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Tailored Incident Investigation Protocols: A Critically Needed Practice

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Abstract: Construction scholars and practitioners have identified a repetitive pattern of direct causes leading to both fatal and non-fatal injuries among construction workers. Over the years, direct causes such as falls, electrocutions, and being struck have consistently represented a substantial proportion of recorded and reported injuries in the United States. One potential factor contributing to this repetition is the absence of root cause investigations for incidents. Incident investigations should focus on system deficiencies and shortcomings instead of individual behaviors. While the identification of incident root causes provides the needed information to eliminate the direct causes, it is inherently complex. Recently, the use of tailored incident investigation protocols as a practical and systematically conducted method was suggested to uncover the root causes of incidents, subsequently assisting in reducing their recurrence. To illustrate the feasibility of such an approach, this article provides a step-by-step guide to creating a tailored investigation protocol for revealing the root causes of arc flash incidents by utilizing a panel of safety experts. In addition, this study demonstrates the feasibility of developing tailored investigation protocols for other common causes, such as falls and electrocutions. Tailored investigation protocols streamline the identification of potential root causes to a manageable number, relying on subject matter experts. Consequently, they enhance learning from incidents by mitigating investigators' biases and potential lack of experience. Safety practitioners can use the method presented in this article to create tailored investigation protocols based on their working environment to improve learning for occupational injuries.

Keywords: incident investigation; tailored incident investigation protocol; construction safety

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1. Introduction

While there has been a notable decrease in occupational injuries over the past century, it appears that the enhancement of overall safety performance is progressing at a slower pace [1]. One contributing factor to this slower pace is the failure to learn from incident investigations, which results in the recurrence of incidents. The construction industry has experienced a repetition of direct causes of fatal and nonfatal injuries over the last 20 years [2,3]. The repetition of direct causes could indicate a failure to extract lessons from occupational incidents [4,5]. Incidents are more likely to reoccur when ignoring the value of learning from them, allowing incidents' causes to remain unnoticed. Knowing the causes of workplace incidents is vital to develop strategies to avoid similar incidents in future projects [6]. Accordingly, incident investigations are crucial to overall site safety by identifying factors frequently associated with injuries, illnesses, and fatalities.

According to the ISO 45001, the International Standard for OHS Management Systems, enhancing incident investigation process is an opportunity to improve overall safety performance [7]. The ISO 45001 emphasizes the importance of identifying the root causes of an incident to implement effective corrective actions. Root cause analysis aims to explore all protentional factors associated with an incident to provide inputs for what can be done to prevent similar incidents from happening again [7].

The absence of learning-focused incident investigation creates deficiencies in the work culture, enabling incidents' root causes to become norms [2]. Thus, the direct causes of repeating incidents are challenges that should be seriously investigated and addressed [2,3]. The accident causation theory focuses on individual behavior [8]. Based on this understanding, many scholars have concluded that 80–90% of all occupational accidents are caused by unsafe behaviors [8,9]. As a result of this understanding, Behavior-Based Safety (BBS) has gained attention from safety practitioners [10]. According to Zhang et al. (2017), BBS focuses on individual safety-related performance by reinforcing safe behavior and eliminating unsafe ones [11]. However, BBS rarely systematically considers the organizational factors influencing behavioral decisions [12,13]. It pays little attention to internal factors such as safety awareness, knowledge, and interpersonal interactions [11]. As a result, individuals directly involved in accidents may be accused, and organizational factors may go unnoticed [13]. BBS may not be able to reduce the incident rate in the long run due to its lack of root cause analysis [13,14]. It mainly focuses on human errors (i.e., direct causes of incidents). Human error should be carefully investigated to reveal organizational factors that lead to them [15]. For example, the actions of upper management and safety personnel significantly influence the safety-related actions of frontline supervisors and field workers [16]. Thus, current mainstream studies have shown that organizational factors are a major contributor to unsafe behavior.

Occupational incidents are quality deficiencies that should be investigated and controlled to avoid incident repetition [17]. Although not all incidents can be prevented, serious incidents must be thoroughly investigated to prevent recurrence [18]. Preventing incidents can be accomplished by revealing their root causes through an incident investigation learning program [5]. An incident investigation learning program aims to control occupational risks and identify process deficiencies through a systematic approach. This approach can systematically determine the root causes of incidents to prevent similar future incidents through corrective and preventive actions [19,20]. Repetition suggests a lack of comprehensive investigation programs due to the lack of a systematic approach and subjective data collection methods, which produce ineffective incident investigation reports [5].

