

HEALTH AND SAFETY PERCEPTION OF CONSTRUCTION WORKERS IN SAUDI ARABIA

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Abstract

Construction is a high-risk industry due to the high rates of accidents/fatalities recorded annually in various countries. Health and safety (HS) is a major concern of the construction industry. More so, for developing countries where HS cultures are yet to become fully established. In such situations, the perception of construction workers is a viable approach to assess the performance of HS. This study investigated the HS conditions in Saudi Arabian construction sites from the perspective of construction labor. The study employed a questionnaire comprised of 50 issues related to safety and health from an employee's perspective, on a 1-5 Likert scale of agreement. Responses were obtained from 196 construction workers in the Eastern Province of Saudi Arabia. Results from the study showed that the crucial issues identified include: lack of communication between front-line supervisors and construction labor, less priority for safety compared to productivity; lack of employee-engagement in developing safety policies; poor morale and lack of motivation amongst workers; and un-tested emergency response procedures. Thus, the study suggests that addressing such issues will allow for improved safety performance in the Saudi Arabian construction industry.

Keywords: Construction; Safety perception; Saudi Arabia.

1. INTRODUCTION

The construction industry continues to rank as one of the highest risk industries. This can be attributed to rising trends in industrialization and the increasing size and complexity of construction projects [1]. Consequently, the construction industry has the highest rate of fatal accidents as well as disabling injuries compared to other high-risk industries [2]. These accidents have serious economic and social consequences [3]. Besides the loss of life and property, financial losses could be attributed to medical bills for the treatment and rehabilitation of injured persons, downtime due to the suspension of production, workers' compensation, cost of repair and/or replacement of dam-

aged equipment, amongst others [4]. The risks are further increased when there is a general lack of awareness or the absence of strict implementation of safety rules and regulations predominate. The prevalence of such behaviors and attitudes impedes the progress and overall success of an organization. For instance, a study of 27 countries in the European Union showed that: for every 100,000 people employed in the construction industry, 3,000 people undergo accidents at work, while six people per each 100,000 of employees fall victim to fatal accidents [5].

Literature reveals that employees' attitudes towards safety have been referred to as safety "culture" and "climate" [6]. The perceptions and beliefs of workers, their behavior and the established management sys-

tems are elements that combine to form the safety culture/climate of an organization [7]. Furthermore, Hale [8] defined safety culture as “the attitudes, beliefs, and perceptions shared by natural groups as defining norms and values, which determine how they react in relation to risks and risk control systems”. Also, an industry standard definition of safety culture has been proposed by a United Kingdom nuclear safety panel as follows: “the safety culture of an organization is the product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the commitment to, and the style and proficiency of an organization’s health and safety management [9].

Though the subject of workers’ perception of the safety climate of their workplace has been on the discussion table for the past 25 years; this concept has only gained prominence in the recent years [10]. The construction industry generally falls short in its establishment of a good safety culture. The situation is further exacerbated in developing countries where there is a general lack of awareness and understanding of what a good safety culture entails. Saudi Arabia continues to develop rapidly despite the fall in oil prices. Numerous developmental projects spread across the country. Current and future developmental projects include investments worth \$258.2bn in real estate; \$151.5bn in petrochemicals; and \$126.7bn in electricity, gas, and water [11]. By virtue of the number of mega projects going on in Saudi Arabia, the potential amount of safety risks is expected to increase in parallel to the level of development. Despite this fact, the overall level of construction safety in Saudi Arabia has been relatively low [12].

Though efforts have been made by the concerned stakeholders to address the increasing costs of accidents and ensure a safer workplace in the construction industry, little progress has been made so far. This may be due to little efforts in studying the root causes of most of the problems faced [13]. Berger [14] in his study suggested that the principles of safety are widely ignored by construction contractors in Saudi Arabia. The study highlighted that 25% of contractors did not provide new workers with a safety orientation; 25% did not provide personal protective equipment; 25% did not provide first-aid on site, and 38% had no trained safety personnel. Therefore, the causes of these problems may be identified through an investigation of the perception of workers on the inherent safety culture [15]. Thus this study aims to investigate the occupational HS perception of workers in Saudi Arabia’s construction sites. This is per-

formed based on distributing a questionnaire for mid-level and low-level workers in various construction sites across the Eastern Province of Saudi Arabia. The results of this study highlight critical areas that could be utilized for developing an effective safety management program, and also to implement, modify already existing programs in the construction industry in Saudi Arabia.

