Scientific Research Publishing

Open Journal of Safety Science and Technology, 2026, 16(3), 138-159
https://www.scirp.org/journal/ojsst
ISSN Online: 2162-6006
ISSN Print: 2162-5999

Assessing Electrical-Related Fire Risks at RMG Factories in Savar, Bangladesh: A Step towards Sustainable Safety and Development

Md. Torikul Islam[1], Md. Ramjan Ali[2], Nabil Mahmud[3], Md. Mostafizur Rahman[2], Md. Sohel Sheikh[4]

[1]Safety Engineering Department, Cosmopolitan Industries Pvt Ltd., Dhaka, Bangladesh
[2]Remediation Programme Department (RPD), RMG Sustainability Council (RSC), Dhaka, Bangladesh
[3]AGM (Safety Engineering), EPIC Group, Dhaka, Bangladesh
[4]Safety Engineering Department, Akij Glass Industries Ltd., Dhaka, Bangladesh
Email: mdtorikulislam983@gmail.com, contact@ramjan.me, enabilmahmud@gmail.com, mostafizur.bup.research@gmail.com, sohel.hes@gmail.com

How to cite this paper: Islam, T., Ali, R., Nabil, M., Rahman, M. and Sohel, S. (2026) Assessing Electrical-Related Fire Risks at RMG Factories in Savar, Bangladesh: A Step towards Sustainable Safety and Development. *Open Journal of Safety Science and Technology*, **16**, 138-159.
https://doi.org/10.4236/ojsst.2026.163009

Received: June 15, 2026
Accepted: August 2, 2026
Published: August 5, 2026

Abstract

The issue of electrical fire hazards is a major safety risk within the Ready-Made Garment (RMG) sector, especially in areas that have a high rate of industrialization, like Savar, Bangladesh. Optimal electrical safety management is necessary in providing protection against the workers, ensuring the flow of production, and guaranteeing sustainable growth of the industry. This paper will evaluate the electrical-related fire risk in RMG factories by determining how leading safety management factors are related to perceived fire risk. In particular, the study examines the functions of electrical hazard identification, practices in maintenance and inspection, training and safety compliance, emergency preparedness and responding, and management commitment to safety and development. The quantitative research method was used based on a structured questionnaire survey that was carried out on the employees who work in the RMG factories in Savar. There were 300 valid responses, which had been collected and analyzed using RStudio statistical software. To measure the relationships among the study variables, descriptive statistics, analysis of reliability, correlation analysis, and multiple regression techniques were used. The reliability test yielded a high internal consistency advantage of the constructs, with the Cronbach alpha values showing a range of 0.850 to 0.937. The regression findings reveal that electrical hazard identification has a strong impact (positive) in generating the perceived fire risk, whereas maintenance and inspection practices have the strongest negative impact, contrary to the perceived fire risk. Electrical fire risk mitigation in the factories, however, is also involved in training and safety compliance, emergency preparedness, and management commitment. Such results underscore the use of preventive maintenance systems, training of workers on safety issues, and active safety management to reduce electrical fire hazards. The paper presents practical information that can be used by managers in the factories and policymakers to enhance the electrical safety management in the workplace, as well as the workplace safety of the RMG industry in Bangladesh.

Keywords

Electrical Fire Risk, RMG Industry, Savar Bangladesh, Workplace Safety, Electrical Hazard Identification, Maintenance and Inspection, Safety Training and Compliance, Emergency Preparedness, Management Commitment, Fire Risk Mitigation, Occupational Safety, Industrial Safety Management, Sustainable Development

1. Introduction

Ready-Made Garment (RMG) is among the most significant branches of the Bangladesh economy that provides a major portion of employment opportunities, export volume, and industrial development in the country [1]. The RMG sector has, over the decades, made Bangladesh one of the main exporters of apparel in the world, with millions of workers, affecting the lives of a significant portion of the populace [2]. Nevertheless, the fast development of industries has also brought numerous occupational safety issues, especially connected with electrical infrastructure, fire risks, and safety management in the workplace [3]. These risks 3.4. Some Common Mistakes include the presence of electrical-related fires, which are one of the most significant dangers to the safety of workers and the sustainability of the industry in garment manufacturing plants.

Most garment factories have electrical systems as an indispensable element of the design that serve to power the machinery, generate the lighting, ventilation systems, and other production-related units [4]. Nevertheless, electrical wiring structures, circuit overloading, malfunctioning equipment, and incompetent maintenance can considerably make electrical fires more likely to occur [5]. Under industrial settings that bring up large ratios of workers who work in cramped production areas, these dangers may result in serious impacts, such as loss of lives, damage to properties, production disturbances, and industry image issues [6]. Thus, it is not only important to ensure that there is a proper electrical safety management to not only protect the people involved in the work but also to make the industrial processes sustainable.

In Bangladesh, there has been a historical tendency of several fire incidents in the garment sector, highlighting the need to enhance the workplace safety systems. Most of such cases have been linked to electrical malfunctions, lack of proper safety checks, and emergency preparedness [7]. Consequently, the problem of the necessity of enhanced fire safety laws, electric tests, and safety management measures has become more intensely discussed by government agencies, international organizations, and industry stakeholders [8]. Such attempts notwithstanding, electrical hazards are still a common problem in most factories because of various reasons, including the old infrastructure, increased pressure of production, and a weak understanding of safety by employees.

In this respect, the determinants of electrical fire risks in garment factories and the ways of creating an effective prevention plan need to be comprehended [9]. The nature of physical hazards is not the only aspect of fire risk, since it is also impacted by organizational policies like maintenance management, staff safety training, emergency readiness, and corporate safety commitment [10]. As an illustration, routine electrical test checks and proactive maintenance would greatly minimize the chances of fire outbreak by detecting any possible faults and preventing them from becoming severe dangers prior to happening [11]. Safety training programs, on a similar note, can make the workers aware of the dangers of electricity and how to behave in case of an emergency.

In addition, good emergency preparedness strategies, such as fire alarms, emergency evacuation, and emergency response teams, are significant in reducing the impacts of fire incidents [12]. Safety in the management commitment is also critical because organizational leadership decides on the distribution of funds to be used for safety initiatives, implementation of policies related to safety, and advancement of safe working environment [13]. Thus, a more detailed measurement of the integrative effects of these factors can help to gain a picture of electrical fire hazard in industries.

One of the most important garment manufacturing centres in Bangladesh is the industrial sector of the city of Savar, which is situated close to Dhaka [14]. There are many RMG factories in this area, which hire thousands of individuals and make a great contribution to the national economy [15]. But the over-saturation of production sites also raises the possibility of encountering any sort of manufacturing safety hazards, such as electrical fire hazards. Even though the Savar industrial zone is economically significant, there has been a paucity of empirical research studies investigating electrical fire risk factors in this particular scenario [16].

The paper will fill this gap by measuring the risk of electrical-related fires in the RMG factories of Savar, Bangladesh [17]. Namely, the study examines the effect of electrical hazard recognition, maintenance and inspection, training and adherence to best safety standards, emergency management, and management devotion to safety on perceived electrical fire risk in garment manufacturing companies [18]. Quantitative surveys and statistical modeling of these factors are used in the study to give evidence-based information on the most important determinants of the fire safety situation in the RMG industry.

The results of this research paper will have an impact on scholarly literature and practice in industries [19]. In the scholarly sense, the study contributes to the current body of knowledge on occupational safety and industrial risk management by investigating the subject of electrical fire risk, considering the manufacturing environment of developing countries [20]. Practically, the findings can help managers of the factories, policies, and even safety officers to know the areas that are important so that they can enhance safety and minimize risks associated with fire.