The forms for incident investigation programs should be tailored to suit the source of incident (i.e., the direct cause) in order to facilitate the exploration of root causes [5]. A tailored investigation protocol is essential for revealing the human and workplace factors contributing to the incident (i.e., root causes). The necessity of having a tailored investigation plan is based on the fact that safety interventions are created based on the hazard that needs to be controlled. Identifying root causes would be challenging without a tailored investigation process. One of the most critical aspects of tailored investigation programs is their ability to enumerate potential root causes, as the tailored investigation form is constructed based on a specific direct cause. This feature can be achieved by identifying the root causes of incidents resulting from a known direct cause, through feedback from subject matter experts. The organization should use investigation methods appropriate to the nature of the incident [7]. Despite this recommendation, there is no current incident investigation program that is tailored to the direct cause of incidents.

Accordingly, this study aims to maximize learning opportunities from incidents by creating a comprehensive incident investigation program that is tailored to the needs of the electrical construction industry, focusing on arc flash incidents. It is essential to note that root causes exist before incidents happen. These root causes are the actual reasons behind the incidents. Proactive safety management can detect and address these root causes, leading to incident prevention. On the other hand, tailored incident investigation protocols can be utilized to uncover the root causes behind it. Identifying these root causes will help prevent incident recurrence, enhancing the overall safety management system.

2. Research Approach and Definition of Key Terms

An arc-flash-tailored investigation protocol will be created in this exploratory study. A tailored investigation protocol is essential for comprehending arc flash incidents and mitigating their recurrence. Arc flash injuries often lead to more days away from work than other injuries due to their severity [5]. Electrocution accidents place a heavy burden on those injured, their employers, and society as a whole. This goes beyond financial costs like lost wages and medical bills, leading to lifelong disabilities and a lower quality of life [21]. To reduce arc flash incidents, the National Fire Protection Association 70E (NFPA 70E) offers comprehensive guidance and recommendations [22]. Although OSHA does not enforce NFPA 70E directly, it may reference it to issue citations as suggested by an OSHA interpretation letter. This letter seeks to bridge a gap in the existing OSHA standard by incorporating elements of NFPA 70E [23].

The likelihood of an arc flash incident increases when energized conductors or circuits are exposed and workers interact with them. Many factors raise the probability of arcing, such as faulty installation, equipment failure, dust, and corrosion. When arc flash hazard exists, the following precautions must be taken:

- An arc flash boundary must be established and communicated via labels. Table 130.7 (c) (15) (a) (22) can be used to calculate the boundary. The boundary delineates the distance from electrical equipment at which an individual would be subject to a second-degree burn (where incident energy equals 1.2 cal/cm^2) in the event of an arc flash.
- Appropriate personal protective equipment (PPE) must be worn by qualified individuals who work within the arc flash boundary. Employers must first designate qualified individuals based on their ability to demonstrate the needed skills and knowledge to execute them safely. There are two methods that can be utilized for determining the necessary PPE. One involves calculating the incident energy to assess potential exposure to a person's face and chest. The other method, known as the table method, relies on NFPA 70E tables such as 130.7 (C) (15) (a), 130.7 (C) (15) (b), and 130.7 (C) (15).

Arc Flash Incident Root Causes

Various methods are employed to uncover the root causes of incidents, such as the fault tree, domino theory, bow-tie, and Swiss cheese models [24,25]. The Sequential Cause Analysis Technique (SCAT) stands out as a frequently employed methodology for the systematic analysis of incidents [5]. The SCAT, being a two-way approach, is designed to pinpoint both the direct causes and root causes of an incident [26]. The SCAT was utilized to create an arc-flash-tailored investigation form in this study. As can be seen in Figure 1, the SCAT categorizes the causes as follows [5]:

- Direct causes include unsafe actions, such as operating equipment without being qualified or removing safety devices, as well as unsafe conditions like poorly maintained guards and defective tools. These unsafe actions and conditions are errors that directly lead to an incident.
- Root causes include human factors and workplace factors that often lead to unsafe actions and conditions. Human factors include inadequate capability, lack of knowledge or skill, and stress or improper motivation. Workplace factors include less-than-adequate leadership, supervision, training, and maintenance.

Accordingly, unsafe behavior should be deemed the direct cause of incidents that often result from one or several root causes, such as lack of upper management support, safety personnel incompetence, and inadequate safety supervision. Addressing the root causes is critical to reducing unsafe behavior. It should be noted that an incident can result from either unsafe acts or unsafe conditions or from a combination of both. Root cause investigation is imperative to learn from incidents and avoid their recurrence, as demonstrated in Figure 2.

