative Program (STCP), with funds provided jointly by the United States Agency for International Development (USAID), USA and Ministry of Science and Technology (MoST), Pakistan. The above-mentioned project has four main objectives:

1. Assess the current state of Pakistan construction industry through quantitative research with specific reference to the status of construction management education, research and practice.
2. Develop a strategic model for the improvement and strengthening of construction management education, research and practice in Pakistan.
3. Devise a framework to standardize the construction industry practices for achieving improved performance on cost, time, quality, productivity and safety.
4. Capacity building of academia, industry, owners and government in the area of construction management so as to improve the overall efficiency and productivity of the construction industry.

Since no accurate information regarding the extent of construction management application in the Pakistan construction industry was available, the first objective of the research project was set as the investigation of the adoption and implementation of construction management practices in Pakistan construction industry.

One of the major objectives of the above mentioned research work is to develop a *Safety Management Model for the Pakistan Construction Industry*. While the scope of research presented in this paper is to diagnose the present practices of safety management among the contractors in Pakistan construction industry and to critically evaluate their perceptions and trends, the remaining research work related to the above objective will be reported in further papers.

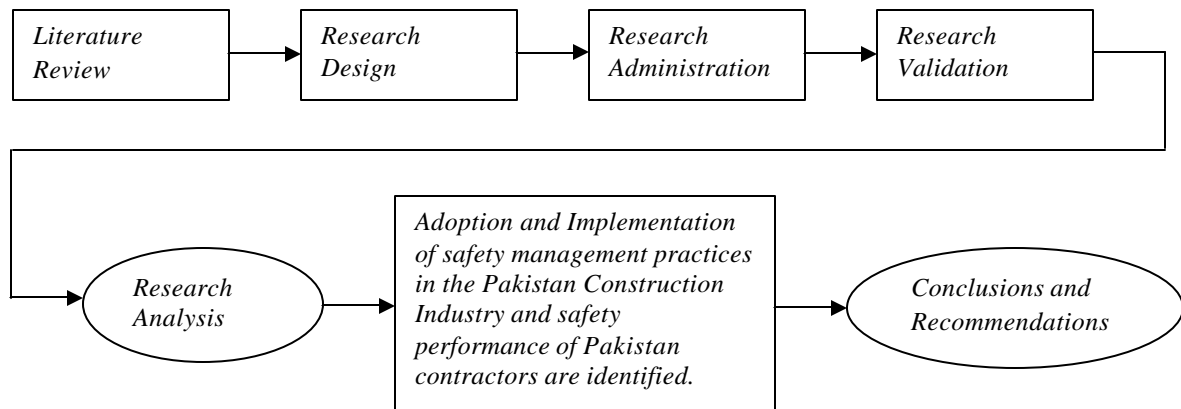
It is expected that this study will be of a pioneering nature. The study will provide some empirical data on the extent and type of safety dilemmas in the construction industry of Pakistan. For the local construction industry, this research has the potential of demonstrating tangible benefits of using safety management in their organizations which will aid in developing appropriate safety management strategies and hence a safety management model for the Pakistan Construction Industry.

#### 4. Methodology

The research methodology consists of the following steps:

1. Literature review i.e. collecting base knowledge essential for survey development.
2. Research design i.e. development of a questionnaire to elicit information about safety management practices and safety performance of contractors in Pakistan.
3. Survey administration i.e. conducting questionnaire survey via interviews, postal mail and fax.
4. Research validation i.e. assessment of returned questionnaires (in terms of respondent profile and consistency of feedback) to discard any invalid responses
5. Research analysis i.e. assessment of feedback from valid questionnaires to identify major areas of safety non-performance.
6. Conclusions and recommendations i.e. compiling major deductions and recommendations from the findings.

The methodology flowchart can be represented as Fig. 1.



**Fig. 1.** Research Methodology Flowchart

The methodology can be described as follows:

The first step was literature review, which provided the base information for survey development. Following the literature review, a questionnaire was designed in the second step to elicit information regarding the extent of safety management practices among contractors in the Pakistan construction industry. The questionnaire was targeted to contractor top management. The questionnaire consisted of two parts – A and B. Part A constituted requesting respondent's personal information (e.g. work experience, position in company) and company information (e.g. type of contractor, years in business, annual turnover). Part B consisted of 52 questions divided into six main categories in order to evaluate contractor safety management perceptions and practices from different perspectives. These categories are as follows:

1. Contractors' perception about safety (6 questions),
2. Safety program documentation procedures (2 questions),
3. Safety policy, management support and responsibility structures (16 questions),
4. Safety induction, training and orientation (7 questions),
5. Safety program administration and procedures (15 questions),
6. Safety performance (2 questions),
7. Safety implementation and improvement (4 questions).

As the first phase of the third step, a list of approximately 200 registered general and specialty contractors was prepared using the Pakistan Engineering Council's Directory (2006), All Pakistan Contractor's Association's Directory (2005) and other local directories. From the 200 contractors, a sample of 100 contractors was randomly selected using 95% confidence level and 5% confidence interval. In the second phase of the third step, the questionnaire was sent to those 100 contractors and responses were collected over a period of three months. Over these three months, reminder calls and faxes were sent to the contractors from time to time as well as personal visits

were made to the companies for expediting the process. Many of these visits were converted into personal interviews and responses collected as such were made part of the feedback. As results of continuous follow-up and visits, 42 responses were received for the 100 questionnaires sent; representing a total response rate of 38%. Considering the fact that it was a construction industry questionnaire and was targeted to an audience who are not used to participate in questionnaire surveys (in Pakistan, construction industry research is almost non-existent), this response rate is considered very encouraging. This is more than typical of a construction industry questionnaire survey and can be used to draw conclusions (Akintoye and Macleod, 1997).