Finally, the management of electrical safety needs to be enhanced to stimulate the long-term sustainability of the RMG industry [21]. Garment factories can mostly decrease the risk of electrical fire occurrence by enhancing the efficiency of hazard detection systems, preventative maintenance procedures, employee training, and commitment to safety by the organization [22]. Thus, the current research presents significant information on the safety issues encountered by clothing manufacturers in Savar and the suggestions regarding the ways to improve electrical fire safety in the industry.

2. Literature Review

Fire safety management is currently a significant concern in the industrial sectors and in the case of labor-intensive manufacturing industries, especially in the Ready-Made Garment (RMG) industry [23]. Electrical-related fires are considered one of the most typical types of industrial accidents, which usually happen due to faulty wiring, overloaded electric circuits, improper maintenance, or improperly designed electrical infrastructure [24]. Other previous research has indicated that a considerable percentage of the industrial fires are caused by electrical failures, particularly in the developing world, where fast industrialization will most likely leave the safety controls and infrastructure upgrading behind [25].

Electrical hazard identification is one of the crucial predictors of fire risk [26]. Hazard identification entails the common identification of unsafe electrical conditions like exposed wiring, damaged insulation, overloaded wiring, and improper electrical installation. Investigations into the management of industrial safety highlight the importance of timely identification of electrical hazards in order to avert the occurrence of fire incidents [27]. Good systems of hazard identification enable an organization to know the possible risks before they develop into major accidents.

Maintenance and inspection practices are also another critical aspect that determines fire safety. Electrical equipment preventive maintenance is an important factor in mitigating the risk of fire in an industrial setting [28]. Periodic testing aids in the identification of faults in electric systems, such as the decay of wiring, bad circuit breakers, and heating of electrical elements [29]. Studies have always revealed that organizations that have organized maintenance programs have very minimal electrical failures and fire incidents.

Besides technical safety, training and safety compliance are considered to be the key elements when it comes to efficient fire risk management [30]. Staff operating at industrial plants should be informed about the techniques related to electrical safety and know how to recognize possible dangers at their workplace [31]. The safety training programs would enhance the knowledge of workers in terms of protecting against the danger of electricity, and also raise the level of knowledge of workers in responding favorably in cases of emergencies. The capacity to act in compliance with the laid-out safety procedures also enhances the efficiency of organizational safety mechanisms.

The emergency preparedness and response systems are also essential in reducing the effects of the fire incident [32]. Fire drills, evacuation, alarm, and provision of fire-fighting equipment are considered emergency preparedness [33]. The investigation into industrial disaster management suggests that an organization that has highly developed emergency response systems is in a position to manage the consequences of fire accidents better and ensure that workers are safe [34].

Lastly, the issue of management commitment to safety is widely accepted as a key variable to have a significant role in the performance of workplace safety [35]. Organizational leadership defines the rate at which the safety policies were enacted and enshrined in the workplace [18]. When the management focuses on safety and invests enough resources in safety programs, the workplace accidents are low, and the safety culture is favorable.

Despite the current literature review of the different facets of industrial fire safety, scant literature exists regarding the management of electrical fire risks in the RMG segment in Bangladesh, specifically in the large industrial enterprises like Savar [36]. Accordingly, the proposed research will investigate the effects of identifying hazards, observing maintenance, training adherence, emergency preparedness, and management commitment on perceived electrical fire hazards in garment manufacturing enterprises [37].

3. Conceptual Framework

The conceptual framework is shown in **Figure 1**, which shows the correlation between the major safety management aspects and the perceived electrical fire risk in the RMG factories in Savar, Bangladesh. Electrical Hazard Identification (EHI), Maintenance and Inspection Practices (MIP), Training and Safety Compliance (TSC), Emergency Preparedness and Response (EPR), and Management Commitment to Safety and Development (MCSD) are considered the independent variables needed to affect Perceived Electrical Fire Risk (PEFR), a dependent variable.

The model supposes that there are effective safety measures like frequent electrical inspection and safety training of the employees, and when there is proper commitment of the management, the risk of fire caused by electricity can be diminished. On the other hand, the existence of electrical hazards could also enhance the image of fire risk in the workplace. The framework gives an organization a methodological means to analyze the relationship between these variables in order to study the impact that organizational safety mechanisms have on electrical fire risks in garment factories.

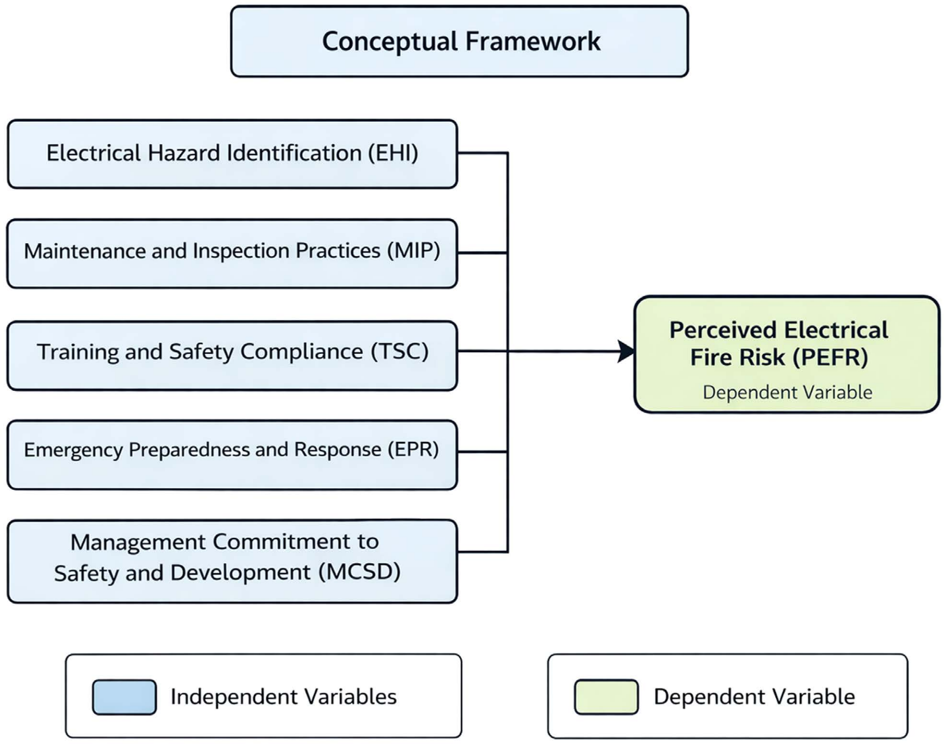

Figure 1. Conceptual framework.

4. Research Methodology

4.1. Research Design

The research is quantitative in nature and will estimate the risks associated with electrical fires in the RMG factories in Savar, Bangladesh. Primary data was collected using a structured questionnaire survey among the employees who were carrying out various duties in the various departments of the garment manufacturing facilities. The choice of quantitative methods was justified by the fact that statistical analysis is possible using them to determine relationships among the factors of safety management and perceived fire risk.

4.2. Study Area and Sample

The study has been performed in 52 Ready-Made Garment (RMG) factories in Savar, Bangladesh. In all included studies, the primary data were collected by the authors themselves, directly in the field.

On the other hand, Savar was chosen because of its position as one of the key industrial zones of the country, and because it has a huge pair of Garment Manufacturing Factories (almost 1500 factories). Employees from Electrical Engineer / Maintenance Manager, Production Supervisor, Senior Electrician & Fire Officer areas in selected factories were the sampling frame.