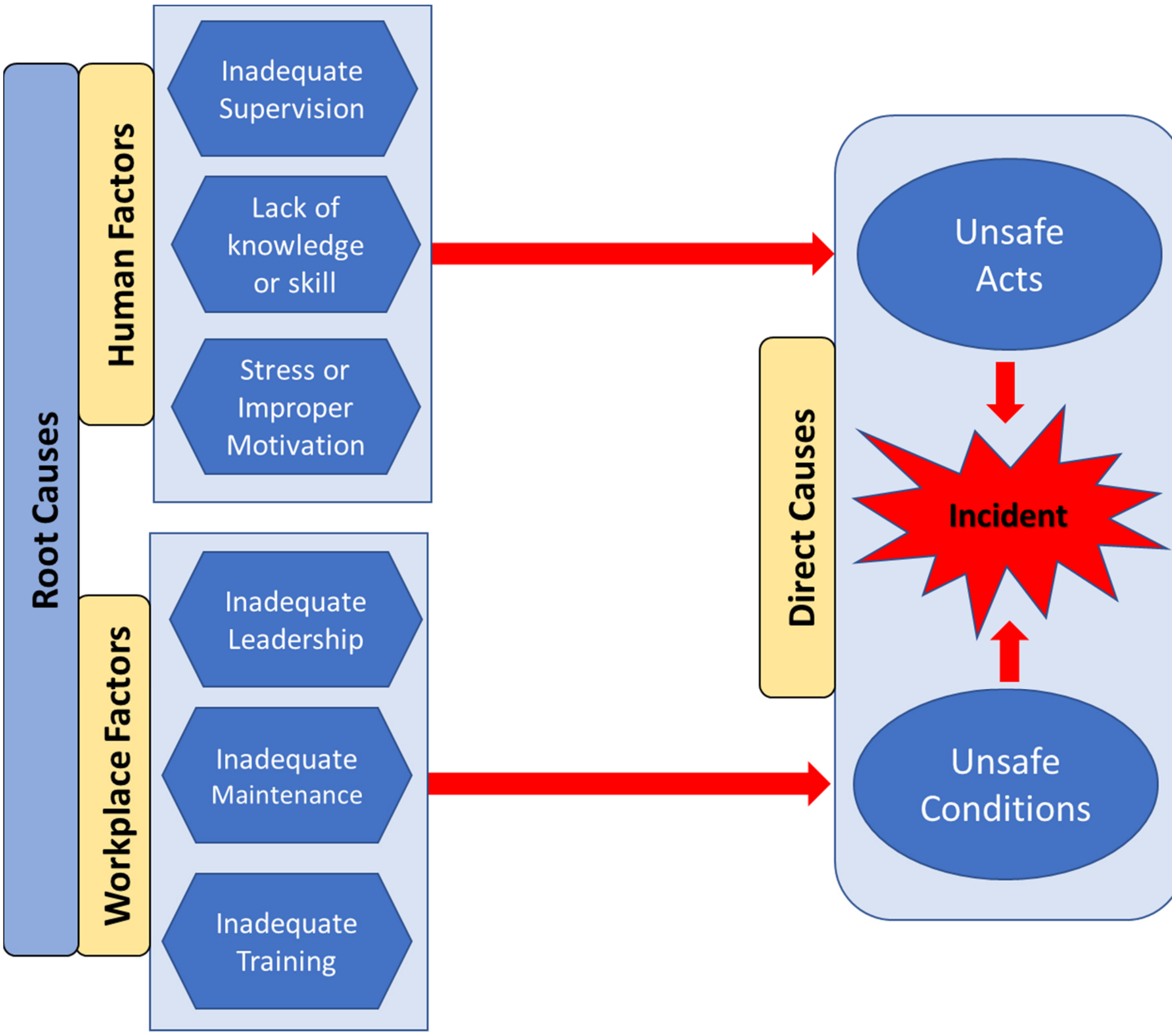

Figure 1. SCAT general diagram.