2. METHODOLOGY

The following activities were conducted to achieve the objective of this research:

- Reviewing the published literature related to safety perception and culture in the construction industry of various regions.
- Acquiring a standardized questionnaire available through the National Safety Council (NSC) [16].
- Deploying the questionnaire to mid-level and low-level workers across 22 construction sites in the Eastern Province of Saudi Arabia. A total of 250 questionnaires were administered, and 196 responses were received indicating a response rate of 78%.
- Calculating percentile scores for the various items in the questionnaire based on the means of the responses, and further rating these percentile scores according to the NSC’s barometric scale, as follows: 0–24% implies “poor performance”; 25–49% implies “below average performance”; 50–75% implies “above average performance”; and 76–100% implies “high performance”.

3. PREVIOUS STUDIES

Numerous efforts have been made in recent years to investigate the HS perception in construction sites. Some of these studies have been conducted in countries such as Ghana, Nigeria, Saudi Arabia, Malaysia, Indonesia, China, Turkey, Portugal and the United States of America. Gyekye [17] studied the perception of workers concerning workplace safety in construction projects in Ghana. The study sought to correlate the rates of accidents with job satisfaction of workers. In the study, 320 workers in the Ghanaian construction industry were interviewed. The findings of the study established a positive relationship between the safety climate and job satisfaction, and consequently lower accident rates.

A study conducted in Nigeria by Kukoyi and Smallwood [18] explored the HS perceptions of con-

struction workers including ironworkers, masons, carpenters, roofers, and electricians. The study employed a combination of interviews and observations. The main results show that lack of understanding of the use of Personal Protective Equipment (PPE), inadequate training, socio-economic realities, cultural and religious beliefs are key factors influencing the construction safety climate.

Panuwatwanich et al. [12] studied the relationship between safety motivation, safety climate, safety behavior and safety outcomes within the context of the Saudi Arabian construction industry. A questionnaire survey was administered to 295 engineers and project managers. The study established a positive relationship between safety motivation, safety behavior, and safety climate.

Several studies have been conducted in the Malaysian construction industry. Zulkefli et al. [19] measured the efficiency of monetary and non-monetary incentives to the performance and behavior of construction workers in Malaysia. Another study in Malaysia was carried out by Hassan et al. [10]. The study presented the safety perception of workers of building construction projects in Kuala Lumpur, Malaysia. A questionnaire of 36 factors was administered to 100 workers. The study suggested that the main factors influencing safety performance levels are organizational and management commitment, communication between workmates, roles of workers and supervisors and obstacles to safety.

Andi [15] measured the perception of workers towards safety culture in construction projects in Indonesia. The study employed a questionnaire survey distributed to 207 workers in three specific large construction projects. The questionnaire included three parts with multiple choice questions; general information about participants, safety culture factors and worker performance factor. The results of the study highlighted issues related to safety processes and rules, competency of workers, communication and management commitment.

A case study of the safety climate in Hong Kong's construction industry was presented by Fang et al. [20]. The study established a significant relationship between safety climate and personal characteristics, including gender, marital status, and education level, number of family members to support, safety knowledge, drinking habits, direct employer, and individual safety behavior. Also, Suo and Zhang [21] investigated the factors influencing migrant peasant workers' use of safety footwear in China. The study suggests that the most influencing factors were employee's

perception of the employers' attitude towards safety, availability of free safety footwear, and comfortability of the safety footwear.

In Turkey, Ulubeyli et al. [22] surveyed 800 workers from 32 construction projects focusing on labor workforce. These included eight categories based on the potential levels of risk: unskilled workers, welders, concrete workers, forming workers, electricians, painters, reinforcement fixers and bricklayers. The key findings of the study suggested that there is a lack of commitment to the safety of the workers, lack of training on safety issues and lack of adequate use of PPEs.

Silva et al. [3] employed a questionnaire survey to assess the safety climate of the Portuguese construction industry. The questionnaire was administered to 213 workers. The study compared the results derived from five construction sites and highlighted the existence of safety sub-climates.

