

Occupational Health and Safety in Kurdistan Region's Construction Industry

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Abstract: Significant issues with health and safety have persisted throughout the construction industry. Historically, one of the riskiest sectors has been construction, especially in developing nations. The Kurdistan Region is one of the worldwide places where such is the case. Workers in the Kurdistan Region's creative industry are not sufficiently knowledgeable about safety and health protocols while building websites. They are unaware of welfare facilities, health and protection control systems, and fitness and safety plans and laws. Fitness and safety regulations are also not followed on construction sites, and even when they are, workers do not use the facilities. Employees in construction are no longer aware of or sufficiently abide by fitness and safety regulations. This article aims to evaluate the level of safety performance within the Kurdistan Region's creative industry and to identify the issues, contributing factors, and safety and fitness-related practices in this field. It also emphasizes the use of structures that raise concerns about safety and health. Eight variables were found to have an influence on administrative center accidents after a thorough review of the literature: There are several factors that contribute to workplace health and safety: management's commitment, workers' involvement, health and protection in agreement documents, rules, procedures, and policies, accident investigation and reporting, health and safety training, conferences, and incentives and disincentives for workers. To prevent workplace accidents and lessen possible damage to building companies, this website may be a helpful resource for promoting comparable research into the significance of occupational safety and fitness management in the Kurdistan Region's creation sector.

Keywords: Construction industry, Occupational health and safety (OHS), Accidents, Hazards, Risk management, Kurdistan Region.

1. Introduction:

The building sector in the United States of America significantly influences both its social and economic growth. It now makes up 6% of GDP, but by 2030 is predicted to reach 14% of the sector's GDP (Perspective and Economics, 2015). According to The European Construction Sector (2016), the construction industry in Europe employs an estimated 18 million people. Regretfully, the building industry is thought to be among the riskiest in the world, with the highest rate of injury (Jannadi and Bu-Khamsin, 2002). The building business has five times the risk of a deadly twist of destiny and 2.5 times the chance of a severe twist of fate compared to the industrial zone (Sawacha, Naoum and Fong, 1999). In the construction business, fatalities occur in around 30–40% of incidents worldwide (Al-Aubaidy, Caldas, and Mulva, 2022). The number of accidents has mostly stayed the same or has even increased recently. As a result, the industry has started taking action to achieve a zero-accident target and has become more concerned

about such problems (Ehnes, 2018). According to Winge, Albrechtsen, and Mostue (2019) and Mora-Serrano, Muñoz-La Rivera, and Valero (2021), the creation region is dedicated to strengthening protection on this area in a strict and comprehensive manner. To enhance creativity inside the future, the building industry must prioritize protection and fitness management. This involves a series of actions aimed at managing occupational risks in this field, such as its creation, monitoring, and control, as well as the use of mitigating and preventive measures. According to Zhou et al. (2012), the goal is to ensure that sports are played safely, with a focus on handling any mishaps or accidents (the goal is to have no injuries).

2. Problem Statement

Erbil, Sulaymaniyah, Duhok, and Halabja are the four governorates that make up the Kurdistan region of Iraq (KRI), which is mostly home to Kurdish people. The Kurdistan Region borders Iran, Syria, and Turkey, all of which are home to populations mostly made up of Kurds.

The construction industry in the Kurdistan Region has grown significantly in recent years due to the region's robust economic growth and the rising demand for residential construction brought about by the influx of many Arab Iraqi professionals and their families. Considering that in 2003, around 15,000 households moved to Erbil and 38,000 families moved to

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Sulaymaniyah from various parts of Iraq (Eric Davis, 2005). Assuming an average of four people per household, the population increase resulting from migration since 2003 has been 4.5 percent in Erbil and 9.4 percent in Sulaymaniyah. Buildings for homes, schools, clinics, and other infrastructure are thus urgently needed in the Region, and their development will cost at least \$5 billion.