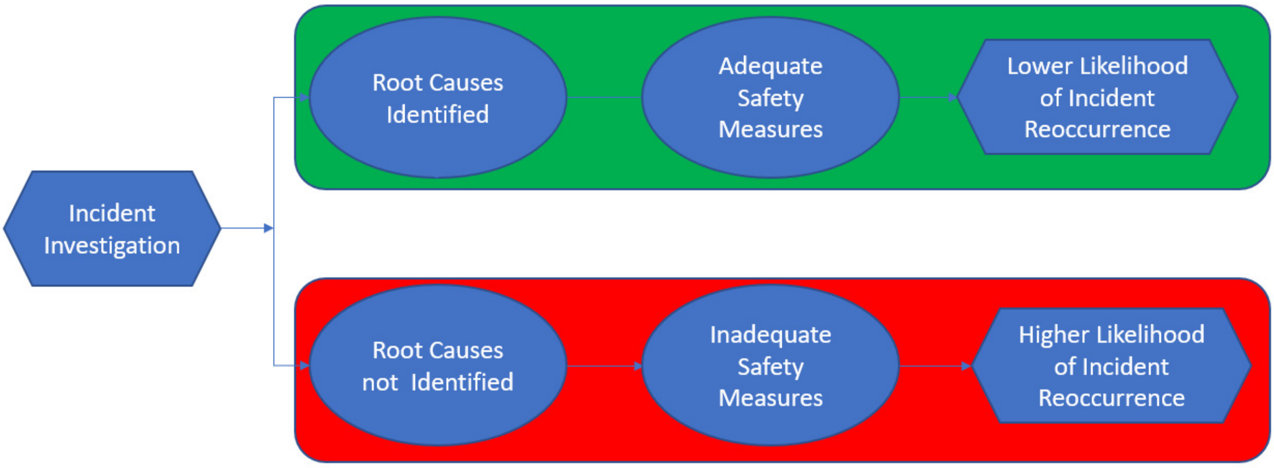

Figure 2. Role of root cause investigation in safety management.

3. Research Methodology

To meet the study objective, the underlying causes of arc flash incidents will be identified via qualitative data analysis. The goal is to assess the feasibility of developing a tailored investigation program. The data were gathered using a set of open-ended questions, which were pre-tested by four electricians recruited by ELECTRI International to ensure clarity. This pre-testing led to revisions to some of the questions. The research protocol was reviewed and approved by Lawrence Technological University's Human Subjects Institutional Review Board (HSIRB) in October 2021.

This study's sample size will reach a satisfaction level when the collected data reaches saturation. Data saturation is the most commonly utilized concept for estimating sample sizes in qualitative research [27]. In the qualitative data context, saturation is where new data cease to offer additional insights or information pertinent to the research questions. Hence, the sample size is not predefined; its sufficiency is gauged by reaching data saturation. Consequently, this study does not focus on population size. This approach differs from other research methods that aim to achieve consensus or conduct multivariate analysis. For example, a requisite number of participants is needed to effectively utilize statistical tools like *t*-tests and ANOVA tests in multivariate analysis, typically reaching 30 participants or more. Similarly, achieving consensus through a Delphi technique requires at least two rounds of data collection sessions and a specific number of participants, typically 8 to 15 individuals.

Additionally, this study seeks to identify direct and root causes based on expert opinions, with data collection concluding upon reaching saturation. Therefore, individuals entrusted with pinpointing potential direct and root causes must have substantial experience pertinent to the relevant topic. Accordingly, this study's methodology centers on engaging occupational safety experts with extensive knowledge and expertise in the causes and prevention of arc flash incidents. Their understanding enables them to offer a nuanced and comprehensive perspective on the causation of arc flash incidents.

As has been stated earlier, narrowing down the potential root causes per incident type is one of the advantages of tailored incident investigation forms. Accordingly, the electrical safety experts who participated in this study were asked to list the potential unsafe actions and conditions that contribute to arc flash incidents, as well as their related human and workplace factors; see Appendix A. In this study, 15 subject matter experts were recruited through collaboration with ELECTRI International. In this study, experts were included if they had at least six years of safety experience working in the electrical construction industry. Safety professionals with six years of experience in the field often hold a managerial position [28]. The experts were presented with study information and consent forms, leading to the question list only after the respondents voluntarily agreed to participate. Participants were free to withdraw from the study at any time. The initial review of collected data indicates that knowledge saturation was reached; no new information could be collected about the topic. Thus, it was recommended to stop collecting data [29]. Accordingly, the collected data underwent comprehensive content analysis. Content analysis facilitates categorizing and extracting meaning from written texts [30,31]. Scholars benefit from content analysis by gaining insights and deepening their understanding of specific issues [32].

Table 1 shows that all participants satisfied the 6-year threshold for experience in electrical safety occupations. Moreover, each participant possessed over ten years of overall experience in the electrical construction industry. Most participants were upper management employees, including safety directors and project managers. Additionally, Table 1 provides information on participants' geographical locations, employment size based on the number of employees, job titles, and the highest degree they received.

Table 1. Participants' general information.

Aspect	Percentage (%)
Geographical Location	
Midwest	60
Northeast	20
West	6.7
Nationwide	13.3
Firm Number of Employees	
10–50	20
51–100	20
101–250	6.7
More than 250	53.3
Years of Experience in Electrical Safety	
6–10	26.7
More than 10	73.3
Job Title	
Safety Director/Manager	46.7
Owner/Safety Vice President	26.6
Other (e.g., Site Manager and Project Manager)	26.7
Highest Degree	
Community College	13.4
BS or Equivalent	33.4
Masters or Higher	13.4
Others (e.g., DOL-Registered Apprenticeship and High School Diploma)	39.8