Within the factories, the respondents were selected by using purposive sampling. Personnel who, as part of their duties, had direct or indirect contact with workplace safety practices, the electrical system, emergency procedures, or factory operations. Production activities were not affected by data collection, as it was done during periods of suitable work breaks or during a non-disruptive time of the work.

Finally, 300 useable questionnaires were returned. These 300 cases are the valid and complete responses that have gone through the screening of data. Answers that contained incomplete information and inconsistent answers were excluded prior to statistical analysis.

4.3. Data Collection Instrument

Primary data was gathered from respondents with the help of a structured questionnaire. The questionnaire was designed to reflect the literature surveyed about the subject of industrial fire safety, electrical risk management, occupational safety practices, emergency preparedness, and management commitment to workplace safety. The text of the item was modified to resonate with Savar, RMG scenarios in Bangladesh.

The questionnaire consists of eight sections. The firstly section was designed to obtain the respondent information (education, job position and department, service length, and experience of electrical fire incidents or near-miss), Secondly section was factory profile (number of employees, factory construction year etc) thirdly was electrical risk indicators, fourthly was maintenance and inspection practices, fifty was training and competence, sixty was emergency preparedness, seventy was electrical fire risk perception and at last open ended questions. The main study constructs were measured in the second section using items with Likert scales.

The constructs included Electrical Hazard Identification (EHI), Maintenance and Inspection Practices (MIP), Training and Safety Compliance (TSC), Emergency Preparedness and Response (EPR), Management Commitment to Safety and Development (MCSD), and Perceived Electrical Fire Risk (PEFR) & one open-ended question. EHI measured the extent to which respondents recognized unsafe electrical conditions in the workplace. MIP measured regular inspection and preventive maintenance practices. TSC measured workers' safety awareness, training exposure, and compliance with safety rules. EPR measured emergency response arrangements such as fire drills, alarms, evacuation readiness, and response procedures. MCSD measured the role of management in supporting safety policies, resources, and safety culture. PEFR measured respondents' perception of electrical fire risk in the factory.

The draft of the questionnaire was checked for content validity prior to the final data collection. Academic supervisors and safety-related practitioners (RMG Sustainability Council of Bangladesh) examined the items to evaluate their relevance, clarity, and appropriateness, in accordance with the RMG factory. A pilot test of a small size was also done to test item clarity, item wording, item sequence, and response time. Review and feedback from the pilot revealed that minor wording changes were made prior to the administration of the final questionnaire.

A 5-point Likert-scale (1 = Strongly Disagree to 5 = Strongly Agree) was used to measure all constructs.

4.4. Data Analysis

Each construct was represented by a composite score that was obtained by averaging all scores of the items of that construct. Therefore, Electrical Hazard Identification was defined as the average of EHI1 to EHI8, Maintenance and Inspection Practices as the average of MIP1 to MIP8, Training and Safety Compliance as the average of TSC1 to TSC8, Emergency Preparedness and Response as the average of EPR1 to EPR8, Management Commitment to Safety and Development as the average of MCSD1 to MCSD8, and Perceived Electrical Fire Risk was defined as the average of PEFR1 through PEFR8. This made it possible to use each of the constructs as a continuous composite variable in the correlation and regression analyses while also keeping the original five-point scale.

The regression model was evaluated using coefficient estimates, t-values, p-values, R^2, adjusted R^2, and the overall F-test. The model explained 54.0% of the variance in perceived electrical fire risk, with $R^2 = 0.540$ and adjusted $R^2 = 0.532$. The overall regression model was statistically significant, $F(5, 294) = 68.984$, $p < 0.001$, indicating that the selected safety-management factors jointly explained a significant proportion of variation in perceived electrical fire risk.

The role of Electrical Hazard Identification and Maintenance and Inspection Practices demonstrated a high negative correlation but they were kept as analytically separate constructs as they reflect different theoretical aspects of electrical fire safety. Electrical Hazard Identification pertains to the detection and/or existence of an unsafe electrical condition and Maintenance and Inspection Practices pertains to taking actions to inspect, maintain and correct electrical systems that have been determined to be unsafe as part of a preventive organizational practice. The VIFs of EHI and MIP were 3.217 and 3.215, respectively, and were less than the standard value of 5. However, the effect of the multicollinearity was not found to be significant enough to remove either of the variables from the model.

5. Analysis and Discussion

5.1. Data Screening and Normality Assessment

Table 1. Data screening and normality assessment.

	Mean	SD	Median	Trimmed	MAD	SKEW	Kurtosis	SE
EHI1	3.17	0.74	3	3.19	0.00	−0.02	−0.40	0.04
EHI2	3.21	0.74	3	3.23	0.74	−0.01	−0.31	0.04
EHI3	3.21	0.79	3	3.22	1.48	0.06	−0.64	0.05
EHI4	3.19	0.70	3	3.21	0.00	0.07	0.30	0.04
EHI5	3.20	0.77	3	3.22	1.48	−0.04	−0.54	0.04
EHI6	3.15	0.74	3	3.16	0.00	0.09	0.00	0.04
EHI7	3.26	0.73	3	3.27	0.00	0.18	−0.22	0.04

Continued

EHI8	3.20	0.74	3	3.22	0.00	0.01	−0.31	0.04
MIP1	3.27	0.82	3	3.28	1.48	−0.01	−0.21	0.05
MIP2	3.27	0.80	3	3.31	1.48	−0.25	−0.33	0.05
MIP3	3.32	0.80	3	3.33	1.48	0.07	−0.51	0.05
MIP4	3.27	0.83	3	3.30	1.48	−0.18	−0.27	0.05
MIP5	3.30	0.77	3	3.31	1.48	0.09	−0.44	0.04
MIP6	3.28	0.80	3	3.30	1.48	−0.05	−0.13	0.05
MIP7	3.27	0.79	3	3.27	1.48	0.14	−0.45	0.05
MIP8	3.27	0.76	3	3.29	1.48	−0.04	−0.13	0.04
TSC1	3.36	0.71	3	3.38	0.00	0.16	−0.18	0.04
TSC2	3.37	0.68	3	3.42	1.48	−0.12	−0.36	0.04
TSC3	3.34	0.66	3	3.38	0.00	−0.06	−0.32	0.04
TSC4	3.34	0.64	3	3.36	0.00	0.08	−0.18	0.04
TSC5	3.39	0.69	3	3.41	1.48	−0.06	0.05	0.04
TSC6	3.35	0.68	3	3.42	1.48	−0.25	−0.49	0.04
TSC7	3.36	0.63	3	3.39	0.00	−0.07	−0.34	0.04
TSC8	3.37	0.65	3	3.38	0.00	0.18	−0.11	0.04
EPR1	3.54	0.72	4	3.55	1.48	−0.14	−0.26	0.04
EPR2	3.54	0.70	4	3.53	1.48	−0.01	−0.26	0.04
EPR3	3.54	0.70	4	3.55	1.48	−0.11	−0.23	0.04
EPR4	3.49	0.66	3	3.49	1.48	0.02	−0.24	0.04
EPR5	3.51	0.68	3	3.49	1.48	0.05	0.14	0.04
EPR6	3.55	0.71	4	3.51	1.48	0.16	−0.32	0.04
EPR7	3.53	0.71	4	3.50	1.48	0.12	−0.29	0.04
EPR8	3.54	0.72	4	3.51	1.48	0.10	−0.32	0.04
MCSD1	3.60	0.60	4	3.58	0.00	0.07	−0.44	0.03
MCSD2	3.59	0.59	4	3.59	0.00	−0.06	−0.41	0.03
MCSD3	3.60	0.61	4	3.59	0.00	−0.06	−0.32	0.04
MCSD4	3.57	0.61	4	3.55	1.48	0.12	−0.41	0.04
MCSD5	3.60	0.59	4	3.59	0.00	0.03	−0.44	0.03
MCSD6	3.58	0.56	4	3.58	0.00	0.03	−0.78	0.03
MCSD7	3.54	0.61	4	3.52	1.48	0.23	−0.41	0.04
MCSD8	3.60	0.59	4	3.60	0.00	−0.07	−0.37	0.03
PEFR1	1.75	0.64	2	1.68	0.00	0.36	−0.35	0.04
PEFR2	1.78	0.64	2	1.72	0.00	0.39	−0.02	0.04
PEFR3	1.73	0.60	2	1.68	0.00	0.20	−0.60	0.03
PEFR4	1.80	0.64	2	1.75	0.00	0.35	0.02	0.04
PEFR5	1.76	0.67	2	1.69	0.00	0.39	−0.51	0.04
PEFR6	1.76	0.59	2	1.72	0.00	0.13	−0.51	0.03
PEFR7	1.78	0.64	2	1.72	0.00	0.38	−0.01	0.04
PEFR8	1.77	0.62	2	1.71	0.00	0.28	−0.24	0.04