Research validation was made in the fourth step. Most firms which responded to the questionnaire were medium-to-large size general contractors (based on their annual turnover and number of employees). The questionnaires were completed by their top management who were involved in the safety management programs. Almost all of them (more than 95%) had over 10 years of construction experience. On the basis of their position, education, work experience and professional background, it can be inferred that the respondents had adequate knowledge of the safety management activities in their organizations. As a result of the validation process, 38 valid responses were selected for analysis purposes.

The survey analysis and discussion is presented in the next section, while conclusions and recommendations are laid out in the section to follow.

## 5. Analysis and Discussion

In accordance with the format of the questionnaire, the results of the questionnaire are reported in seven sections. The companies' responses are mostly indicated as a percentage of total responses.

### 5.1 Contractors' Perception about Safety

In this section, six questions were asked to evaluate contractors' perception about safety. The results are as follows.

An important finding was that safety was rated as the second highest *priority* by the contractors, following cost. This is an encouraging finding in that it signifies the priority perceived by contractors for safety towards developing a safe work culture in the industry. The following is the order of importance according to the survey:

1. Cost
2. Safety
3. Quality
4. Time

*Safety is perceived* as a need to the industry by majority of the contractors (71%), which is also a positive indication. However, safety is not viewed as a value by most (only 11% consider safety a value). Both the above findings are comprehensible considering the current absence of safety culture in Pakistan construction industry in particular as well as the inherent unsafe nature of the industry in general, which have evidently led to hazardous project conditions and have created an enormous need for safety; however, establishing safety as a need would still require long-term sustainable efforts. Also, worth noting is that only few contractors (11%) perceive safety as a compulsion while the rest (7%) were unsure. Had a high proportion of contractors perceived safety as a compulsion to them, this would have seriously undermined the legitimate value of the safety efforts of the companies. It is important to identify that the reason of not considering safety a compulsion by most contractors is directly related to the absence of a regulatory framework for mandatory enforcement of safety implementation in the Pakistan construction industry.

When the contractors were asked about their *perception of safety management*, their responses were as follows:

Option	Percent of Responses
Zero serious injuries & illnesses (serious is that which requires the employee to leave the project)	74%
Zero fatalities on project site	71%
Zero hazards and defects throughout the project	68%
Development of a safety culture in the organization that protects effectively the safety of personnel	58%

Above results indicate that although most contractors relate safety management with eliminating serious injuries, illnesses and/ or fatalities on project sites, it is interesting to note that not all contractors consider safety management a continuous effort of developing a safety culture in the organization in order to implement safety as part of

organizational way of thinking and working. This indicates a lack of understanding of safety management on the contractors' part as a means of inducing cultural and behavioral change in the organization in terms of safety.

The hierarchical *order of responsibility for project safety* (in descending order) as determined by survey findings is:

1. Owner
2. Contractor
3. Project Consultant

This finding is in consistence with prior research in construction industry, which has identified that a cultural and behavioral shift in the mind-set of all participants in the construction process especially project owner is necessary if the construction industry is to improve its performance and competitiveness (Kanji and Wong, 1998; Love and Heng, 2000). Obtaining owner commitment to safety is crucial to success. Until the project owners do not emphasize as well as mandate implementation of safety on projects, contractors and consultants will not accept the major share of responsibility for safety, despite being the key players in the industry.

The hierarchical *order of responsibility for employee safety in a contracting organization setup* as determined by the survey findings is given (in descending order of responsibility) as:

1. Employees (themselves)
2. Safety Officer
3. Project Manager (site)
4. Supervisors
5. Site Manager
6. Project Director (office)

It is interesting to note that most contractors believe that it is the worker's own responsibility to keep oneself safe on construction site. However, responsibility assignment should always be preceded by right level of orientation and training, clear and precise communication of safety rules and procedures as well as provision of adequate safety tools which, unfortunately, are found to be weak areas in safety implementation in Pakistan (as evident by findings presented in this study). Hence, with this lack of attitude of nurturing a safety culture in organizations, accounting the employees as the major responsible entity for safety implementation is little justified.

The *benefits for implementing safety*, as indicated by contractors, are given as follows:

Option	Percent of Responses
Accident reduction	71%
Improved workers motivation	68%
Improved project cost performance	53%
Improved project schedule performance	47%
Reduced disputes/ litigation	34%
Increased client satisfaction	32%

An interesting finding from the results is that client satisfaction is considered to be least related with safety implementation. This again emphasizes the lack of client commitment and support towards safety. Absence of safety enforcement regulatory framework in the industry is depicted by the response that despite unsafe work practices prevailing in the industry (as evident from informal construction site accidents information in the Pakistan industry); contractors seldom find safety a critical issue towards disputes/ litigation. Many contractors consider safety most significant towards accident reduction and improving workers motivation. Project cost and schedule performance are only moderately affected by safety as per their perception. This again emphasizes that worker safety has not been considered a vital issue in the industry and unsafe behavior mostly goes unnoticed and unaccounted.

The analysis of this section indicates that majority of contractors perceive safety as a relatively high priority to them. They feel that safety management is a need for the industry for successful project completion which will ultimately translate into higher profits for them. Most contractors relate safety management with eliminating serious injuries, illnesses and/ or fatalities on project sites. Owners are considered to be key initiators for project safety; without owner commitment to safety, contractors (and probably consultants) are not willing to accept major responsibility. In a contracting organization setup, employees are considered to be most responsible for maintaining a safe work environment. This is ironic in the absence of adequate safety related support from top management.