4. Findings

The participants were asked about actions, conditions, and factors (i.e., human and workplace) contributing to arc flash incidents. Identifying these elements is crucial to creating a tailored investigation protocol. Table 2 shows the identified unsafe actions and their related human factors and workplace factors. Investigators can employ the comprehensive set of actions and factors listed in Table 2 as a systematic guide to initially pinpoint the specific action that caused the arc flash incident. Subsequently, they can further examine and identify the contributing factors that led to the unsafe action. This structured approach enhances the investigative process by providing a systematic framework for unraveling the sequence of events and root causes leading to the occurrence of the incident. For example, if an investigator determines that the failure to test for live energy was the cause of an arc flash incident, the investigators can then investigate the factors associated with this action to understand why it occurred. Possible factors include inadequate training or a lack of arc flash inspection protocol. Similarly, Table 3 shows the identified unsafe conditions and their related human and workplace factors. For example, an investigator identified that the absence of labeling played a significant role in an arc flash incident. The lack of labeling was explicitly categorized as a direct cause of the incident. Referring to Table 3, the investigator concluded that the root cause of the labeling issue was the absence of risk assessment (i.e., a workplace factor). Per NFPA 70E (Annex F), a risk assessment identifies and characterizes workplace hazards [22]. Later, the investigator found documentation for a risk assessment, but the crew supervisor did not implement it. Once more, inadequate supervision (i.e., a human factor) can be pinpointed as the incident's root cause by referring to Table 3.

Table 2. Unsafe actions and their related human and workplace factors.

Unsafe action
PPE-related issues
Improper PPE (e.g., not voltage-related PPE)
Failure to wear/use PPE
Voltage test issues
Failure to test for voltage
Failure to use testing equipment
Failure to use accurate testing equipment
Failure to test for live energy
Working on live equipment without an appropriate LOTO
The wrong tool was chosen for the operation
Others
Human Factors
Risk normalization *
Negative attitude
Lack of awareness
Lack of supervision
Others
Workplace Factors
Inadequate training (e.g., lack of training on how to use PPE)
Lack of PPE
lack of arc flash inspection protocol
Lack of needed tools
Work pressure
Others

* Being complacent about safety hazards, considering them to be a normal part of their work.

Table 3. Unsafe conditions and their related human and workplace factors.

Unsafe Conditions
Outdated equipment
Inadequate guards
Defective tools
Lack or inadequate labels
Inexperienced workforce
Others
Human Factors
Rushing
Inadequate supervision
Others
Workplace Factors
Lack of arc flash risk assessment
Lack or inadequate maintenance
Lack or inadequate training
Inadequate working space
Work fatigue/overworked
No pre-plan or work permit
Others

It is important to underscore that the 'Others' category has been deliberately included to provide investigators with flexibility, enabling them to address any unidentified causes that may arise during an actual incident investigation. This strategic inclusion ensures that the protocol remains adaptable and can effectively capture and categorize unforeseen factors that might be revealed during the investigation process.

5. Discussion

Based on the collected data, utilizing an arc flash incident investigation protocol is now feasible. Figures 3 and 4 show the resulting charts that could be used to systematically investigate an arc flash incident. More than one direct cause and root cause could contribute to an incident. The investigator should first try to carefully examine the incident scene to understand what happened and identify a chain of contributing events, utilizing these two forms. Most importantly, experienced practitioners can modify or edit the factors based on their experience or working environment.