The data screening and normality test results of all the measurement items that are used in this study are presented in Table 1. The descriptive statistics in the table are: Mean, Standard deviation, Median, Trimmed mean, Median absolute deviation, Skewness, Kurtosis, and Standard error. These values were studied to learn about the general pattern of responses, uniformity of responses, and distribution of the data. Before the main statistical analyses, the dataset was examined to assess data quality and suitability for the statistical tests. The screening procedures involved the absence of values, outliers, and normality of distribution. These findings reported that there were no gaps between the variables, and this implied that the data were complete and could be analyzed further.

Skewness and kurtosis were the measures to test whether the survey items are normally distributed. It was found that the skewness values were located between −0.256 and 0.390, with kurtosis lying between 2.240 and 3.324 among the variables observed. These values are far below the generally accepted values of skewness of +2 and kurtosis of +7, whereby the variables do not follow the norms significantly. As such, the dataset meets the criteria for the assumption given to parametric statistical methods, such as correlation and multiple regression analysis.

5.2. Respondent Profile Analysis

Table 2. Respondent profile analysis.

Educational Qualification	No Formal Education	12	4
Educational Qualification	Primary	58	19.33
Educational Qualification	Secondary	109	36.33
Educational Qualification	Higher Secondary	70	23.33
Educational Qualification	Diploma	27	9
Educational Qualification	Bachelor's Degree or Above	24	8
Job Position	Worker/Operator	139	46.33
Job Position	Line Supervisor	45	15
Job Position	Technician/Electrician	31	10.33
Job Position	Compliance/Safety Officer	30	10
Job Position	Manager/Admin Officer	40	13.33
Job Position	Other	15	5
Department	Production	132	44
Department	Maintenance	41	13.67
Department	Electrical/Utility	55	18.33
Department	Compliance/Safety	25	8.33
Department	Administration	29	9.67
Department	Other	18	6
Length of Service	Less than 1 year	90	30
Length of Service	1 - 3 Years	112	37.33
Length of Service	4 - 6 Years	58	19.33

Continued

Length of Service	7 - 10 Years	22	7.33
Length of Service	More than 10 Years	18	6
Factory Size	Less than 500	44	14.67
Factory Size	500 - 1000	58	19.33
Factory Size	1001 - 2000	75	25
Factory Size	2001 - 5000	85	28.33
Factory Size	More than 5000	23	7.67
Factory Size	Do Not Know	15	5
Fire Safety Training	Yes	174	58
Fire Safety Training	No	126	42
Electrical Safety Training	Yes	172	57.33
Electrical Safety Training	No	128	42.67
Electrical Fire Incident or Near-Miss Experience	Yes	91	30.33
Electrical Fire Incident or Near-Miss Experience	No	209	69.67

The respondent profile is shown in Table 2 regarding demographic and workplace-related characteristics of the participants for this study. Regarding education, most respondents had Secondary (109, 36.33%). For the job position, the largest group was Worker/Operator (139, 46.33%). The highest number of respondents worked in the Production (132, 44%) department. In terms of service length, most respondents had 1 - 3 years (112, 37.33%) of experience in the current factory. The most common factory size category was 2001 - 5000 (85, 28.33%). For safety exposure, the largest response group for fire safety training was Yes (174, 58%), while the largest response group for electrical safety training was Yes (172, 57.33%). Finally, regarding electrical fire incident or near-miss experience, the largest response group was No (209, 69.67%).

5.3. Descriptive Analysis of Safety Constructs

Table 3. Descriptive statistics.

	Mean	SD	Median	Trimmed	MAD	SKEW	Kurtosis	SE
EHI1	3.17	0.74	3	3.19	0.00	−0.02	−0.40	0.04
EHI2	3.21	0.74	3	3.23	0.74	−0.01	−0.31	0.04
EHI3	3.21	0.79	3	3.22	1.48	0.06	−0.64	0.05
EHI4	3.19	0.70	3	3.21	0.00	0.07	0.30	0.04
EHI5	3.20	0.77	3	3.22	1.48	−0.04	−0.54	0.04
EHI6	3.15	0.74	3	3.16	0.00	0.09	0.00	0.04
EHI7	3.26	0.73	3	3.27	0.00	0.18	−0.22	0.04
EHI8	3.20	0.74	3	3.22	0.00	0.01	−0.31	0.04
MIP1	3.27	0.82	3	3.28	1.48	−0.01	−0.21	0.05
MIP2	3.27	0.80	3	3.31	1.48	−0.25	−0.33	0.05