## 5.2 Safety Program Documentation Procedures

In this section, two questions were asked to find out how the contracting organizations document their safety program.

When asked whether they have a written safety program manual or company safety plan for projects, fifty eight percent (58%) contractors responded affirmatively. This response is in consistence with a response related in the next section in which 61% contractors indicated that they maintain a safety policy. This indicates that almost all contractors who have a safety policy also maintain a written plan to define safety program, administration and procedures. However, most of the respondents did not mention the last revision date of the program, which indicates that doing periodic revisions in the program is not a routine practice.

Forty two percent (42%) contractors responded affirmatively when asked whether they have a *written safety field manual*. In comparison to the response of the previous question, fewer contractors adopt the practice of keeping a safety field manual, which, of course, is significantly essential for a contractor to maintain safe site operations.

The results of this section highlight that a moderate number of contracting firms document their safety program in terms of program manuals and field manuals. This in turn shows an existence of a fairly modest safety program documentation system with Pakistan contractors. However, considering the significance of safety in construction operations, and the significance of adequate documentation towards implementation of a formal program, this trend needs to be drastically improved.

## 5.3 Safety Policy, Management Support and Responsibility Structures

In this section, respondents were asked sixteen questions to explore facts about safety policy, management support and the responsibility structures in their organizations and with their subcontractors. The results are as follows:

Thirty nine percent (39%) respondents indicated that they do not have a *safety policy statement for an officer of the company*. The result is far below satisfactory considering the unsafe nature of the construction industry in general and the need for safe practices in the Pakistan construction industry in particular.

Moreover, excluding the 39% organizations not having a safety policy, from the respondents who indicated otherwise, three organizations do not have a *disciplinary process for enforcement of their safety policy/ program* which makes the implementation of their safety policy questionable.

To the question whether *contractor top management sets corporate safety goals*, the responses showed that only 47% organizations have an active safety management support that sets goals as part of a corporate policy, while the rest do not have any such trend. This group of respondents came from the cluster of companies who responded affirmatively on having a safety policy statement as well as a disciplinary process of its enforcement.

When the contractors were asked whether *executive management reviews (a) accident reports? (b) Safety statistics? (c) Inspection reports*, 45% respondents reported that their executive management does review accident reports, 37% indicated a review of safety statistics, while 28% indicated review of inspection reports by their executive managements. The result shows an inadequate involvement of executive management in enforcing safety management in the projects. It is interesting to note also that only 24% responding contracting firms have the most active executive management review support in that their managements review all three safety related data: accident reports, safety statistics and inspection reports.

When asked whether *each level of management has assigned safety duties and responsibilities*, the response was negative by 53% contractors, including the 39% not having any safety policy.

Fifty percent (50%) respondents indicated that *safety and health responsibilities of employees* have not been clearly defined/ documented. Evaluating this response in conjunction with a response given in previous section, which indicated the contractors' perception that employees are themselves mainly responsible for safety implementation, it can be inferred that description (and hence communication) of employee safety responsibilities is a major obstacle toward realizing the perception.

Thirty two percent (32%) contracting organizations do not have *written policies on accident reporting and investigation*, again showing lack of commitment to a strong accountability system related to safety by almost one-third of the contracting organizations.

Sixty five percent (65%) contractors reported that they do not have *personal protective equipment policy*, while 68% contractors indicated that they do not have a *written substance abuse program*, again indicating the lack of management commitment to safety in their organizations.

Forty seven percent (47%) contracting organizations indicated that *safety is an evaluation criterion of their supervisor's performance*, 53% reported otherwise. This once more indicates the lack of existence of a strong safety management enforcement system among the contractors.

When inquired about the *average allocation of their project budgets on safety implementation and support*, the response was as follows.

Option	Percent of Responses
No budget allocation for safety	21%
Less than 1%	53%
1-2%	21%
2-4%	5%
4-6%	0%
More than 6%	0%

Results clearly indicate that a major proportion of contractors either do not allocate any budget for safety implementation or allocate less than 1%. Yet again this emphasizes their lack of commitment to safety implementation.

When inquired about *the safety policies followed for subcontracting*, the response was as follows. Results indicate that except for including safety rules and regulations in subcontract documents which is practiced by a moderate proportion of contractors, safety is not considered a major concern by most contractors during the subcontracting procurement process. This result is in relation to the finding that since owners do not mostly demand contractors to follow safe work practices, contractors also do not emphasize subcontractors to maintain safe work environment and hence an overall project safety culture remains unobserved in most cases.