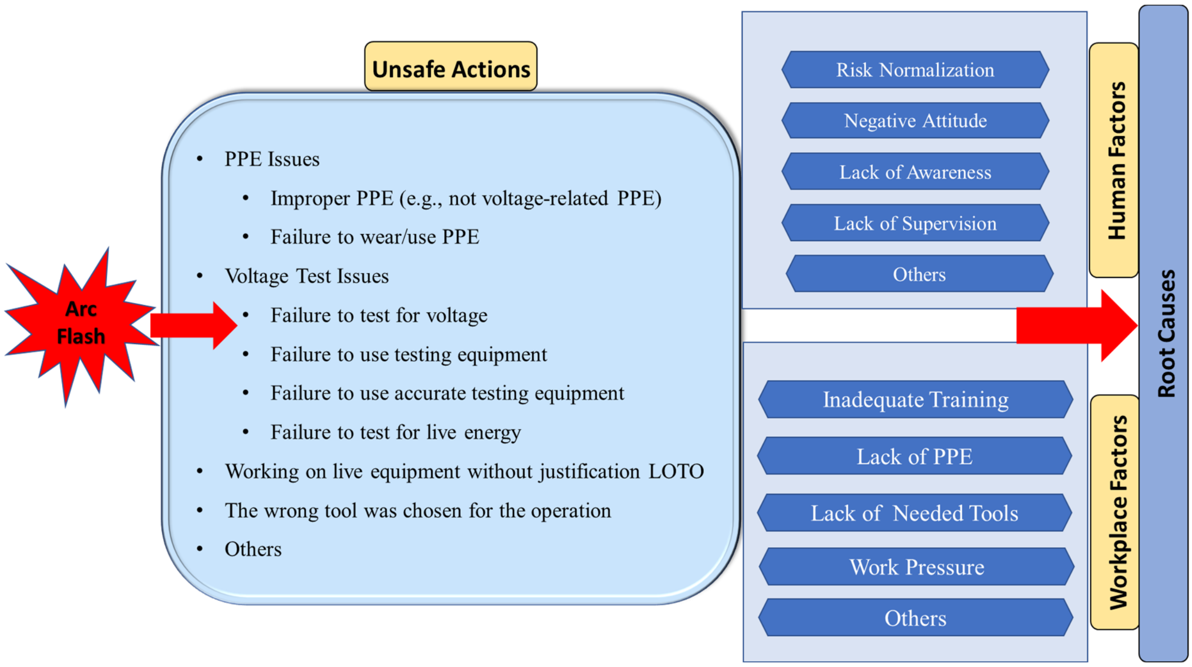

Figure 3. Unsafe actions and their root causes chart.

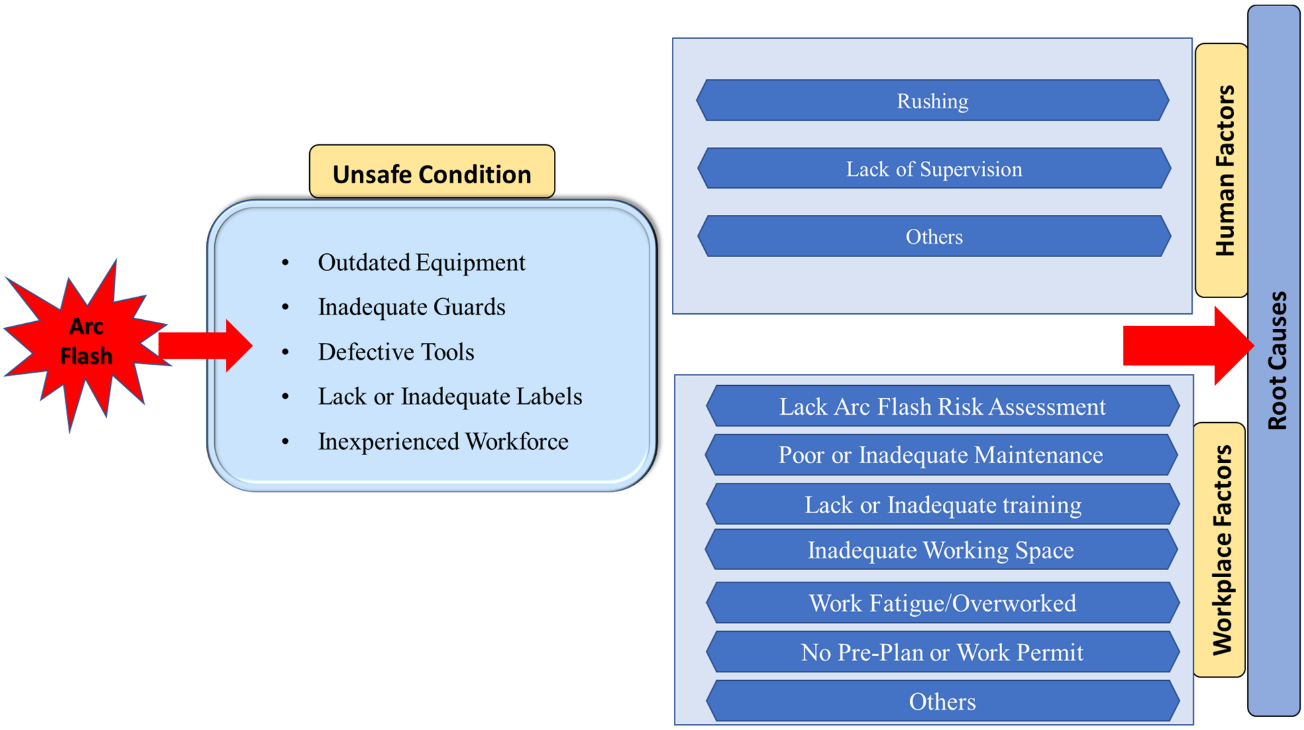

Figure 4. Unsafe conditions and their root causes chart.

The two charts allow safety practitioners to learn about the root causes that may lead to arc flash injuries. Addressing these root causes would prevent future arc flash injuries. This approach focuses on the organizational deficiencies that can be fixed to improve overall safety performance. Based on the investigation results, corrective actions should be suggested, implemented, and monitored to ensure their effectiveness. Addressing the systematic issues that lead to arc flash incidents also prevents the recurrence of incidents stemming from the same root cause. In this case, the root cause could be classified as a generic cause, such as inadequate training and maintenance. It is anticipated that generic causes contribute to multiple unsafe conditions and actions.