Continued

MIP3	3.32	0.80	3	3.33	1.48	0.07	−0.51	0.05
MIP4	3.27	0.83	3	3.30	1.48	−0.18	−0.27	0.05
MIP5	3.30	0.77	3	3.31	1.48	0.09	−0.44	0.04
MIP6	3.28	0.80	3	3.30	1.48	−0.05	−0.13	0.05
MIP7	3.27	0.79	3	3.27	1.48	0.14	−0.45	0.05
MIP8	3.27	0.76	3	3.29	1.48	−0.04	−0.13	0.04
TSC1	3.36	0.71	3	3.38	0.00	0.16	−0.18	0.04
TSC2	3.37	0.68	3	3.42	1.48	−0.12	−0.36	0.04
TSC3	3.34	0.66	3	3.38	0.00	−0.06	−0.32	0.04
TSC4	3.34	0.64	3	3.36	0.00	0.08	−0.18	0.04
TSC5	3.39	0.69	3	3.41	1.48	−0.06	0.05	0.04
TSC6	3.35	0.68	3	3.42	1.48	−0.25	−0.49	0.04
TSC7	3.36	0.63	3	3.39	0.00	−0.07	−0.34	0.04
TSC8	3.37	0.65	3	3.38	0.00	0.18	−0.11	0.04
EPR1	3.54	0.72	4	3.55	1.48	−0.14	−0.26	0.04
EPR2	3.54	0.70	4	3.53	1.48	−0.01	−0.26	0.04
EPR3	3.54	0.70	4	3.55	1.48	−0.11	−0.23	0.04
EPR4	3.49	0.66	3	3.49	1.48	0.02	−0.24	0.04
EPR5	3.51	0.68	3	3.49	1.48	0.05	0.14	0.04
EPR6	3.55	0.71	4	3.51	1.48	0.16	−0.32	0.04
EPR7	3.53	0.71	4	3.50	1.48	0.12	−0.29	0.04
EPR8	3.54	0.72	4	3.51	1.48	0.10	−0.32	0.04
MCSD1	3.60	0.60	4	3.58	0.00	0.07	−0.44	0.03
MCSD2	3.59	0.59	4	3.59	0.00	−0.06	−0.41	0.03
MCSD3	3.60	0.61	4	3.59	0.00	−0.06	−0.32	0.04
MCSD4	3.57	0.61	4	3.55	1.48	0.12	−0.41	0.04
MCSD5	3.60	0.59	4	3.59	0.00	0.03	−0.44	0.03
MCSD6	3.58	0.56	4	3.58	0.00	0.03	−0.78	0.03
MCSD7	3.54	0.61	4	3.52	1.48	0.23	−0.41	0.04
MCSD8	3.60	0.59	4	3.60	0.00	−0.07	−0.37	0.03
PEFR1	1.75	0.64	2	1.68	0.00	0.36	−0.35	0.04
PEFR2	1.78	0.64	2	1.72	0.00	0.39	−0.02	0.04
PEFR3	1.73	0.60	2	1.68	0.00	0.20	−0.60	0.03
PEFR4	1.80	0.64	2	1.75	0.00	0.35	0.02	0.04
PEFR5	1.76	0.67	2	1.69	0.00	0.39	−0.51	0.04
PEFR6	1.76	0.59	2	1.72	0.00	0.13	−0.51	0.03
PEFR7	1.78	0.64	2	1.72	0.00	0.38	−0.01	0.04
PEFR8	1.77	0.62	2	1.71	0.00	0.28	−0.24	0.04

The means of the most important safety-related constructs were obtained in this study and displayed in **Table 3**. As the results suggest, the highest mean score is exhibited by the Management commitment to Safety and Development (MCSD), with the approximate mean score being 3.6, indicating that the respondents are relatively satisfied with the way the management supports the workplace safety and sustainable development programs in the surveyed RMG factories.

On the same note, Emergency Preparedness and Response (EPR) also records a relatively high average score (around 3.5), which shows that the majority of respondents consider emergency procedures, including fire drills and response mechanisms, to be fairly instituted at their places of work. Training and Safety Compliance (TSC) shows an almost similar mean value (approximately 3.4), implying that the level of awareness and compliance with procedures of electric safety among workers is moderate.

Conversely, electoral hazards identification is Electric Hazard Identification (EHI) and Maintenance and Inspection Practices (MIP) with rather low mean scores, approximately 3.23. Such a discovery suggests that, though there exist some simple electrical safety management practices, there may still be a need for improvements in hazard detection and regular electrical maintenance to increase overall performance in safety.

It is important to note that the high level of Perceived Electrical Fire Risk (PEFR) produces a low level of mean (about 1.7), and the respondent groups consider the electrical fire risk to be not so high in the researched factories. This perception should, however, be viewed with a sense of caution since low perceived risk does not necessarily mean non-existence of risk of occurrence, especially in an industrial setting where electrical networks are widely used.

5.4. Reliability Analysis

Table 4. Reliability analysis.

Construct	Cronbach_Alpha
Electrical Hazard Identification (EHI)	0.933259159
Maintenance and Inspection Practices (MIP)	0.937098756
Training and Safety Compliance (TSC)	0.911677339
Emergency Preparedness and Response (EPR)	0.912867233
Management Commitment to Safety and Development (MCSD)	0.850366867
Perceived Electrical Fire Risk (PEFR)	0.890862307

Table 4 shows the reliability analysis of the most constructs used in this research. Engagement of Cronbach's alpha coefficient to determine the internal consistency of the survey items was used to determine the reliability of the measurement constructs. Reliability analysis is done to ensure that the items that have been used to measure each of the constructs are always a reliable measure of the underlying construct and yield consistent measurements.

These findings show that there are high levels of reliability in all the constructs, with Cronbach's alpha ranging between 0.850 and 0.937, and this shows that the alpha value is far greater than 0.70, which is the recommended alpha value that should be considered acceptable in terms of reliability. In particular, the level of reliability of Electrical Hazard Identification (α = 0.933) and Maintenance and Inspection Practices (α = 0.937) is the most significant and therefore represents dense internal consistency of corresponding measurement items. On the same note, Training and Safety Compliance (α = 0.912) and Emergency Preparedness and Response (α = 0.913) are also remarkably high ceterois.

Moreover, the reliability levels of the constructs Management Commitment to Safety and Development (α = 0.850) and Perceived Electrical Fire Risk (α = 0.891) are much higher than the acceptable level, which proves the stability and consistency of the measurement scales. These results show that the questionnaire items are effective in representing the underlying constructs of electrical fire risk management of RMG factories.

5.5. Correlation Analysis

Table 5. Correlation matrix.

EHI_mean	MIP_mean	TSC_mean	EPR_mean	MCSD_mean	PEFR_mean
1	−0.8298313	−0.010578	−0.0552791	−0.1095846	0.6553284
−0.8298313	1	0.0069769	0.05267262	0.10849625	−0.6866783
−0.010578	0.0069769	1	−0.0295536	0.00154235	−0.183432
−0.0552791	0.05267262	−0.0295536	1	−0.0196317	−0.1186318
−0.1095846	0.10849625	0.00154235	−0.0196317	1	−0.1559707
0.6553284	−0.6866783	−0.183432	−0.1186318	−0.1559707	1

The Pearson correlation analysis was used to analyze the correlations between the key constructs related to the electrical fire risk in RMG factories in Savar, Bangladesh. They show that there are some major associations among the independent variables and perceived electrical fire risk.

The results show Table 5, that Electrical Hazard Identification (EHI) has a strong positive correlation with Perceived Electrical Fire Risk (PEFR) (r = 0.655). This means that respondents who reported a higher level of observed or recognized electrical hazard conditions also reported a higher level of perceived electrical fire risk. Therefore, the positive association should be interpreted as evidence that visible or recognized electrical hazards increase workers' perception of fire risk in the factory.

Maintenance and Inspection Practices (MIP), on the contrary, show a close correlation with perceived fire risk with an equal negative value of −0.687, which implies that good maintenance and frequent electrical inspections have a significant impact in diminishing the attitudes toward electrical fire hazard. This observation highlights the relevance of preventative maintenance measures to eliminate possible fire hazards in garment manufacturing plantations.

Relationships between the constructs and perceived fire risk are weaker in other constructs. There is a weak negative correlation between Training and Safety Compliance (TSC) and PEFR (r = −0.183), which implies that better safety training and compliance practices might also help in diminishing perceived electrical risks of fire, which is, however, not that significant. The same happens with Emergency Preparedness and Response (EPR) (r = −0.119) and Management commitment to safety and development (MCSD) (r = −0.156), which show weak negative correlation with perceived fire risk.

Moreover, an inverse relation is found to be high between Electrical Hazard Identification and Maintenance Practices (r = −0.830), hence the factories with better maintenance practices are less likely to encounter any apparent electrical hazards.

5.6. Multiple Regression Analysis

Table 6. Multiple regression analysis.