Option	Percent of Responses
Include safety rules and regulations in subcontract documents	44%
Review qualification of subcontractor safety staff	28%
Require subcontractors to submit a site-specific safety plan	24%
Safety prequalify subcontractors	22%
None of above	25%

When contractors were requested to identify, in relation to safety, the *responsibilities of their site supervisors, safety officers (or personnel/ department), employees, and third party/ subcontractors*, the following responses were received (separated in various tables according to the responsible entity):

Safety Responsibilities of Site Supervisor	Percent of Responses
Emphasize labor to perform their work in a safe manner	62%
Ensure all accidents are reported and take preventive measures	53%
Take steps to eliminate hazardous acts and conditions	51%
Ensure that work load is reasonably distributed among workers	47%
Adopt and promote safe work attitude at site	44%
Ensure tools and equipment provided is safe and suitable for the job	42%
Give priority to rules and regulations related to safety (if any)	38%
Ensure safe practices are followed	38%
Conduct regular site safety inspection and meetings (with safety as an agenda)	35%
Implement environmental management strategies and monitor progress against them	24%



<b>Safety Responsibilities of Safety Officer/ Personnel/ Department</b>	<b>Percent of Responses</b>
Assist in reducing hazards	55%
Monitor safety statistics and trends	48%
Carry out safety auditing	42%
Identify areas of improvement	39%
Identify safety related risks in the pre-mobilization phase	32%
Review subcontractor operating equipment prior to mobilization	28%
Ensure that training of supervisors, workers and subcontractor employees are adequate	24%
Link with project owner and regulatory bodies on safety regulations	24%
No officer/ personnel/department for safety	39%

<b>Safety Responsibilities of Employees</b>	<b>Percent of Responses</b>
Ensure that work is carried out in safe manner	80%
Report all unsafe and defective material immediately	72%
Work in accordance with instructions	68%
Comply with safety rules and procedures	39%
Wear safety protective clothing correctly	31%
Comply with environmental management strategies	24%

<b>Safety Responsibilities of Third Party/ Subcontractors</b>	<b>Percent of Responses</b>
Be aware of the potential hazards of the working environment	75%
Ensure that the working equipment brought to site is brought in safe working environment	72%
Use proper personal protective clothes and equipment	42%
Be aware of any environmental sensitivity that exist and what actions will be taken to protect them	40%
Be fully informed on site safety procedures, emergencies, alarm and their roles	35%
Participate in meetings as required	32%

For supervisors, the overall safety responsibility is moderate to low; in almost 50% contracting firms, supervisors do not play significant role towards safety implementation.

For safety officers, the overall safety responsibility is also moderate to low; almost 40% organizations do not have existence of such an entity responsible for safety implementation. Interesting (and consistent) finding is that linking with project owner and regulatory bodies for safety regulations is the least priority of safety officer.

Responses indicate that workers are considered by contractors to be most responsible for implementing safety (as also evident by a previous response). This is more of a responsibility shift to workers from the contractor management rather than holding the workers accountable for their actions after equipping them with necessary tools, trainings, and safety procedures. This is evident from the relatively low responses on “comply with safety rules and procedures”, “wear safety protective clothing correctly” and “comply with environmental management strategies”, all of which require organizational level input, support and commitment. Hence employee commitment to safety is rather expected than required with adequate support.

Again a major responsibility shift is seen from the higher response rates on major aspects of safety responsibilities of subcontractors. As with the case of employees, relatively low responses are received on aspects such as “be fully informed on site safety procedures, emergencies, alarm and their roles”, and “participate in meetings as required”, which require input, support and commitment from contractor management. This response in conjunction with a previous response, which indicated that except for including safety rules and regulations in subcontract documents which is practiced by a moderate proportion of contractors, safety is not considered a major concern by most contractors during the subcontracting procurement process, it can be inferred that most safety responsibilities from subcontractors are rather expected than mandated.

In summary, it is observed that there exists moderate level of safety policy, management support and responsibility commitment in majority of contracting firms. Major consequences of this include inappropriate budget allocations for safety implementation, inadequate policies related to safety, insufficient management involvement in safety reporting, lack of well defined responsibility structures and duties related to safety for various management and

employee levels, lack of requirement from subcontractors for safety performance and implementation of project-specific safety plans, and responsibility shifts to workers as well as subcontractors based more on expectations rather than defined structures, procedures and support for responsibility commitments. Existence of defined policies and top management commitment together form the vital first step towards implementation of any successful management program.

Hence this is an area that requires substantial improvement for improving safety culture on projects.

#### 5.4 Safety Induction, Training and Orientation

In this section, respondents were asked seven questions to explore about safety related training and orientation programs designed for employees. The findings are as follows:

Fifty two percent (52%) organizations indicated that they have a *health and safety training plan*.

Forty five percent (45%) contractors indicated that they conduct *safety orientation training for each new employee*.

Only 21% respondents indicated that *subcontractor workers attend a formal standard safety orientation*.

When asked whether their safety program requires *safety training meetings for each supervisor (foreman and above)*, the response was positive by 45% respondents. Among the contractors who indicated that they do require safety training meetings for supervisors, most of the contractors did not mention a particular schedule for these meetings and indicated that safety training is part of agenda on site meetings on need basis. This represents some kind of emphasis on safety training but lack of a formal mechanism for disbursing the training.

When inquired about holding *tool box/ tailgate safety meetings focused on specific work operations/exposures*, the response was positive by 38% respondents. Most of the contractors who identified that they do hold tool box safety meetings indicated conductance of these meetings on daily basis.

On-the-job training and employee training/ orientation before the start of a new task are adopted by majority of contractors (from those who indicated having a health and safety training plan) as *preferred training mechanisms*. However, there were no offices spotted on most sites for the purpose of training workers. It is, therefore, understood that, in many cases, training is less formally disbursed. Moreover, informal discussions identified that the training, rather than emphasizing on working safely, is more directed towards doing the job correctly and quickly.