Soliciting reliable and high-quality information about an incident is critical to improving learning opportunities. However, how an investigation is conducted often depends on the investigators' experience (i.e., skills and knowledge). Overreliance on investigators' experience leads to biased judgment [33–35]. Adopting a tailored investigation protocol can dramatically mitigate the likelihood of bias and significantly enhance the quality and reliability of the information produced. MacLean and Read (2019) suggested that professional investigators may be biased in their judgments even when using systematic methods [36]. The panel of experts involved in the creation process enables the identification of root causes with greater precision, which, in turn, helps overcome the protentional subjectivity of one investigator. Thus, utilizing tailored systematic investigation protocols is crucial to reduce biases by narrowing down potential causes based on input from several experts.

In the United States, the Occupational Safety and Health Administration's (OSHA) Fatality and Catastrophe Investigation Summaries (FCIS) program investigates fatal and catastrophic incidents. The FCIS program is unique and aims to provide considerable insight into the current deficiencies within OSHA standards and organizations' safety management systems [5]. The Fatality Assessment and Control Evaluation (FACE) program, sponsored by the National Institute for Occupational Safety and Health (NIOSH), is a comparable initiative designed to offer employers strategies for preventing occupational fatalities through comprehensive investigation reports [6,37]. Both programs lack consistency in format and content and should be improved by implementing a well-designed systematic approach [5,6,37]. The tailored investigative process outlined in this study could readily enhance both programs. Furthermore, tailored investigative protocols align well with OSHA's mission to consciously improve their standards since OSHA standards are categorized into subparts based on the direct cause of injury (e.g., fall and electrical). Thus, this study can potentially assist government agencies, such as OSHA and NIOSH in the United States, in enhancing their investigation protocols.

Learning organizations often utilize the acquired knowledge to improve their capacity. A key aspect of safety improvement is to learn from incidents. While several models exist that attempt to improve learning from incidents, there is no existing model that is based on the nature of the direct cause of the incidents. This study illustrates the feasibility of creating such incident investigation protocols. However, it is crucial to follow a systematic approach to ensure that organizations can learn from incident investigation [38]. The Deming Cycle can be utilized to continually improve the suggested protocol. The Deming cycle consists of four stages: plan, do, check, and act [39]. The PDCA cycle encourages continuous improvement and is designed to be repeated continuously to achieve ongoing enhancement. A similar approach has been suggested by Drupsteen et al. (2013) that contains four phases in the learning process—investigation (i.e., Act), the planning of actions (i.e., Plan), intervening (i.e., Do), and evaluation (i.e., Check) [40]. This understanding emphasizes that incident investigation is just one phase among several that must be taken to ensure an effective investigation protocol and the elimination of root causes. After the incident investigation is complete, a list of recommendations should be generated based on the findings of the incident investigation (i.e., the second phase). Subsequently, a plan that entails selecting and prioritizing the most effective and practical recommendations should be developed. This should lead to the development of an intervention plan (i.e., the third phase), for implementing the selected recommendations. Finally, the evaluation phase (i.e., the fourth phase) is initiated, encompassing two levels: (1) assessing the execution of recommendations and (2) evaluating the effectiveness of the actions taken. The evaluation phase should result in enhancements across the other phases, including the incident investigation protocol [40]. The investigation protocol proposed in this paper is no different and should undergo continuous evaluation and improvement rather than being considered a final, inflexible version set in stone. It is important to note that the evaluation stage is rarely implemented, which limits the potential for learning [40]. Furthermore, construction scholars and practitioners are encouraged to utilize other root cause analysis models, such as fault tree, domino theory, and bow-tie, to create tailored investigation protocols and assess their effectiveness in comparison with the SCAT model.

Finally, the multi-employer nature of construction workplaces should be considered. General contractors should invest in improving their subcontractors' safety performance in all possible ways to avoid deviation from their safety policies and culture [41]. Deviation often occurs due to the influence of several factors, such as unfamiliarity with the general contractors' safety culture and the presence of multiple subcontractors in a shared workplace [42]. This deviation highlights the need to establish a positive project safety climate to mitigate the adverse impact of one contractor/subcontractor on others [43]. General contractors play a crucial role in maintaining an acceptable project safety climate, given their financial and operational interests in enhancing it [41]. Among various advantages, investing in site safety will result in fewer disruptions to work production, reduced workers' compensation costs, preserve a positive business reputation, and decreased workers' absenteeism [44]. Thus, general contractors should consider developing and sharing tailored investigation protocols with their subcontractors. They should also ensure the successful utilization of shared protocols. As previously discussed, successful implementation should focus on the four phases of learning from incidents.