Thakur and Sawhney [23] presented a study to examine the influence of cultural factors on safety perception. The study proposed a conceptual model to analyze the perception of safety among Hispanic and non-Hispanic workers in the United States. The aim was to introduce a new method for construction fatality analysis by providing insight into cultural influences on safety perception. Furthermore, Cubides and Felipe [24] reviewed the literature to identify the factors leading to occupational injuries and illnesses among Hispanic construction workers in the United States. The most common factors identified by the study was the unavailability of PPE use, employees' fear of demanding safer working conditions, lack of training, and management's preference for productivity over safety. O'Toole [25] conducted an employee safety perception survey from a large ready-mix concrete producer in the United States. The results of the study suggest that management's commitment was the major factor influencing employees' perception of safety.

The above studies demonstrated the importance of studying construction workers' perception of HS in various construction climates. These studies indicated that there is a direct relationship between the perception of construction workers and HS performance in the construction industry. Some of the studies presented have focused on the labor workforce due to high levels of risks among this group of workers. These studies showed that the major issues influencing workers' perception of HS include job satisfaction; leadership's commitment to workers' safety; communication between workmates; roles and responsibilities of all project's stakeholders; safety

rules and regulations; competency of workers; lack of training and lack of proper use of PPE.

4. AREA OF STUDY

The study was carried out in the Eastern Province of Saudi Arabia, which hosts a significant number of the construction projects. Twenty-two construction sites have been surveyed in this study in the cities of Khobar, Dammam, Dhahran, and Jubail. These sites are composed of a variety of construction projects accessible to the investigators. They range from residential, educational, governmental, road and bridge projects. The workforce in these sites ranged from 40 to 600 workers.

5. RESULTS AND DISCUSSION

The results of the questionnaire survey are presented in Tables 1-5. The percentile scores for the various elements of the questionnaire survey are also illustrated in Figures 1-6. The overarching objective of this study was to examine the perception of mid-level and low-level construction workers in the safety culture, in the construction industry in Saudi Arabia. The elements of the questionnaire survey as presented by the NSC are categorized into six sections, and can be summarily described as follows [16]:

- **Organizational safety climate:** it describes general conditions, and inherent atmosphere critical to the success of safety programs. It is manifested in the turnover/absenteeism of workers, morale, and teamwork.
- **Safety support climate:** it describes the observations, impressions, and beliefs of workers concerning the commitment of the management to HS.
- **Safety support activities:** this describes the available HS program practices such as training, communications, maintenance, inspection and emergency response.
- **Management involvement:** it describes management's leadership and commitment to HS. This can be perceived by workers through management's actions, words, and organizational procedures.
- **Supervisor participation:** it describes the role of supervisors in ensuring a safe and healthy workplace and their physical display of support to the workers.
- **Employee participation:** this describes the role of employees towards the successful implementation of established safety programs, and is manifested through personal compliance, responsibility, and engagement.

The results obtained from the survey have been presented according to the above-mentioned categories.

5.1. Organizational Safety Climate

The survey results for organizational safety climate are presented in Table 1, while the percentile scores are plotted in Figure 1. The findings of the survey showed that 87 respondents strongly agreed that it is common for employees to take part in identifying and eliminating worksite hazard as opposed to only five of the respondents who disagreed. The findings also indicated that 57 respondents were neutral in that there are frequent contact and communication between management. However, 85 respondents strongly agreed with the statement. Safety takes a back seat to production as agreed by 48 respondents, 98 respondents disagreed while 22 were neutral. The finding as well indicated that 63 respondents agreed that their supervisors maintain a high standard of job safety performance as opposed to 13 and 35 respondents who disagreed, or were neutral, respectively. The survey established that 86 respondents agreed that employees often get involved in developing or revising worksite safety and health practices as opposed to only 69 respondents who strongly disagreed, while 32 were neutral. One hundred and one (101) respondents agreed that detailed inspections of the facilities are carried out at regular and frequent intervals. Eighty-five (85) respondents were neutral in that the management's views on the importance of safety are seldom stressed in employee's communication, 44 respondents agreed with the statement. Forty-two (42) respondents strongly agreed while 96 respondents agreed that the safety meetings are held less often than they should be, as opposed to 25 respondents who disagreed. The study showed that good teamwork exists among department as agreed and strongly agreed, respectively by 91 and 82 respondents. Finally, 65 respondents agree, while 96 respondents strongly agree that management cares about employees' safety.

