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TO REVIEW SAFETY CLIMATE FACTORS EFFECTING BUILDING CONSTRUCTION INDUSTRY

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ABSTRACT

All over the world, construction industry plays very essential role in the economic condition of the country. Beside this, in construction industry , during construction of buildings at different level large number of deaths and injuries occurred as compared to other industries are considered. As a result, on construction sites maintaining safety of adequate level becomes more important, and among the construction industry personnel through raising of safety climate it can be promoted. The main aim of this study is to find those factors which influencing the construction industry through safety climate. The data for this research study was collected form literature review .For the process of key factors determination, in this study journals included on the Web of Science platform were only considered. Based on literature review results, 18 numbers of factors were found and classified in two different groups such as management related and worker related safety climate factors. Based on analysis and results it was concluded the management related team in any organization had the greatest effect on safety climate. Thus, as a result for safety measure ,this group is considered as accountable.

keywords: Construction industry, Factors, Safety climate, Web of Science, Literature Review

I. INTRODUCTION:

Through worldwide, construction industry plays very essential role in the economy of nations. While it is considered one of the key economic pillars in most of the countries [1]. As production increases constantly with booming of the construction industry booms which also causes to increase the accidents and deaths rates continuously [2]. Therefore, a positive correlational relationship demonstrated between construction projects and safety risks and hazards which is considered the most dangerous industries worldwide [2,3]. Thus, the main practices which promoted to prevent the industry-related dangers are by law, by people, by the related accidents economic cost, and by administrative surveillance [3]. For the survival and wellbeing of construction industry workers the important elements are i.e. existence of safety practices, procedures, and guidelines. Furthermore, health and safety principles development from an organizational perspective is an important subject of international concern [4].

Thus, based on safety prioritization verification was done through implementation on construction sites by both regulating authorities and organizations. Employees at site of construction plays significant role when other and their own safety comes. The employee's awareness regarding safety can be improved and by positive safety climate their unsafe actions can be minimized [5]. In an organization management, supervisors and co-workers were linked the Safety climate to workers' perceptions of safety rules, procedures, and practices [6]. Thus, all construction organization stakeholders must have a unified safety goal. In an organization, due to importance of safety a lot of attention has been focused on safety climate [7]. Safety climates facilitate the recognition problems that played important role in order to improve safety because it is a practical diagnostic tool [3]. Employers of any company at construction site encouraged safety climate measurement before occurring any type of accident to identify and solve the problems of organization and management [8].

As Safety performance level can be predicted by safety climate thus excellent relationship found between safety climate and safety performance [10, 11]. In order to improve the safety performance of organization in two ways i.e. through training by improving employer's psychological health and with progressive safety climate encouragement [9]. Securing reliable critical features that cover the safety climate is vibrant in enabling the assessment of safety climate, which supports the recognition of effective methods to improve safety performance [5]. Finally, in a company levels of high safety climate could result in staff distinguishing. Instead of increased production pressure they maintained good safety practices and was encouraged, thus, they will behave safely [12].

II. LITERATURE REVIEW:

In the construction industry throughout the world to know the factor which influences the safety climate, the literature review conducted in various countries are essential to review. Generally, research on there are limited research on safety climate and psychological strains on performance of safety [13]. In the literature of safety climate dimensions from 2014 to present a research gap exists, [14]. However, on safety climate review of large number of research studies were conducted in which importance factors effected on safety climate was addressed by majority of researchers. For example, in the Chinese construction industry during research study that examined safety, it was concluded that safety climate most effective factors included rules and regulation of safety along with safety training and promotions provision [5].

During study conducted in New Zealand , in this research the main and individual safety climate factors methods were examined to effect safety behavior construction workers. More ever, there were major relationship between management safety commitment, social support and production pressure was found after results were obtained. As an important factor, all safety aspects were affected directly by the production pressure, while safety behavior was affected by the social support. as was the influence of social support on safety behavior (although the safety participation effect was excluded and was found to be insignificant). In addition, with this, it was also found that safety participation effected directly by factors including safety knowledge and motivation[15]. Another research study was conducted in Ontario, Canada, on specific part of safety climate , thus performance of safety and psychological stress of construction labors was affected due to safety climate [9]. Similarly , a research study was conducted in South Africa for investigation the features of safety climate that exist between construction personnel and its effect on safety performance [16]. Beside this relationship are the most significant factor contributing mainly to safety performance through satisfactory procedures, training, and constructive communication was also observed [16].