Variable	Beta	Std_Error	t_value	p_value	
(Intercept)	3.31	0.40	8.13	1.18	***
EHI_mean	0.20	0.05	3.71	0.00	***
MIP_mean	−0.32	0.05	−6.39	6.38	***
TSC_mean	−0.16	0.03	−4.54	8.00	*
EPR_mean	−0.07	0.03	−2.19	0.02	*
MCSD_mean	−0.09	0.04	−1.99	0.04	*

Signif. Codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1.

Table 6 analyzes the reason why multiple linear regression analysis was done to investigate the effects of electrical safety-related factors on the Perceived Electrical Fire Risk (PEFR) in RMG factories in Savar, Bangladesh. As independent variables, the model factors consisted of Electrical Hazard Identification (EHI), Maintenance and Inspection Practices (MIP), Training and Safety Compliance (TSC), Emergency Preparedness and Response (EPR), and Management Commitment to Safety and Development (MCSD).

Regression findings reveal that several predictors significantly affect perceived electrical fire risk. Electrical Hazard Identification (EHI) has a positive and statistically significant effect on perceived fire risk ($\beta = 0.204$, t = 3.715, $p < 0.001$). This finding indicates that when respondents observe or recognize more unsafe electrical conditions in the workplace, their perceived level of electrical fire risk increases. Therefore, the positive coefficient does not mean that better safety detection increases fire risk. Rather, it means that the presence or recognition of electrical hazard conditions is associated with a higher perception of fire risk.

Conversely, the Maintenance and Inspection Practices (MIP) have a significant negative association with perceived fire risk ($\beta = -0.325$, t = −6.393, p = 0.001), which shows that recommended maintenance and regularity of electrical inspection are significantly associated with the reduction of the perceived electrical fire risk. Maintenance practices, among other predictors, seem to have the most impact in reducing the fire risk perceptions.

In the same way, Training and Safety Compliance(TSC) also exhibits the negative effect on perceived fire risk ($\beta = -0.163$, $t = -4.546$, $p = 0.001$), meaning that increased safety compliance and awareness in relation to electrical safety policy leads to a reduced level of risk of fire in the workplace.

Moreover, there is a negative correlation between Emergency Preparedness and Response (EPR) and perceived fire risk ($\beta = -0.075$, $t = -2.195$, $p = 0.029$), which means that with better emergency preparedness systems, including fire drills and fire response mechanisms, the perceived fire risk can be lowered.

Lastly, it is also established that the Management Committee for Safety and Development (MCSD) has a statistically significant negative correlation with the perceived risk of fire ($\beta = -0.090$, $t = -1.991$, $p = 0.047$), meaning that the stronger the managers embrace workplace safety and sustainable development, the lower the perceived fire risk in the manufacturing sites of RMG.

On the whole, the findings of the regression point to the significance of preventive maintenance measures, safety education, the readiness of emergency responses, and the interest of the management in minimizing the risk of electrical fire in garment factories. Meanwhile, the fact that hazard identification and perception of fire risks are positively correlated indicates that active hazard detection and reduction measures have to be taken.

5.7. Relationship between Electrical Hazards and Fire Risk

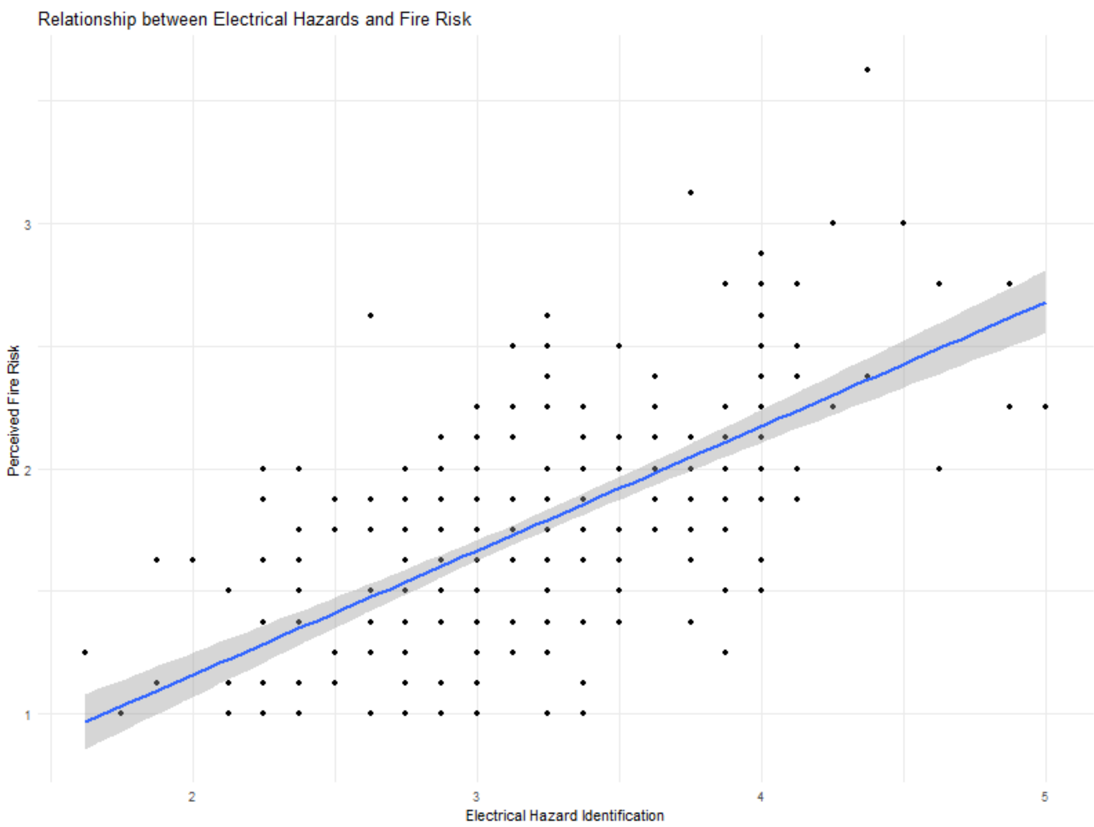

Figure 2. Relationship between electrical hazard identification and perceived electrical fire risk.

Figure 2 shows the relationship between Electrical Hazard Identification (EHI) and Perceived Electrical Fire Risk (PEFR) in the surveyed RMG factories. The upward regression line indicates a positive association between the two variables. This means that respondents who reported higher levels of observed or recognized electrical hazard conditions also perceived higher levels of electrical fire risk.

This finding supports the regression result, where EHI showed a positive and statistically significant effect on PEFR. The result should be interpreted carefully. In this study, EHI represents the recognition or presence of unsafe electrical conditions, such as exposed wiring, circuit overloading, damaged electrical equipment, or poor electrical installation. Therefore, higher EHI scores indicate higher observed hazard conditions, which logically increase the perceived risk of electrical fire.

5.8. Model Validation and Significance Testing

Table 7. Regression model summary.

Model Statistic	Value
R^2	0.540
Adjusted R^2	0.532
Overall F-test	F(5, 294) = 68.984
Model p-value	p < 0.001
Residual Mean Square	0.106

Table 8. Model validation and significance testing.