According to responses, the aspects focused in trainings are as follows:

Option	Percent of Responses
Knowledge and awareness	52%
First aid	42%
Physical controls and rules (PPE <sup>1</sup> , Equipment safety...)	30%
Employees Duties	28%
Motivation and behavior	25%
Safety communication	22%
Safe work rules/ procedures	22%
Precautions against hazards	15%
Duties of Company	15%

<sup>1</sup>Personal Protective Equipment

Above responses indicate that the respondents who have had a safety training plan (52%) had a unanimous opinion that the training programs mostly emphasize on safety knowledge and awareness; next in priority is first aid training. Other training aspects, including Personal Protective Equipment (PPE) and equipment safety, employee duties, motivation and behavior, safety work rules and procedures, are addressed by less than one-third contractors only.

Only 27% contractors responded affirmatively when they were asked if they conduct *safety inductions for site visitors*.

Safety training is a very effective way to reduce safety hazards on sites as well as continually improve the attitude and behavior of the workforce towards safety. Training of the workers on site is a responsibility of various project personnel. Findings of this section indicate that the safety related training structures available with contracting organizations are not quite sufficient in relation to the significance and contribution of training towards improvement of safety behaviors; only moderate to low proportion of contracting firms focus on safety related training and orientation programs for their employees and supervisory level staff. Use of safety training meetings and tool box meetings is not practiced by a major proportion of contracting firms; in many cases, training is less formally disbursed. Where exist, training programs mostly emphasize on safety knowledge and awareness and use of first aid facilities; other important areas of safety are usually less emphasized. Safety orientation requirement for subcontractor workers is non-existent with majority of firms. Also, less than one-third contractors give significance to safety inductions for site visitors.

### 5.5 Safety Program Administration and Procedures

In this section, fifteen questions were asked to evaluate the status of safety program administration and procedures in contracting organizations. The results are as follows.

When asked about the *typical inclusions in safety program required by project owners*, the responses from contractors were as follows:

Option	Percent of Responses
Contractor should prepare a plan for site emergencies	42%
Contractor should conduct pre-task safety planning on project sites	36%
Contractors should develop and submit a project-specific safety (or hazards mitigation) plan	24%
Contractors should provide safety equipment to workers and visitors	21%
Contractor should implement a substance abuse safety program	17%
Contractors are not mandated to have a safety program on projects	52%

An important finding is that almost one-half proportion of contractors is not required by project owners to maintain a safety program on projects. This is an unfortunate situation in Pakistan construction industry, particularly keeping into consideration that the most major project owner in Pakistan is the government itself, which, by virtue of lack of a structured regulatory framework, is still less concerned about project safety. In the absence of (1) a culture of project owners demanding safety, (2) lack of any incentive/ disincentive mechanism existing in the industry to promote safety (such as reduced insurance premiums for safe contractors), and (3) most contractors neither emphasizing themselves nor demanding from subcontractors on developing a safety culture on project sites, safety, although perceived as a need for industry by many contractors, still is not a major project success parameter for many industry players.

When inquired whether they have a process of developing a *project-specific safety plan (or hazards mitigation plan)*, only 32% contractors responded affirmatively. Moreover, forty two percent (42%) contractors responded affirmatively when inquired as to whether they have a *practice to do pre-task hazard /risk assessment for each task*. Both of these responses indicate that majority of contractors do not have a process of hazards planning at project level as well as at task level, although the latter is practiced by a larger proportion comparatively.

Moderate to low responses were received on existence of *motivation mechanisms for workers on construction sites*, as shown in the table below.

Option	Percent of Responses
Through safety orientation and training on sites	48%
Imposing penalties for safety non-performance	22%
Providing safety performance based incentives	15%

Sixty seven percent (67%) contractors conduct *jobsite safety inspections/ audits*. This is a relatively positive finding; however, in absence of required safety policies, plans, procedures, orientation and training, the jobsite safety inspections/ audits may not prove to be very functional for contractors lacking a safety management system. Among

the contractors who have a process of conducting jobsite safety inspections/ audits, majority (54%) indicated that they conduct these inspections/ audits monthly.

When inquired about the use of *jobsite safety checklists (or similar tools) for inspection*, thirty three percent (33%) contractors responded favorably. This is approximately 50% of the contractors conducting jobsite safety inspections. The other one-half contractors use informal inspection methods such as judgment, intuition or experience of the inspector.

Fifty four percent (54%) contractors *discuss safety at all preconstruction and progress meetings*.

A healthy finding was that majority of contractors (77%) *perform site layout planning before start of work*. Since a proper site layout aids in providing a safe working area for employees, this was a positive planning aspect of project management. A further positive finding was that few contractors (22%) also indicated that their site layout planning process is dynamic in nature and continues throughout the life of a project. It is worth mentioning here that site layout planning is a contributory process to safety management. Hence implementing site layout planning is also beneficial for contractors from various perspectives other than safety such as schedule, cost and quality.

Majority of the contractors indicated that *working with defective equipment* that would undermine site safety was not allowed under any circumstances.

When asked if contractors *maintain first aid facilities on site*, eighty percent (80%) contractors responded affirmatively; however, most of them indicated that they were not very satisfied with the condition of the first aid facilities and are in the process of improving those. When the earlier part of this response is considered in relation to the finding that a moderate number of contractors do not have formal safety management systems (which latter part of this response also indicates), it can be inferred that provision of first aid facilities on site is more of a responsive approach towards accidents rather than part of a proactive system of safety. This is also evident from the finding that although 80% contractors provide first aid facilities on site, only 38% contractors (about half of them) focus on first aid training to their employees (as evident from a previous response).