Furthermore, a research study that examined the variances in safety climate perceptions between job positions in North America revealed that differences exist according to job position . So, it was concluded from results that project managers were at top in score of safety climate, followed by superintendents, then technical support staff and supervisors, and lastly labor [17]. Moreover, for site of construction, safety climate was implemented as tool of investigation to assess and enhancing safety climate was suggested in a research study conducted in Hong Kong .The way in which safety on construction site was evaluated by measuring safety climate was found, and thus potential safety system failures warned by management[18]. In construction industry ethnic minorities perceptions were also targeted during study conducted in Hong Kong along with identifying three safety climate factors, such as

1) Resources of safety, management commitment, and communication.
2) Staff's participation and worker college influence.
3) safety rules, procedures, and risks views.

More ever, this study also illustrated variation in safety climate perceptions of workers, depending on citizenship, marital status, dependents, and consumption of alcohol [11]. Also, the ensuing part of the research revealed that safety climate is clearly linked to

safety behaviors i.e. safety involvement and safety compliance . Furthermore, it was also observed that safety behaviors were poorly linked to "close calls" and for ethnic minority construction labors injuries. Therefore, more positive safety climate can be improved by safety compliance and safety involvement of ethnic minority construction laborer [19].

The Colombian construction industry demonstrated that better scores of safety climates were observed for managers instead of supervisors and labors through a research study was conducted [20]. Country to country due to vast ranges of problems, safety climate can vary as concluded from the results of previous safety climate studies. Additionally, to know the safety performance effecting factors conduction a research study is important along with examining the safety climate effects on construction project safety [18]. Hence, the main focus of this research is to investigate safety climate factors effecting on the construction industry and to know them in a holistic matter.

III. RESEARCH METHODOLOGY

The main data source of this research based on literature review forms. The search for literature was carried out through the Saudi digital library (SDL), which provided access to many of the reputational academic databases. In the safety climate factors identification process all journal articles included clear representation of safety climate factors and was included in the Web of Science platform were considered. To investigate previous conducted research having relation with this topic is the main aim of literature review process. In addition, this study also focused on the research work conducted by other researchers of various countries to determine the safety climate factors. In this study the main question of investigation was " Factors effecting of safety climate on building construction industry". The answer to this research question provided the main contribution to knowledge in the form of a comprehensive list of safety climate factors in the construction industry collected from various high-quality research studies.

IV. RESULT ANALYSIS AND DISCUSSION:

For determination of factors effecting safety climate in the construction industry, 10 numbers of journal were referenced with 28 articles in total (Table 1). For this process, the included journals articles from Web of Science Plate form was taken as already mentioned in research methodology section. To ensure factors effecting safety climate in construction industry sound production inclusive list was prepared in this study. In this study mainly, two numbers of journals because of its relevancy with topic i.e. Safety Science, and Journal of Construction Engineering and Management were selected. In the process of factors identification large numbers of articles were contained reference from these two journals.

Table 1. Selected journal Articles Distribution

Journal	Number of sources
Safety Science *(Web of Science)*	9
Journal of Construction Engineering and Management *(Web of Science)*	7
Accident Analysis and Prevention *(Web of Science)*	3
International Journal of environmental Research and Public Health *(Web of Science)*	2
Journal of Safety research *(Web of Science)*	2
American Journal of Industrial Medicine *(Web of Science)*	1
Construction Economics and Building *(Web of Science)*	1
Safety *(Web of Science)*	1
Acta Structilia (Web of Science)	1
China Information *(Web of Science)*	1
Total	**28**

In construction industry, as a result of literature review 18 numbers of safety climate factors were identified which were shown in table 2.

Table 2. Factors effecting safety climates in Construction Industries

Safety climate factor	Source	Number of Sources
Management commitment to safety	[1, 4, 5, 7, 8, 11, 14, 15, 18,19, 21-30]	20
Safety rules, and procedures	[5, 7, 8, 11, 14, 18, 21-25, 27, 29-31]	15
Communication	[1-3, 11, 13, 14, 16, 19, 21,22, 24, 28, 29, 31]	14
Supervision and guidance	[2, 5, 8, 14, 17, 21-24, 26, 27, 29, 30]	13
Education and training	[3-5, 9, 14-16, 22-24, 30]	11
Workers' involvement	[7, 14, 15, 18, 19, 21, 23-26, 29]	11
Worker's college influence	[1, 2, 5, 11, 19, 23, 25, 26, 31]	9
Work pressure and intensity	[2, 8, 14, 15, 21, 29, 31]	7
Worker's attitude toward health and safety	[1, 5, 7, 13, 19, 25, 26]	7
Safety resources	[11, 19, 23, 28, 30, 31]	6
Supportive environment	[1, 15, 21, 26, 29, 30]	6
Appraisal of risk and hazard	[14, 21, 23, 28, 29]	5
Competence	[1, 21, 23, 29]	4
Safety value and reward system	[2, 27]	2
Management safety justice	[1, 28]	2
Workers' commitment to safety	[15, 28]	2
Adequacy of procedures	[16, 31]	2
Social security and health in-surance	[2]	1

Various safety climate factors set were identified by the various researchers. These variations were contributed by many variables such as culture, workers background, and safety regulations and policies of a country. Similar factors of safety climate were identified during some studies with different names i.e. safety directions against safety roles, and procedures. There for , for this research study, all safety climate factors were included in a single list after collection and refining. From research, it was observed that two type of groups of safety climate factors were identified i.e.