Source	Df	Sum Sq	Mean Sq	F value	Pr (>F)
EHI_mean	1	29.0548661	29.0548661	274.387598	5.4737E−44
MIP_mean	1	4.43475802	4.43475802	41.8808539	4.0509E−10
TSC_mean	1	2.12764967	2.12764967	20.0930433	1.0582E−05
EPR_mean	1	0.48648987	0.48648987	4.5943005	0.03289883
MCSD_mean	1	0.41977195	0.41977195	3.96423157	0.04740208
Residuals	294	31.1316207	0.10588987		

The regression model summary in Table 7 shows that the model has strong explanatory power. The R^2 value was 0.540, indicating that 54.0% of the variance in perceived electrical fire risk was explained by the five independent variables. The adjusted R^2 value was 0.532, showing that the model remained stable after adjusting for the number of predictors. The overall model was statistically significant, $F(5, 294) = 68.984$, $p < 0.001$. This confirms that Electrical Hazard Identification, Maintenance and Inspection Practices, Training and Safety Compliance, Emergency Preparedness and Response, and Management Commitment to Safety and Development jointly explain a significant proportion of perceived electrical fire risk among respondents.

In order to determine the general importance of the regression model, a test known as the Analysis of Variance (ANOVA) test was performed. ANOVA outcomes support the fact that the regression model is statistically significant and can be used to explain the difference in the perceived electrical fire risk in the sampled RMG factories.

Table 8 shows that the findings reveal that Electrical Hazard Identification (EHI) has the greatest value of explanatory power to the model ($F = 274.39$, $p < 0.001$), which means that the existence and recognition of electrical hazards are a significant factor that causes perceived fire risk in the industrial workplace. Likewise, the Maintenance and Inspection Practices (MIP) also illustrate a very high level of importance ($F = 41.88$, $p < 0.001$) of preventive maintenance and planned, systematic electrical inspections on reducing the risks of fires.

Moreover, it is evident that Training and Safety Compliance (TSC) plays a major role in the model ($F = 20.09$, $p < 0.001$), which implies that the level of awareness of employees and compliance with electrical safety practices are significant in the perceived fire hazards. There is also a statistically significant contribution of Emergency Preparedness and Response (EPR), $F = 4.59$, $p = 0.033$, which implies that well-developed emergency response mechanisms are supportive of the improvement of workplace safety.

Additionally, Management Dedication to Safety and Development (MCSD) shows a statistically significant effect ($F = 3.96$, $p = 0.047$), indicating the relevance of managerial commitment and organizational culture focused on safety in minimizing fire risk in garment manufacturing facilities.

The model variance that is not explained (Mean square = 0.106) suggests that the unexplained variation in perceived electrical fire risk is rather low. In general, the findings of the ANOVA test support the statement that the regression model is able to explain the differences in the perception of the electrical fire risk among the employees working in the RMG factories in Savar, Bangladesh.

5.9. Model Validation and Multicollinearity Test

Table 9. Model validation and multicollinearity test.

Variable	VIF	
EHI_mean	3.2172899	Acceptable
MIP_mean	3.21530443	Acceptable
TSC_mean	1.00103233	Excellent
EPR_mean	1.00482147	Excellent
MCSD_mean	1.01387085	Excellent

Variance Inflation Factor (VIF) was used to check multicollinearity diagnostics, to further prove the regression model. Multicollinearity occurs when the independent variables have a high correlation rate among themselves, thus distorting the regression estimates and, in turn, compromising the model.

The VIF analysis results shown in Table 9 reveal that all the predictor variables are within acceptable levels. In particular, there is moderate though satisfactory multicollinearity in Electrical Hazard Identification (VIF = 3.217) and Maintenance and Inspection Practices (VIF = 3.215). In the meantime, Training and Safety Compliance (VIF = 1.001), Emergency Preparedness and Response (VIF = 1.005), and Management Commitment to Safety and Development (VIF = 1.014) demonstrate a very low VIF, which means that all these variables are very independent factors.

As far as generally accepted statistical rules, a VIF number below 5 shows that the issue of multicollinearity is not a grave factor. Thus, the findings support the fact that the independent variables included in the regression model are not problematic with multicollinearity, and regression coefficients could be interpreted without any doubt.

6. Conclusions

This paper conducted an evaluation of the electrical fire hazards at Ready-Made Garment (RMG) factories within Savar, Bangladesh, and specifically focused on determining the critical issues that contributed to the awareness of the fire hazards and the safety management measures. The results include useful information about the role of electrical hazards, maintenance practice, safety training, emergency preparedness, and management commitment in general regarding the fire hazard situation in the industrial manufacturing settings.

The findings reveal that electrical hazard recognition is a vital factor in creating perceived fire risk, and it is reasonable to argue that the availability of electrical hazards that can be observed enhances the awareness of workers toward the possibility of fire. On the other hand, which practices highlight the greatest negative impact on fire risk perception, there is maintenance and inspection, which refers to the significance of regular electrical inspections and proactive maintenance to mitigate risks of possible fire. Equally, compliance with training and safety was also found to greatly lower perceived fire risk, with the importance of the awareness and adherence to safety procedures by the employees in enhancing the safety of the workplace.

What is more, the preparedness and response systems towards emergencies proved to assist in the reduction of the fire risk perception, meaning that properly developed emergency protocols, including fire training and response schemes, can increase the trust of the workers in the ability of the factory under discussion to handle fire-related events. The commitment of management in ensuring safety and sustainable development also has a significant contribution, meaning that leadership commitment can serve as a significant factor in minimizing fire risks.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Islam, M.S. (2021) Ready-Made Garments Exports Earning and Its Contribution to

Economic Growth in Bangladesh. *GeoJournal*, **86**, 1301-1309.
https://doi.org/10.1007/s10708-019-10131-0

[2] Swazan, I.S. and Das, D. (2022) Bangladesh's Emergence as a Ready-Made Garment Export Leader: An Examination of the Competitive Advantages of the Garment Industry. *International Journal of Global Business and Competitiveness*, **17**, 162-174. https://doi.org/10.1007/s42943-022-00049-9

[3] Karanikas, N. and Hasan, S.M.T. (2022) Occupational Health & Safety and Other Worker Wellbeing Areas: Results from Labour Inspections in the Bangladesh Textile Industry. *Safety Science*, **146**, Article 105533. https://doi.org/10.1016/j.ssci.2021.105533

[4] Siraj, M.T., Hasan, M.M., Islam, M.F.A., Jamil, S.N.S., kabir, A. and Rahman, M.M. (2023) Electrical Risk Domains in Ready-Made Garments Industries of Bangladesh: Applying Entropy Method to Prioritize. *AIP Conference Proceedings*, **2825**, Article 050001. https://doi.org/10.1063/5.0171412

[5] Thai, H.-D., Le, N.-B.-V., Lee, D. and Huh, J.-H. (2024) A Survey of Electrical Fire Causes Assessment Technology. *IEEE Access*, **12**, 145378-145392. https://doi.org/10.1109/access.2024.3437175

[6] Wadud, Z., Huda, F.Y. and Ahmed, N.U. (2014) Assessment of Fire Risk in the Readymade Garment Industry in Dhaka, Bangladesh. *Fire Technology*, **50**, 1127-1145. https://doi.org/10.1007/s10694-013-0349-2

[7] Habib, M.M., Sabah, S. and Debnath, D. (2022) The Scenario of Fire Safety through Accord in Bangladeshi Garments Industry. *Open Journal of Social Sciences*, **10**, 149-165. https://doi.org/10.4236/jss.2022.104011

[8] Salminen, J. (2018) The Accord on Fire and Building Safety in Bangladesh: A New Paradigm for Limiting Buyers' Liability in Global Supply Chains? *The American Journal of Comparative Law*, **66**, 411-451. https://doi.org/10.1093/ajcl/avy030