The percentile scores for all elements are also presented in Table 1. These scores have been illustrated in Figure 1, where it is shown that the rate of performance is high for employees' participation in identifying and eliminating worksite hazards, teamwork, and management's commitment to employee safety. The importance of safety being emphasized in management meetings and organizational communications needs to be improved.

Table 1.
Organizational safety climate

	Components	Level of Agreement					Percentile Score (%)	Rate of Performance
		SA	A	N	D	SD		
1.	It is common for employees to take part in identifying and eliminating worksite hazards.	87	96	8	5	0	87	High
2.	There are frequent contact and communication between employees and management.	85	46	57	7	1	81	High
3.	Safety takes a back seat to production.	24	48	22	98	4	59	Above Average
4.	Employees often get involved in developing or revising work-site safety and health practices.	69	86	32	8	1	82	High
5.	My supervisor maintains a high standard of job safety performance.	84	63	35	13	1	82	High
6.	Detailed inspections of the facilities are made at regular, frequent intervals.	60	101	26	7	2	81	High
7.	Management's views on the importance of safety are seldom stressed in employee communications.	31	44	85	34	2	67	Above Average
8.	Safety meetings are held less often than they should be.	42	96	28	25	5	75	Above Average
9.	Good teamwork exists among departments.	82	91	19	3	1	86	High
10.	Management shows that it cares about employee safety.	96	65	21	11	3	84	High

SA: Strongly Agree, A: Agree, N: Neutral, D: Disagree, SD: Strongly Disagree

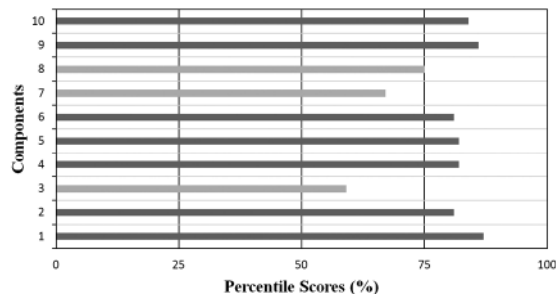


Figure 1.
Percentile scores for organizational safety climate components

5.2. Safety Support Climate

The results for the components of the safety support climate are presented in Table 2, while the percentile scores are presented in Figure 2. The survey results show that employees can protect themselves and their co-workers through their actions while being on the job as agreed and strongly agreed, respectively by 105 and 65 respondents. However, 8 respondents disagreed. Furthermore, 66 respondents agree that the supervisor's behavior was often against safe job procedures, while 87 respondents disagreed with the statement. Designated employees were well trained

in emergency practices including evacuation as agreed by 119 respondents, though 13 respondents disagreed, while 17 respondents were neutral. Seventy-eight (78) respondents agreed, while 83 respondents strongly agreed that the management had published a written policy that expresses their attitude about employees' safety. Sixty-nine (69) respondents strongly agreed to the investigation of near-miss accidents/incidents, while 68 respondents agreed. Thirteen (13) respondents, however, disagreed. Thirty-two (32) respondents strongly agree that the morale of the employees was poor, while 21 respondents agree, 31 respondents were, however, neutral, while 69 respondents disagreed. Forty-three (43) respondents were in strong disagreement. Seventy-seven (77) respondents agree that the management does no more than the law requires to keep employees safe, 56 respondents were neutral, while 33 respondents disagreed.