According to earlier studies, workers in various professions sustain injuries in various ways (Dudarev, Karnachev, and Odland, 2013). One of the riskiest sectors of the global economy is thought to be the construction sector (Cheng, Leu, Lin, and Fan, 2010). According to Alhajeri (2011), the majority of developing nations often have weak or nonexistent safety rules. Consequently, the present study aims to examine the deficiencies in safety standards within the Kurdish construction sector. According to local industrial associations, there has been a notable surge in the number of deaths in the Kurdistan Region; during the following two years, this rise amounted to 40%. According to the Workers' Voice Organization, 73 workers died while doing their jobs in 2023, with most of the deaths being in the 15–70 age range. The chief of work accident management for the department admitted that there were no safety procedures in place, which put the lives of the workers in grave danger. Numerous incidents, such as falls, fires, electric shocks, mechanical malfunctions, burns, drowning, and other deaths, might result in death. More detailed information about the death toll has been made public in a few different places. In particular, 22 workers perished in Erbil, 19 in Sulaymaniyah, 6 in Duhuk, and 5 in Halabja. Data over the previous ten years, first published by the Workers' Voice group and then by the Workers' Construction group, shows a marked rise in the number of deaths in the construction sector. The yearly data on worker deaths for the year 2024 has yet not been issued by the Ministry of Labor and Social Affairs. The Kurdish region's building sector lacks safety awareness despite the high rates of fatalities and injuries in the area. The research assesses the safety problems in the Kurdish region's building sector by addressing the gaps and concerns found. Research on occupational health and safety is crucial for the Kurdish region's building sector. The response is clear-cut and straightforward: tragic accidents are expensive for families, businesses, and society at large. According to research, lost productivity, human capital, medical costs, transfer costs, management costs, and other related costs are among the costs connected with construction accidents (Feng, Zhang, and Wu, 2015). Because of this and the dangerous nature of the building business, safety has become a major issue.

3. Methodology

Construction safety is mostly dependent on maintaining worker safety, adhering to rules, and lowering accident costs. For a construction firm, the most crucial safety program should consist of a thorough safety plan, in-depth training, PPE, safety signage, regular equipment audits, open communication, and assessment. Researchers searched a number of databases, including PubMed, E-Base, Springerlink, Web of Science, Google Scholar, and the Cochrane Library, to find safety literature for large-scale initiatives. To broaden the scope of the study and find more articles to include, we carefully examined the references of previous research works that complied with our inclusion criteria. The construction industry's large-scale projects are covered in this paragraph. Numerous subjects are covered in this study review, such as the definition, characteristics, causes, outcomes, and advantages of MCP. The many kinds of construction-related mishaps, their root causes, and the essential elements of workplace safety and health management are all covered in this inquiry..

4. Significance of The Study

The significance of this study lies in its examination of the health and safety issues related to the construction sector in the Kurdistan Region. This inquiry will fill up the present information gap surrounding the issue of building. preserving safety procedures, removing any hazards, and lowering the number of accidents. Therefore, reducing workplace accidents is the first and most important step in enhancing safety. Businesses should be encouraged to join pressure organizations and made more aware of the need to prioritize safety. Therefore, understanding and identifying the reasons behind accidents is essential to improving safety. Accidents may be avoided by identifying and eliminating risky conditions and behaviors. Enhancing the health and safety of construction workers has also been linked to better quality, shorter turnaround times, and lower costs for customers and contractors. Furthermore, it enhances working conditions in the general construction sector (Awwad et al., 2016; Zahoor et al., 2016; Ikpe et al., 2007; Agumba & Haupt, 2014). The right of employees to health and safety at work is a global concern, with the construction sector being particularly affected (ILO, 2005). Furthermore, when workers take part in implementing the best safety and health practices, the industry's reputation is improved. This is especially important in developing nations like Kurdistan, where development initiatives need a lot of physical effort. Nevertheless, it is noteworthy that prior safety research has not addressed the behavioral and psychological aspects of safety. It's critical to comprehend the factors that lead to risky conduct in some personnel.