[9] Siraj, M.T., Debnath, B., Payel, S.B., Bari, A.B.M.M. and Islam, A.R.M.T. (2023) Analysis of the Fire Risks and Mitigation Approaches in the Apparel Manufacturing Industry: Implications toward Operational Safety and Sustainability. *Heliyon*, **9**, e20312. https://doi.org/10.1016/j.heliyon.2023.e20312

[10] Vinodkumar, M.N. and Bhasi, M. (2010) Safety Management Practices and Safety Behaviour: Assessing the Mediating Role of Safety Knowledge and Motivation. *Accident Analysis & Prevention*, **42**, 2082-2093. https://doi.org/10.1016/j.aap.2010.06.021

[11] Li, G., Guo, J., Kang, Y., Huang, Q., Zhao, J. and Liu, C. (2025) Classification and Prevention of Electrical Fires: A Comprehensive Review. *Fire*, **8**, Article 154. https://doi.org/10.3390/fire8040154

[12] Hassanain, M.A., Al-Harogi, M. and Ibrahim, A.M. (2022) Fire Safety Risk Assessment of Workplace Facilities: A Case Study. *Frontiers in Built Environment*, **8**, Article ID: 861662. https://doi.org/10.3389/fbuil.2022.861662

[13] Michael, J.H., Evans, D.D., Jansen, K.J. and Haight, J.M. (2005) Management Commitment to Safety as Organizational Support: Relationships with Non-Safety Outcomes in Wood Manufacturing Employees. *Journal of Safety Research*, **36**, 171-179. https://doi.org/10.1016/j.jsr.2005.03.002

[14] Ahmed, S., Raihan, M.Z. and Islam, N. (2013) Labor Unrest in the Ready-Made Garment Industry of Bangladesh. *International Journal of Business and Management*, **8**, 68-80. https://doi.org/10.5539/ijbm.v8n15p68

[15] Hasan, I., Islam, M.N. and Khan, S.R. (2020) Ready-Made Garment Industry Attractiveness: The Case of Bangladesh Garments' Blue-Collar Employees. *International Journal of Emerging Markets*, **17**, 1218-1237.

https://doi.org/10.1108/ijoem-03-2019-0232

[16] Khan, N.R., Dipti, T.R., Ferdousi, S.K., Hossain, M.Z., Ferdousi, S., Sony, S.A., *et al*. (2016) Occupational Health Hazards among Workers of Garment Factories in Dhaka City, Bangladesh. *Journal of Dhaka Medical College*, **24**, 36-43. https://doi.org/10.3329/jdmc.v24i1.29560

[17] da Rocha, G.S., Rodrigues, J.P.C. and da Silva Gazzana, D. (2023) Electrical Fire Risk Indexing Using Fuzzy Petri Nets. *Fire Safety Journal*, **139**, Article 103817. https://doi.org/10.1016/j.firesaf.2023.103817

[18] Sadeghi-Yarandi, M., Torabi-Gudarzi, S., Asadi, N., Golmohammadpour, H., Ahmadi-Moshiran, V., Taheri, M., *et al*. (2023) Development of a Novel Electrical Industry Safety Risk Index (EISRI) in the Electricity Power Distribution Industry Based on Fuzzy Analytic Hierarchy Process (FAHP). *Heliyon*, **9**, e13155. https://doi.org/10.1016/j.heliyon.2023.e13155

[19] Liu, X., Mishra, A., Goldstein, S. and Sinha, K.K. (2019) Toward Improving Factory Working Conditions in Developing Countries: An Empirical Analysis of Bangladesh Ready-Made Garment Factories. *Manufacturing & Service Operations Management*, **21**, 379-397. https://doi.org/10.1287/msom.2017.0679

[20] Maalouf, M.M. and Hoque, I. (2022) Estimating the Effect of Buyers' Commitment to Corporate Social Responsibility on Safety Risks in Garment Factories in Bangladesh. *Cleaner and Circular Bioeconomy*, **2**, Article 100018. https://doi.org/10.1016/j.clcb.2022.100018

[21] Ahlquist, J.S. and Mosley, L. (2020) Firm Participation in Voluntary Regulatory Initiatives: The Accord, Alliance, and US Garment Importers from Bangladesh. *The Review of International Organizations*, **16**, 317-343. https://doi.org/10.1007/s11558-020-09376-z

[22] Rahman, Z. (2014) Accord on "Fire and Building Safety in Bangladesh": A Breakthrough Agreement? *Nordic Journal of Working Life Studies*, **4**, 69-74. https://doi.org/10.19154/njwls.v4i1.3551

[23] Saha, P., Salsabil, N., Zaman, T. and Hossain, M.F. (2025) Evaluating the Fire Accidents and Safety Challenges in the Ready-Made Garment Industry of Bangladesh from 2000 to 2024. *Indonesian Journal of Geography*, **57**, 596-605. https://doi.org/10.22146/ijg.103731

[24] Zhang, J., Huang, L., Chen, T. and Su, G. (2021) Simulation Based Analysis of Electrical Fire Risks Caused by Poor Electric Contact between Plug and Receptacle. *Fire Safety Journal*, **126**, Article 103434. https://doi.org/10.1016/j.firesaf.2021.103434

[25] Kobes, M., Helsloot, I., de Vries, B. and Post, J.G. (2010) Building Safety and Human Behaviour in Fire: A Literature Review. *Fire Safety Journal*, **45**, 1-11. https://doi.org/10.1016/j.firesaf.2009.08.005

[26] Hutchinson, D., Luria, G., Pindek, S. and Spector, P. (2022) The Effects of Industry Risk Level on Safety Training Outcomes: A Meta-Analysis of Intervention Studies. *Safety Science*, **152**, Article 105594. https://doi.org/10.1016/j.ssci.2021.105594

[27] Burke, M.J., Sarpy, S.A., Smith-Crowe, K., Chan-Serafin, S., Salvador, R.O. and Islam, G. (2006) Relative Effectiveness of Worker Safety and Health Training Methods. *American Journal of Public Health*, **96**, 315-324. https://doi.org/10.2105/ajph.2004.059840

[28] Alkış, S., Aksoy, E. and Akpınar, K. (2021) Risk Assessment of Industrial Fires for Surrounding Vulnerable Facilities Using a Multi-Criteria Decision Support Approach and Gis. *Fire*, **4**, Article 53. https://doi.org/10.3390/fire4030053

[29] Robson, L.S., Stephenson, C.M., Schulte, P.A., Amick, B.C.I., Irvin, E.L., Eggerth, D.E., *et al*. (2012) A Systematic Review of the Effectiveness of Occupational Health and Safety Training. *Scandinavian Journal of Work*, *Environment & Health*, **38**, 193-208. https://doi.org/10.5271/sjweh.3259

[30] Zohar, D. (1980) Safety Climate in Industrial Organizations: Theoretical and Applied Implications. *Journal of Applied Psychology*, **65**, 96-102. https://doi.org/10.1037/0021-9010.65.1.96

[31] Flin, R., Mearns, K., O'Connor, P. and Bryden, R. (2000) Measuring Safety Climate: Identifying the Common Features. *Safety Science*, **34**, 177-192. https://doi.org/10.1016/s0925-7535(00)00012-6

[32] Guldenmund, F.W. (2000) The Nature of Safety Culture: A Review of Theory and Research. *Safety Science*, **34**, 215-257. https://doi.org/10.1016/s0925-7535(00)00014-x

[33] Christian, M.S., Bradley, J.C., Wallace, J.C. and Burke, M.J. (2009) Workplace Safety: A Meta-Analysis of the Roles of Person and Situation Factors. *Journal of Applied Psychology*, **94**, 1103-1127. https://doi.org/10.1037/a0016172