In relation to *documentation of safety work rules and procedures for various site operations performed by company (such as excavation works, trenching works etc.)*, sixty two percent (62%) contractors indicated existence of documented safety work rules. This indicates that more than one-third contractors resort to personal experiences, judgment and intuition of the project team to perform various site operations. However, these contractors indicated that certain work procedures, although not adequately documented, are followed on sites by practice. For instance, for excavation and trenching works, which have been areas of major safety concern for most contractors involved in such construction works, most contractors specified that whenever excavation reaches a certain depth suitable shoring was installed or the sides were sloped back to safe angle. Materials were placed at a distance of at least two feet from the edges of the excavation. Workers were not permitted to work in any place where they could be struck by any part of mechanical excavator. In all cases, suitable barriers and warning tapes were installed to prevent persons, vehicle or equipment falling into the excavation. All these procedures, although followed, have not been documented as safe work rules. This again indicates lack of documentation as well as formal and systematic implementation of safety as a management concern.

In relation to *implementation mechanisms for safety work rules and procedures*, the responses were as follows:

Option	Percent of Responses
Enforcement of PPE <sup>1</sup> whenever possible	31%
Adequate sources of information on safety for workers is made available on site	31%
Workers are required to report any violation by a fellow worker	13%
Only new workers are required to consult safety rules and procedures	6%
No documented safety rules and procedures in place	38%

<sup>1</sup>Personal Protective Equipment

Above responses indicate that from among the 62% contractors who have had documented safety work rules and procedures, only half of the contractors make these work rules and procedures available to workers. Also, most workers are not required to report any violation in relation to safety work rules and procedures by a fellow worker.

These results indicate that although safety work rules and procedures exist with a fairly moderate proportion of contractors, implementation mechanisms of these work rules and procedures are weak.

Practice of keeping site safety records is a positive commitment by the management towards encouraging a safety environment. Corrective actions can be taken based on the safety records. Hazards can be analyzed and suitable preventive strategies can then be adopted. When inquired about *safety record keeping and logging*, the following results were obtained.

Option	Percent of Responses
Accident investigation reports	56%
Safety inspection reports	44%
Safety meeting minutes	44%
Record of emergency response drills	31%
No record keeping	31%

The first part of this result is in consistence with a previous response which indicated that 58% contracting organizations have written policies on accident reporting and investigation. Almost one-third of the organizations indicated not having a procedure for keeping safety records and logs; this is an alarming trend and needs to be improved. Overall, a modest proportion of contracting firms are into the practice of safety record keeping and logging.

As regards *post-accident safety response mechanism followed usually on project sites*, the response indicates that 52% contractors do not have a documented post-accident response procedure, which is rather decided based on the intuition and judgment of site manager or project manager. The remaining contractors follow a certain post-accident response procedure but most do not take preventive actions for avoiding similar occurrence in future. This indicates that most contractors do not follow a preventive approach towards accidents and hence have an inherently reactive attitude towards safety. This is comprehensible considering the absence of formal safety management systems and procedures in the industry at large. The results are shown in the following table.

Option	Percent of Responses
Immediate organizational level action is taken (investigation, penalization, etc.)	42%
Preventive actions are taken for avoiding similar occurrences in future	24%
Only the accident is reported (no further action taken)	22%
The site/ project manager decides response mechanism	52%

In relation to *accident reporting mechanism*, most contractors indicated that accidents were first reported verbally to the concerned authority and then later a written report was also submitted. In case of injuries, except those that only required first aid, an oral report to the project owners by the contractors was usually required.

In summary, contractors, generally, are not required by project owners to maintain a safety program on projects. As such, many contractors do not follow a practice of developing a project-specific safety plan; pre-task hazard assessment is also not an adopted practice by many contractors. A moderate number of contractors implement worker motivation mechanisms which are mostly tied to their training and orientation programs. Jobsite safety inspection is performed as a practice by a majority but mostly informally. Moreover, in the absence of defined safety policies, plans and procedures, as well as required level of worker orientation and training, the jobsite safety inspections do not usually prove to be beneficial towards safety improvement. Site layout planning and provision of first aid facilities are relatively stronger areas of safety implementation. Although almost two-third of the contracting firms document safety work rules and procedures, only less than one-third adopt appropriate mechanisms for implementing these rules and procedures. Almost one-third of the organizations do not have a procedure for keeping safety records and logs, while the remaining also do not keep all the required records and logs. Almost half of the contractors do not have a documented post-accident response procedure; it is rather decided based on the intuition and judgment of site manager or project manager. An oral report to project owners is usually required in case of accidents.

## 5.6 Safety Performance

In this section, respondents were asked two questions to investigate their safety performance and the measures taken by them to improve safety performance.

According to the survey response, the *major injuries faced by contracting firms on their project sites*, in descending order of occurrence, are given as follows (the percentages in parenthesis indicate the weighted average percentages of the injuries based on a combined proportion of percentage of occurrence of the injury and percentage of companies facing the injury):

1. Fall injuries (55%)
2. Struck-by injuries (53%)
3. Injuries by wastage and raw materials (36%)
4. Heat stroke (33%)
5. Head injuries (25%)
6. Eye injuries (21%)
7. Burning cases (9%)

Falling from height has been found as one of the major causes of construction fatality. From company safety records, it was found that falling from roofs and floor openings was the major cause of such injuries. In order to prevent such injuries and fatalities, contractors reported use of safety belts, ropes and cables. Safety nets were also reported to be used by few contractors. However, looking at the high value of weighted percentage of fall injuries (55%), it can be asserted that these safety measures were either not available to most workers on site or were not required to be adopted by them as part of the site safety management system. Further diagnostic is needed to substantiate this inference. It was also found that there were a small percentage of contractors not reporting use of any of the safety harness, even though it constituted a major proportion of their accidents.