Furthermore, it's critical to comprehend the variables that might influence an employee's inclination toward safety. With the help of these answers, management can comprehend and forecast how workers would behave in potentially dangerous circumstances. Furthermore, placing a strong focus on the behavioral and psychological aspects of safety might help to change the recruiting process by only choosing candidates who meet the requirements for the position. Sadly, there hasn't been much thought given to the location of fire barriers in the building sector. It's critical to understand that beginners are often the source of workplace accidents, which has a substantial financial effect on management, communities, and even governments. This investigation's goals are to evaluate the Kurdistan Region's construction industry's safety record and pinpoint the key variables influencing safety. This is a result of the absence of industry-relevant safety and health regulations in the workplace.

5. Literature Review

It is imperative that construction sites prioritize worker safety, especially when it comes to personal safety. Safety attitudes have a significant impact on a project's effectiveness; yet, worker-intensive projects have a risk of accidents during construction. Employee safety is ensured by adhering to safety procedures. It takes more than only keeping workers from becoming ill or hurt at work to ensure workplace safety (Yaacob M., 2012). As the most valuable resource, workers' safety is at the center of this complicated issue. Precautionary measures such as providing protective gear and training may save expenses associated with employee health and insurance, as well as the cost of recruiting temporary labor to cover for injured staff. The goal of occupational safety and health (OSH) is to protect workers' health, safety, and well-being while they engage in approved activities (Abdollah, Tzuaan, and Sivaji, 2013). In order to provide a safe and healthy work environment for both men and women, the Occupational Safety and Health Act of 1970 was created with legislative authority. To achieve this, adherence to legal regulations, encouragement of efforts to maintain a secure workplace, and provision of resources for studies, data collection, instruction, and training in the area of occupational safety and health are all necessary (Abdollah et al., 2013). The number of deaths and accidents is still remarkably high in many nations, even after stricter safety and health rules were put in place. Economic success in a nation is mostly determined by the quantity of projects required to accomplish its developmental objectives. According to researcher Phoya (2012), the construction sector plays a significant role in the economy of many nations and is often seen as a catalyst for economic progress,

particularly in emerging nations. Owing to its labor-intensive nature, the construction sector offers job opportunities for those with varying levels of competence, including unskilled, semiskilled, and skilled laborers. According to researcher Bhole (2016), adhering to safety and health protocols at work may save expenses by preventing expensive litigation and minimizing injuries, in addition to raising employee happiness and productivity. Construction businesses may show their workers thanks and appreciation by putting safety and health first. Additionally, by adhering to strict safety and health requirements, businesses may increase their productivity in meeting deadlines and building a favorable reputation with their clientele. Previous studies have shown that the construction business is still thought to have a high accident rate, even in industrialized nations. Furthermore, from 2003 to 2010, the construction sector in New Zealand was accountable for more than 12% of non-fatal injuries (155,566 injuries), according to (Ghodrati, Yiu, Wilkinson, & Shahbazpour, 2018). It is significant to note that over these seven years, only 7.8% of workers were working in the construction sector. Therefore, in order to improve safety and lower the frequency of accidents and deaths in the construction sector, a national strategic plan is required. To efficiently gather data on injury occurrences and major events, businesses are required under the Occupational Safety and Health Act of 1970 to monitor, maintain, and archive the records of illnesses and injuries connected to the workplace. On the other hand, according to Drew (2014), a lot of businesses lack substantial, uniform, and adequate systems and procedures for reporting accidents or injuries that occur at work. Ultimately, after an accident or injury, important information on employee behavior cannot be inferred. According to SchulTz (2012), the ability to anticipate workplace accidents may both avoid and lessen their frequency. For realistic and successful ways to improve safety and health in the construction industry as a whole, the ability to anticipate safety concerns is essential. By emphasizing the behavioral components of safety, supervisors and law enforcement can predict workers' actions in potentially dangerous circumstances. Furthermore, the key determinants influencing safety performance in the construction industry in developing nations are not thoroughly investigated, and there is presently no uniform safety standards framework that addresses this sector (Priyadarshani, Karunasena, and Jayasuriya, 2013). This problem is also present in the soon-to-be Kurdish Region. The goal of this inquiry is to determine the important factors influencing safety performance in the Kurdistan Region's construction sector in order to close this knowledge gap. By identifying these crucial elements, the importance of

safety performance may be better appreciated, which will enhance safety regulations in the Kurdistan Region's building sector..