The survey findings also presented that employees understood the safety and health regulations relating to their job. Sixty-two (62) respondents agreed to this, while 106 respondents strongly agreed. However, 12 respondents disagreed. Seventy (70) respondents agree that their supervisors enforce safe

Table 2.
Safety support climate

Components	Level of Agreement					Percentile Score (%)	Rate of Performance
	SA	A	N	D	SD		
1. I can protect myself and co-workers through my actions while on the job.	65	105	17	8	1	83	High
2. My supervisor's behavior often goes against safe job procedures.	8	66	28	87	7	58	Above Average
3. Designated employees are well trained in emergency practices, including evacuation.	43	119	17	13	4	79	High
4. Management has published a written policy that expresses their attitude about employee safety.	83	78	24	9	2	84	High
5. Near miss accidents/incidents are thoroughly investigated.	69	68	45	13	1	79	High
6. Employee morale is poor.	32	21	31	69	43	53	Above Average
7. Management does no more than the law requires to keep employees safe.	15	77	56	33	15	64	Above Average
8. I understand the safety and health regulations relating to my job.	106	62	16	12	0	87	High
9. My supervisor enforces safe job procedures.	98	70	21	6	1	86	High
10. Standardized precautions are used by employees who deal with hazardous materials.	55	88	22	31	0	77	High

SA: Strongly Agree, A: Agree, N: Neutral, D: Disagree, SD: Strongly Disagree

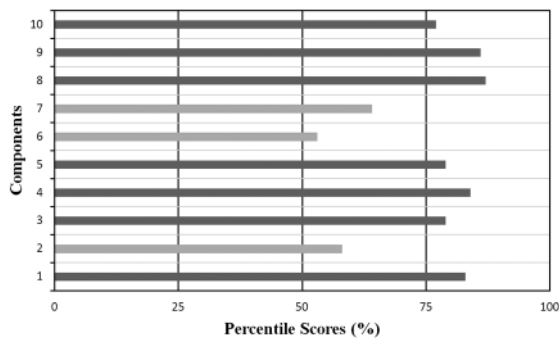


Figure 2.
Percentile scores for safety support climate components

job procedures, while 98 respondents strongly agree. Finally, standardized precautions were used by employees who deal with hazardous materials as agreed by 88 respondents, and strongly agreed by 55 respondents, though 22 respondents were neutral, while 31 respondents disagreed. The percentile scores plotted in Figure 2 for safety support climate components show that most of the components were rated as high performance including workers perception of personal protection on the job, availability of a written safety policy, accident investigations, understanding of safety regulations, and supervisor's

enforcement of safe job procedures. Potential issues to be concerned with include supervisors' actions going against established safety rules and regulations, and management not making extra efforts to ensure the HS of workers.

5.3. Safety Support Activities

The results for the components of safety support activities are presented in Table 3, while the percentile scores are presented in Figure 3. The survey findings demonstrated that management had provided adequate staff to manage and support its safety programs, 114 respondents agree to this, while 52 respondents are in strong agreement. Twenty-four (24) respondents are however neutral, while 6 respondents are in disagreement. Twenty-nine (29) respondents strongly agreed that awards and recognition programs used in the company are not good at promoting safe employees' behaviors, 33 respondents also agreed to this. While 39 respondents were neutral, and 93 respondents disagreed. Twenty-seven (27) respondents are in strong agreement with job performance standards being higher for production as compared to safety. Forty-one (41) respondents also agree to this, while 68 respondents were neutral,

Table 3.
Safety support activities

	Components	Level of Agreement					Percentile Score (%)	Rate of Performance
		SA	A	N	D	SD		
1.	Management has provided adequate staff to manage and support its safety program.	52	114	24	6	0	82	High
2.	Awards and recognition programs used in this company are not good for promoting safe employee behavior.	29	33	39	93	2	59	Above Average
3.	Job performance standards are higher for production than for safety.	27	41	68	60	0	64	Above Average
4.	My supervisor understands the job safety problems I face.	61	106	20	9	0	82	High
5.	Employees are familiar with and follow regular lockout/tag out procedures.	38	80	65	11	2	74	Above Average
6.	Safety training is part of every new employee's orientation.	80	93	16	4	3	85	High
7.	I believe management is sincere in its efforts to ensure employee safety.	80	78	35	2	1	84	High
8.	My supervisor seldom acts on employee safety suggestions.	105	53	21	13	4	85	High
9.	Emergency response procedures are almost never tested to ensure that they are working.	33	25	45	75	18	58	Above Average
10.	The work of the employee and management safety committee improves safety conditions.	69	89	28	8	2	82	High

SA: Strongly Agree, A: Agree, N: Neutral, D: Disagree, SD: Strongly Disagree

and 60 respondents disagreed. Sixty-one (61) respondents are in strong agreement with the fact that their supervisors understood the job safety problems the workers face. Twenty (20) respondents were neutral, while 9 respondents disagreed. Eighty (80) respondents agreed that employees are familiar with and follow regular lockouts/tag out procedures, while 65 respondents were neutral. Ninety-three (93) respondents agreed that safety training is part of every new employee's orientation, while 80 respondents were in strong agreement, and 16 respondents were neutral. Management's sincerity in ensuring employees' safety was strongly agreed to by 80 respondents, while 78 respondents agreed, 35 respondents remained neutral.