1) Safety climate factors related to management
2) safety climate factors related to workers.

Safety climate factors related to management were directly linked to the organization's management team. In this way the team sees that safety has a direct effect on other staffs with respect to safety perceptions. In Reality, Safety climate factors related to workers is less as compared to management shown by majority of literature sources. From the literature safety climate factors related to management were determined which included such as

1) Management commitment to safety,
2) Rules, and procedures of safety
3) Supervision and guidance,
4) Communication,

5) Education and training,
6) Work pressure and intensity,
7) Safety resources,
8) Supportive environment,
9) Safety value and reward system,
10) Management safety justice
11) Adequacy of procedures,
12) Social security and health insurance,
13) Workers' involvement.

Thus, out of 178 safety climate factors 13 factors were related to management team of organization while remaining were related to workers safety management factors . The remaining five factors which were related to workers included

1) Effects on Worker's college
2) Attitude of workers toward health and safety
3) Risk and hazard Appraisal
4) Competence,
5) Workers' commitment to safety.

So, this clearly showed that management team of organization with respect to safety played essential role. All safety climate factors related to management team of organization were mentioned in top five factors. In more than 10 journal articles least popular of these factors was cited. One of factor was found in 20 various resources i.e. management commitment to safety. Furthermore, the workers' commitment to safety management was found less in literature as compared to commitment to safety factor. More ever, the topmost factor of worker's related safety management factor i.e. Effects on Worker's college, were found in 9 journal articles. This showed that effects on worker college importance and that positive or negative safety actions transferred from their colleges to workers. It was clearly shown form table 2 that effect of safety climate on workers distributed across three effecting level as shown in fig 1.

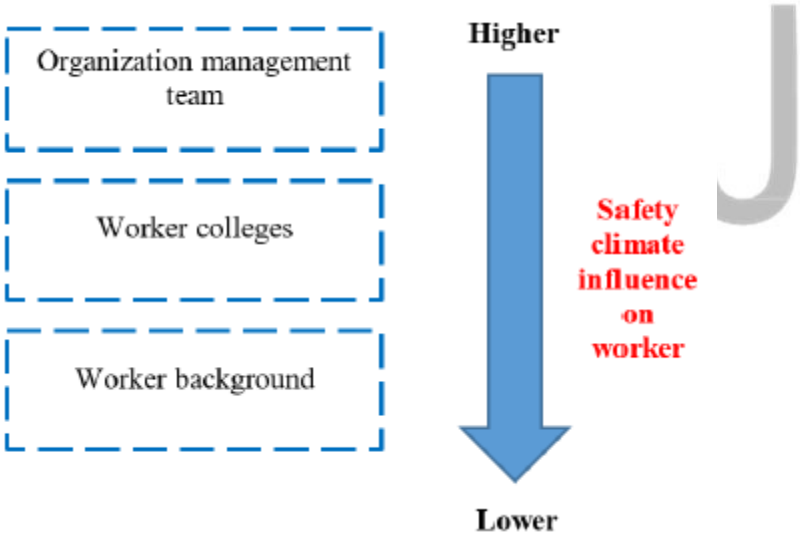

Fig.1 influencing level on Safety climate

The above figure.1 clearly shown the effecting level on safety climate form high to lower. The first (and highest) influence level comes from the organization's management team and followed by the effect of the workers on their colleges.

V. CONCLUSION

In this article total of 18 factors were identified which affected the safety climate in industry of construction. For keeping the site safe with respect to safety levels of performance, safety climate played very essential and prior role in management team of any company. Management team represent top of pyramid of power and their decisions which affected the staff and output of work. Moreover, it was also concluded that effect on colleges by worker should be keep in mind with proper attention with respect to safety positive and negative perceptions. Lastly, workers at construction site must stimulate in their routine activities of job to adopt good practices of safety climate along with its promotion in the construction industry. It was also noted that in the industry of construction safety climate affecting factors rank and groups will be explored for conducting research in future. In addition, for future research purpose questionnaire will be used by distributing in field professionals and workers. More ever , excellent results will be obtained for construction industry on identifying safety climate factors affected by comparisons of different industries professionals

and their perspective. A more holistic view on safety climate will be provided in the construction industry and add to the existing research available.

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