Hit by falling materials was related to be a major source of struck-by accidents by many contractors. Similarly, hit by private vehicles was also found to be a prime cause of struck-by accidents on sites. Using hoist and cranes requires extra cautions in this respect; most contractors indicated that they ensure that workers are not allowed to walk beneath the hoist and cranes. Also, according to a majority, due care was given not to exceed the capacity of the hoist crane.

An appreciable proportion of contractors reported to have faced situations whereby their workers had fracture cases owing to injuries caused by improper house keeping such as inappropriate material storage (e.g. wood pieces, steel pieces and nails). Heat stroke was also reported as another frequent cause of injuries on sites.

When contractors were asked to list their *company's approximate average percentage of fatalities (with respect to total workers on project) on their last five projects*, the responses were as follows:

Option	Percent of Responses
1% or less	14%
2-3%	24%
3-5%	16%
5-7%	2%
No record	44%

The results indicate poor safety performance by an appreciable proportion of contractors (40% contractors reported average fatality percentage in the range of 2-5%). Another finding which is consistent with previous findings is that 44% of the contractors do not have a process of logging their safety (accident) records.

Findings of this section indicate that contractor safety performance is below par in various respects. Most companies have an average fatality in the range of 2-5%. The major injuries faced by more than 50% contracting firms include fall injuries and struck-by accidents. While excavation and crane injury figures are not high, this can not be attributed only to above par safety performance of contractors in these work areas but should be considered from the perspective that, not until very recently, most of the construction work in Pakistan has remained conventional in nature neither requiring very deep excavation or trenching works nor high rise works requiring tower cranes. Hence safety performance in these areas has remained consistent.

## 5.7 Safety Implementation and Improvement

In this section, four questions were asked to assess contractors' viewpoints on safety implementation and improvement in the industry. The results are as follows.

When the contractors were requested their expert view as to *which of the following mechanisms best contribute toward implementing and improving safety on projects*, majority of the contractors indicated their perception that developing safety policies and manuals, including general safety guidelines in the body of contract, establishing physical controls and rules and integrating safety into project schedule were the most suited tools and procedures to implement and improve project safety. It is interesting to find that not many contractors believed that proactive approaches such as developing safe work standards, setting up a construction safety department to manage safety performance, safety risk identification, and implementing a behavior-based safety program would be much helpful in implementing and improving safety on projects. The reasons for such a perception can be related to the obstacles identified by contractors to the implementation and improvement of safety, as indicated in the response to follow. Summary of results to this question is indicated in the following table.

Option	Percent of Responses
Developing safety policy/ manual/ procedures	69%
By including general safety guidelines in the body of contract	64%
Establishing physical controls and rules	61%
Integrating safety into project schedule	57%
Accident reporting and investigating	48%
Implementing safety checklists	48%
Developing safe work standards	44%
Conducting safety audits and inspections during construction	43%
By always including safety on the agenda at owner-contractor meetings	36%
Setting up a construction safety department to manage safety performance	36%
Safety risk identification	24%
Providing safety incentives and penalties	21%
Implementing a behavior-based safety program	21%

The *obstacles in the implementation of safety program* as indicated by the respondents are shown below in descending order of responses (based on total number of responses received against each option).

1. Worker cooperation/ behavior
2. Lack of familiarity and expertise with safety management techniques
3. Lack of safety awareness and knowledge
4. Lack of owner commitment and support
5. Absence of safety regulatory framework in the industry
6. Lack of top management commitment and support
7. Complicated safety work rules make the workers non-responsive
8. Lack of proper training of employees
9. Shortage of safety managers
10. Lack of accident liability
11. Time constraints
12. Lack of consultant emphasis on safety
13. Lack of communication between stakeholders
14. Safety management in commercial terms is not always viable on projects

The major barrier towards implementing and improving safety was identified as the lack of cooperation from the workers. Lack of familiarity and expertise with safety management techniques as well as lack of safety awareness and knowledge were also pointed out to be major hindrances towards implementing safety on projects. Lack of owner commitment coupled with the absence of a safety regulatory framework, as also identified in previous findings, is also considered as a major bottleneck towards improvement of safety management implementation in the industry.

Eighty two (82%) percent contractors agreed that *owner incentives to “safe” contractors* can improve safety culture in the industry.

Although 88% contractors indicated the need for such an organization, it is surprising to note that only a moderate proportion of 54% contractors recommended the *creation of a safety administrative body in Pakistan with the objective to establish and enhance safety culture in Pakistan construction industry on sustainable basis*. Despite the lack of safety culture in the industry, one possible reason that may have contributed to almost half of the contractors not recommending such an organization may be attributed to the industry prior experience towards the sustainable development and effectiveness of similar organizations which, although were evidently created with vision and objectivity, could neither maintain the authority nor sustain the effectiveness needed to implement their mission in the long-term and hence either faded away or became practically non-functional. This is most noticeable owing to the current adversarial business environment in the industry that has developed due to the lowest bidding setup and has drastically affected the nurturing of such impartial organizations in the industry.

Findings of this section can be summarized as follows. Not many contractors believe that proactive approaches such as developing safe work standards, setting up a construction safety department, safety risk identification, and implementing a behavior-based safety program would be much helpful in implementing and improving safety on projects. The reasons for such a perception can be related to the obstacles identified by contractors to the implementation and improvement of safety which include, in decreasing order of significance, lack of the following: cooperation from workers, familiarity and expertise with safety management techniques, safety awareness and knowledge, owner commitment, and a safety regulatory framework. Almost all contractors indicated the need for a safety administrative body in Pakistan with the objective to establish and enhance safety culture in Pakistan construction industry on sustainable basis; however, most did not recommend creation of such an organization owing to the current adversarial business environment in the industry that has developed due to the lowest bidding setup and has drastically affected the integrity and effectiveness of any such organization.