The survey also highlighted that supervisors seldom acted on employees' safety suggestions. One hundred and five (105) respondents strongly agreed with this component, while 53 respondents were in agreement, and 21 respondents remained neutral. Thirty-three (33) respondents were in strong agreement that emergency response procedures were almost never tested to ensure that they were working, 25 respondents agreed, while 45 respondents were neutral, and 75 respondents disagreed.

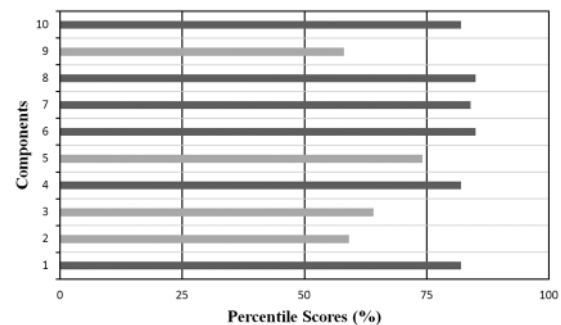


Figure 3.
Percentile scores for safety support activities components

Eighty-nine (89) respondents agreed with the fact that the work of employees/management safety committee improved safety conditions, 28 respondents were neutral, while 8 respondents disagreed. Figure 3 is an illustration of the percentile scores for the components of the safety support activities category. Highly rated components include safety training during orientation of new employees and management's sincerity in ensuring the HS of workers. The results suggest that the testing of emergency response procedures and knowledge of lockout and tag out procedures seems to be largely ignored.

Table 4.
Management involvement

	Components	Level of Agreement					Percentile Score (%)	Rate of Performance
		SA	A	N	D	SD		
1.	Management sets a positive safety example through their words and actions.	64	92	28	9	3	81	High
2.	My supervisor has successfully fit safety into the production process.	106	52	24	13	1	85	High
3.	The system of preventive maintenance for facilities, tools, and machinery operates poorly.	18	61	38	78	1	62	Above Average
4.	Management regularly participates in safety program activities.	71	86	22	15	2	81	High
5.	The safety coordinator has high status in this organization.	74	68	38	16	0	80	High
6.	Hazards that are not fixed right away by supervisors are often ignored.	9	35	77	33	42	53	Above Average
7.	Employees take part when accident or incident investigations occur.	27	60	63	38	8	66	Above Average
8.	The training provided by my supervisor helps me to do my job safely.	38	105	25	18	10	75	Above Average
9.	Medical facilities are sufficient for treating the injuries that occur.	54	101	16	14	11	78	High
10.	It is well known that management ignores a person's safety performance when determining raises and promotions.	75	70	33	16	2	80	High