6. Concluding Remarks

Preventing incident repetition is the main reason for incident investigation through providing valuable opportunities for acquiring practical knowledge. This can be accomplished by identifying the root causes of incidents. The causes of incidents are often a series of undesired events that occur in a sequence. The series of events could be different based on the direct cause of injuries. Firms should use an incident learning system tailored based on the source of incidents. Tailored incident investigation protocols provide a learning review by examining experts' input about the potential root causes of incidents. Their current use is limited despite the importance of utilizing tailored investigation protocols. It is advisable to initiate the development of tailored investigation protocols for the most common direct causes by following the steps outlined in this study. Simultaneously, firms should continue using the traditional investigation protocol for rare incidents until they become familiar with tailored investigation protocols.

Investigators could exhibit bias when making judgments exclusively based on their experiences. Thus, tailored investigation protocols are crucial in mitigating biases by necessitating investigators to select from a predefined list of direct and root causes. This tailored approach helps minimize subjective influences and ensures a more structured and systematic analysis. By adhering to a predetermined set of factors, the investigation process gains transparency and consistency, contributing to a comprehensive and unbiased examination of the underlying causes. The tailored protocols enhance the reliability and objectivity of the investigative outcomes, fostering a more accurate understanding of the contributing factors. Accordingly, they would help improve learning opportunities and the quality of corrective actions and reduce incident recurrence. In the initial implementation phase, the emphasis should not be on achieving perfection; instead, the process should be viewed as a learning opportunity. Thus, investigators should recognize the importance of continually enhancing the incident investigation form based on insights gained from field investigations.

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Institutional Review Board Statement: This study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board of Lawrence Technological University (Approval Code: 00721 on 4 October 2021).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data are contained within the article.

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Conflicts of Interest: The author declares no conflicts of interest.

Appendix A Study Questions

1. How many years of experience do you have in the electrical construction industry?

    ○ Less than 1 year

    ○ 1–5 years

    ○ 6–10 years

    ○ More than 10 years

2. How many years of experience do you have in electrical construction safety?

    ○ Less than 1 year

    ○ 1–5 years

    ○ 6–10 years

    ○ More than 10 years

3. Based on your experience, list the four most common unsafe actions that often lead to arc flash injuries (Unsafe actions include, but are not limited to, failure to use safety devices, failure to use PPE, and wearing unsafe clothing).
    Most common unsafe action ____
    2nd most common unsafe action ____
    3rd most common unsafe action ____
    4th most common unsafe action ____

4. Based on your experience, list the three most common human factors that lead to unsafe actions associated with arc flash injuries (Human factors include, but are not limited to, stress due to personal issues, inadequate capability, inability to understand instructions, and negative attitude).

Most common human factor ________________________________
2nd most common human factor ________________________________
3rd most common human factor ________________________________

5. Based on your experience, list the three most common workplace factors that lead to unsafe actions associated with arc flash injuries (Workplace factors include, but are not limited to, inadequate supervision, inadequate training, and inadequate maintenance).
   Most common workplace factor ____________________________
   2nd most common workplace factor ____________________________
   3rd most common workplace factor ____________________________

6. Based on your experience, list the four most common unsafe conditions that often lead to arc flash injuries (Unsafe conditions include, but are not limited to, inadequate guards and defective tools).
   Most common unsafe condition ________________________________
   2nd most common unsafe condition ________________________________
   3rd most common unsafe condition ________________________________
   4th most common unsafe condition ________________________________

7. Based on your experience, list the three most common human factors that lead to unsafe conditions associated with arc flash injuries (Human factors include, but are not limited to, stress due to personal issues, inadequate capability, inability to understand instructions, and negative attitude).
   Most common human factor ________________________________
   2nd most common human factor ________________________________
   3rd most common human factor ________________________________

8. Based on your experience, list the three most common workplace factors that lead to unsafe conditions associated with arc flash injuries. (Workplace factors include, but are not limited to, inadequate supervision, inadequate training, and inadequate maintenance).
   Most common workplace factor ___________________________
   2nd most common workplace factor ___________________________
   3rd most common workplace factor ___________________________

9. What is your job title?

- ☐ Safety Manager
- ☐ Safety Engineer
- ☐ Project Manager
- ☐ Licensed/Professional Engineer
- ☐ Superintendent
- ☐ Project/Site Engineer
- ☐ Construction Manager
- ☐ Other

10. Please write your job title ____________________

11. Please select the highest degree that you have earned.

   ◯ DOL-registered apprenticeship

   ◯ Community college

   ◯ BS (or equivalent degree)

   ◯ Master's or higher

   ◯ High school diploma

   ◯ Other

12. How many employees work at your establishment?

   ◯ Less than 10

   ◯ 10–50

   ◯ 50–100

   ◯ 101–250

   ◯ More than 250

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