## **6. Conclusions and Recommendations**

### **6.1 Conclusions**

The following major conclusions have been derived:

1. The survey results indicated that the contractors in Pakistan are generally aware of the priority of safety as well as its significance to the industry but lack commitment, cooperation, expertise and familiarity with tools to implement safety culture on their projects.
2. Owners are considered to be the key initiators for project safety; without owner commitment to safety, contractors are not willing to accept major responsibility for safety and hence their lack of commitment.
3. Majority of the contracting firms in Pakistan do not have established mechanism for documenting their safety programs in terms of program manuals and field manuals.
4. Well-documented policies on safety, established disciplinary process for enforcement of safety programs, management commitment, safety responsibility structures and layered organizational support for safety implementation do not exist with majority of contracting firms. Major consequences have been inappropriate budget allocations for safety implementation, poor worker and subcontractor safety performance, and responsibility shifts.
5. Management review process needs significant improvement and all safety related reviews need to be incorporated in order to achieve improved safety performance.
6. Although few companies have a mechanism of on-the-job trainings for the workers, there is a general lack of commitment from majority of contracting firms toward conductance of safety related orientation and training. Establishing safety cell in the site office will be an important step towards improving safety on the job site.
7. Contractors, generally, are not required by project owners to maintain a safety program on projects. As such, many contractors do not follow formal safety management practices. Consequently, procedures for accident



reporting and investigation, mechanisms for implementation of safety work rules, processes for safety record keeping and logging, methods for accident response, and practices for safety performance evaluation are not suitably applied by majority of contractors. However, – more because of a practice – jobsite safety inspections, site layout planning and provision of first aid facilities on site are relatively stronger implementation areas of safety.

8. Past safety performance of contractors has remained below par in various respects in the recent years. Most companies have an average fatality rate per project in the range of 2-5% of the total project work force.
9. A cultural and behavioral shift is needed in the contractors' perception about safety management implementation and improvement on projects; most contractors currently perceive proactive approaches in safety as not being much useful.
10. The major obstacles faced by contractors to the implementation and improvement of safety include – in decreasing order of significance – absence of the following: worker cooperation and behavior, familiarity and expertise with safety management techniques, safety awareness and knowledge, owner commitment, and a safety regulatory framework.

## **6.2 Recommendations**

Analysis shows that there are many barriers due to which safety is not implemented on projects. Following are some recommendations to overcome these barriers:

1. In Pakistan, currently there is no regulatory agency or organization for occupational safety management (for instance, OSHA – Occupational Safety and Health Administration in the USA). The primary construction regulatory body in Pakistan – the Pakistan Engineering Council (PEC) has yet to lay down safety laws and regulations that will be adopted by the stakeholders in order to implement safety practices. Such regulations need to be defined and enforced. Hence the need for such an administrative body is evident; however, the integrity and effectiveness of such an organization is a major concern in relation to the existing adversarial business environment in the construction industry of Pakistan and need to be addressed. The jurisdiction and authority of this organization also need to be defined.
2. The current rating of contractors by PEC does not incorporate contractor safety performance. Incorporating safety performance as a factor in contractor rating would encourage the contractors to adopt safety management practices in their companies.
3. It would be appropriate to arrange some form of formal and/or informal education and training. Formal education could be graduate studies in safety management systems. Informal education and training could take the form of career development programs (like safety management awareness program) organized by academic institutions or professional organizations.
4. The authors strongly believe that a major need of the industry is to develop the attitude of project owners towards an active safety management implementation, since owners are usually the driving factor towards an active and mature safety management system. Therefore, a change in the views and attitude of the owners through awareness programs can bring a prominent and distinctive change in the safety management status in Pakistan not only among contractors but also in the entire construction industry.
5. As a catalyst for maintaining a safe project, contractor top management should formulate strategies and develop policies that nurture a safe culture. Safety should be emphasized at all times no matter how fast the construction needs to be completed and under what budget constraints. Contractors should integrate safety training programs with other practices according to their budget. Training can be provided in many ways: on-site training, safety meetings before the start of any work; large size contractors may develop separate safety departments. Contractors should encourage their project managers to develop safety incorporated project plans and schedules.
6. The project management has to play a key role in safety implementation. They should take it as their responsibility to consider safety concerns during the planning stage and give safe work plans to their clients

(project owners and contractors). Project managers, as project coordinators, should also educate and motivate all stakeholders to implement safety on projects.

7. Successful implementation of safety management in Pakistan construction industry can be achieved through persistence, positive hands-on leadership, upfront preparation and continuous maintenance of a sensible plan. The following basic steps are identified to implementing safety management in the Pakistan construction industry:
  - i. Obtain client commitment to safety management. This is crucial to success.
  - ii. Generate awareness, educate project staff and change attitude.
  - iii. Develop and document approach to safety management to projects.
  - iv. Prepare project safety management plans for all levels of work.
  - v. Install organization and managing bodies.
  - vi. Institute proper tools and techniques which may enable the participants perform formal safety management.
  - vii. Promote staff participation and contribution by pre-task meetings and initiate brainstorming sessions.
  - viii. Review safety management plans and measure performance.

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