SA: Strongly Agree, A: Agree, N: Neutral, D: Disagree, SD: Strongly Disagree

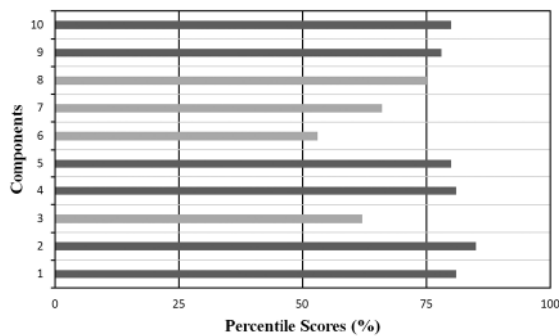


Figure 4.
Percentile scores for management involvement components

5.4. Management Involvement

The survey results for the components of management involvement are presented in Table 4, while the percentile scores are plotted in Figure 4. The survey showed that management sets a positive safety example through their words and actions. Ninety-two (92) respondents agree with this component, 28 respondents are neutral, while 9 respondents disagreed. One hundred and six (106) respondents were in strong agreement with safety being successfully synchronized with the production process, while 52 respondents agreed, 24 respondents, however, remained neutral, while 13 respondents disagreed. Sixty-one (61) respondents agreed with the poor performance of preventive maintenance strategies for tools, machinery, and facilities, 38 respondents were neutral, while 78 respondents disagreed. Eighty-six (86) respondents agreed that the management regularly participates in safety program activities, 71 respondents were in strong agreement, 22 respondents remained neutral, while 15 respondents disagreed. Sixty-eight (68) respondents agree that the safety coordinator has a high status in the organization, 38 respondents remained neutral, while 16 respondents disagreed. Thirty-five (35) respondents

agreed that hazards are not fixed right away by the supervisors, and are often ignored, while 77 respondents remained neutral, and 33 respondents disagreed. Forty-two (42) respondents were in strong disagreement. Sixty (60) respondents agreed with the existence of employee participation in accident/incident investigation, 63 respondents were neutral, while 38 respondents disagreed.

The survey findings also show that the training provided by the supervisors helped the employees in performing their jobs safely. Thirty-eight (38) respondents were in strong agreement, while 105 respondents agreed, 25 respondents remained neutral, while 18 respondents disagreed. On the sufficiency of medical facilities in treating the injuries that occur, 101 respondents agreed, 16 respondents were neutral, while 14 respondents disagreed, and 54 respondents were in strong agreement. Seventy (70) respondents agreed with the fact that management ignores employees' safety performance when determining raises and promotions, 75 respondents were in strong agreement, 33 respondents remained neutral, while 16 respondents were in disagreement. An illustration of the percentile scores for the components of management involvement category is presented in Figure 4. Highly rated components include the supervisor's successful synchronization of safety into the production process, management's participation in safety activities, and sufficient medical facilities. Despite that, the performance of preventive maintenance, the lack of immediate corrective actions for hazards are identified, and employee's participation in accident investigation are potential issues that may need to be addressed.

5.5. Employees and Supervisors Participation

The findings of the survey for the components of employees and supervisors participation are presented in Table 5, while the percentile scores are plotted in Figure 5. The availability of the safety coordinator to provide advice and assistance to employees was agreed to by 96 respondents, 63 respondents were in strong agreement, while 24 respondents remained neutral, and 11 respondents were in disagreement. Ninety-five (95) respondents were in strong agreement that the organization had a stable workforce, 52 respondents agreed, 34 respondents were neutral, while 9 respondents disagreed. Twenty-seven (27) respondents were in strong agreement that employees were afraid to report safety problems to their supervisors, 36 respondents agreed, while 66 respondents were neutral, and 50 respondents disagreed.

The findings also show that supervisors always investigate lost workday cases. Strong agreement was expressed by 42 respondents, while 114 respondents were also in agreement. Though, 15 respondents remained neutral, while 24 respondents were in disagreement. Fifty-five (55) respondents were in strong agreement that the ventilation, lighting, noise and other environmental conditions are kept at good levels. Eighty-eight (88) respondents also agreed with this component, while 41 respondents were neutral, and 11 respondents disagreed. The lack of use of PPE was judged to be strongly agreed by 9 respondents, while 48 respondents were also in agreement. Twenty-one (21) respondents were neutral, while 74 respondents were in disagreement, and 44 respondents were in strong disagreement. Sixty-nine (69) respondents were in agreement with job stress problems for coworkers, though 60 respondents were neutral, and 37 respondents were in disagreement.

The results of the survey also showed that 101 respondents were in strong agreement that management insists that supervisors think about safety when doing their jobs. Sixty (60) respondents agreed, while 20 respondents were neutral, and 11 respondents disagreed. Fifty-five (55) respondents were also in strong agreement that management annually sets safety goals for which all employees are held accountable, 88 respondents agreed, 30 respondents were neutral, while 19 respondents disagreed. Sixty-nine (69) respondents were in strong agreement that employees rarely take part in the development of safety requirements for their job. Seventy-four (74) respondents agreed, 41 respondents were neutral, while 12 respondents disagreed. Furthermore, an illustration of the percentile scores for the components of employees and supervisors' participation category is presented in Figure 5. Highly rated components include the management setting annual goals for which the employees are accountable, and employees are rarely taking part in the development of safety requirements for their jobs. This shows a lack of employees' engagement in the formulation of safety rules and regulations. Other potential issues may include the instability of the workforce, lack of investigation of lost workdays, lack of use of PPE, and inherent stress problems from coworkers.

Table 5.
Employees and supervisors participation

Components	Level of Agreement					Percentile Score (%)	Rate of Performance
	SA	A	N	D	SD		
1. The safety coordinator is readily available to provide advice and assistance.	63	96	24	11	2	81	High
2. This organization has a stable workforce.	95	52	34	9	6	83	High
3. Employees are afraid to report safety problems to their supervisors.	27	36	66	50	17	61	Above Average
4. My supervisor always investigates lost workday cases.	42	114	15	24	1	78	High
5. Ventilation, lighting, noise, and other environmental conditions are kept at a good level.	55	88	41	11	1	79	High
6. Many employees do not use the PPE necessary to do their jobs safely.	9	48	21	74	44	50	Above Average
7. There are job stress problems from my coworkers.	19	69	60	37	11	65	Above Average
8. Management insists that supervisors think about safety when doing their jobs.	101	60	20	11	4	85	High
9. Management annually sets safety goals for which all employees are held accountable.	55	88	30	19	4	77	High
10. Employees rarely take part in the development of safety requirements for their jobs.	69	74	41	12	0	80	High

SA: Strongly Agree, A: Agree, N: Neutral, D: Disagree, SD: Strongly Disagree

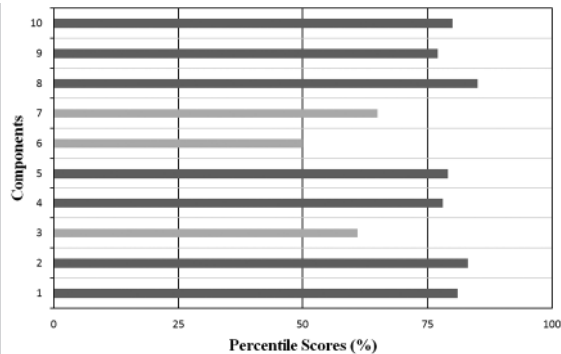


Figure 5.
Percentile scores for employees and supervisors participation

6. SUMMARY AND CONCLUSIONS

This paper presents a survey of the perception of construction workers to 50 HS components organized into 5 categories. A questionnaire survey tool available through the NSC has been used in this study. One hundred and ninety-six (196) mid-level and low-level workers in 22 construction sites in the Eastern Province of Saudi Arabia have been surveyed. The percentile scores have been calculated based on the means of the levels of agreement, and a performance rating has been determined according to the barometric style of the NSC. The percentile scores for the five categories are also presented in Figure 6. These are organizational safety climate, safety support climate, safety support activities, management involvement, employees and supervisors participation. The illustration in Figure 6 shows that management involvement, employee and supervisor participation are the lowest performing categories, while safety support climate, safety support activities and organization climate are the highest performing categories. Furthermore, it can be concluded from the findings that there is a need to engage employees in developing safety programs, and also strengthening communicating with employees and top management. The

motivation of employees through awards, and recognition of safety performance needs to be considered. Preventive maintenance systems for facilities, tools, and machinery should be established. Additionally, employees should be provided with training on emergency procedures, as well as incident/accident investigation techniques. This can be achieved through the enforcement of standardized safety procedures that are related to handling hazardous materials.

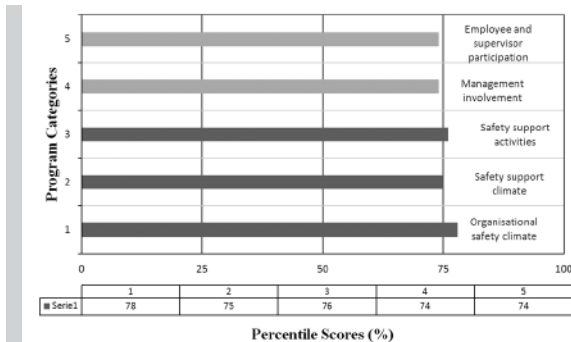


Figure 6.
Percentile scores by program category

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