5.1 Rates of Fatalities and Accidents at Developed and Developing Regions:

Many different safety variables may affect how safe building sites are. Sadly, despite being thought to carry a significant level of risk, several studies have shown that the construction business lacks safety (Michaud, 2017). Although many efforts have been made to rectify the appalling record, more workable solutions to this problem have not been created (Recarte Suazo and Jaselskis, 1993). The building sector significantly affects a nation's capacity to grow its GDP, especially in emerging nations. In order to meet the rapidly increasing demand, developing countries need to invest heavily in infrastructure. Because of this, the construction sector needs a lot of workers to achieve these objectives. These establishments include residences, places of worship, medical facilities, hospitals, schools, and other places of community significance. Priyadarshani et al. (2013) claimed that around 350,000 people are killed annually in job-related accidents, despite the fact that there is no accurate way to track occupational injuries worldwide. By using the proper safety measures, real estate

developers and project workers may lower their workplace accident rates (Adane et al., 2013). According to Awwad, El Souki, and Jabbour (2016), the main reason for subpar safety performance in developing nations is the inadequate implementation of laws or regulations. In underdeveloped nations, the number of construction-related deaths is three times higher than in industrialized nations. The majority of poor nations lack regulatory control, which is the main cause of this disparity. This idea is supported by Suazo and Jaselskis's (1993) thorough analysis of safety regulations pertaining to building in industrialized and developing nations. Because of this, developing nations may learn from the techniques, tactics, and management frameworks used by wealthy nations to lower the incidence of industrial accidents. Though studies evaluating or contrasting the safety performance of developed and developing nations are scarce (Suazo and Jaselskis, 1993; Koehn et al., 1995; Hamalainen et al., 2006), occupational safety and health has been a hot issue in scientific study. As Table 1 shows, there are notable regional differences in the incidence of injury-related occurrences. The World Bank's categorization is adhered to by Table 1's regional divisions. Table 1.1 shows that Singapore has much lower accident and death rates than South Africa...

Table.1: Rates of Accidents and Deaths by Region

	Region	Death rate (per 100,000 employees)	Rate of accidents (per 100,000 employees)
1	EME	4.2	3240
2	FSE	12.9	9864
3	OLA	21.5	16434
4	SSA	21.0	16012
5	LAC	17.2	13192
6	MEC	18.6	14218
7	Singapore	9.8	7452
8	South Africa	19.2	14626

""SSA" and "Sub-Saharan Africa" (which includes South Africa); "OIA" and "Other Asia and Islands" (excluding China and India); "LAC" and "MEC" stand for Latin America and the Caribbean; and "OIA" and "Other Asia and Islands" are meant for developed market economies like the United States and Hong Kong. Using (W. Bank, 2014) as a model

The above data on safety construction in different locations indicates that developing countries have a low degree of compliance with safety regulations. Additionally, even when rules are followed, they are often lacking, misaligned or out of date. This research is

dedicated to the Kurdistan Region and attempts to assess the safety of the country as regards occupation. The research on pertinent materials led to the conclusion that the Kurdistan Region is considered a developing country in the construction field..

5.2 Occupational safety and health safety

The Higher Education Institutions (OHS) Regulation Law regulates the rights, powers, and responsibilities of workers, employers, and the government in an effort to enhance the safety and health conditions that exist now and to guarantee safety and health at work. These

regulations are broad guidelines that include all institutions, both public and private, as well as employers and their employees. They also apply to interns and trainees, as well as all workers, regardless of the nature of their job. The mostly Kurdish districts of Erbil, Sulaymaniyah, Duhok, and Halabja are all part of the Kurdistan Region (KR). Kurdistan has made great strides in a number of sectors, and it is presently in a transitional period to meet the environmental, health, and safety requirements set by the World Health Organization (WHO) (Kurdistan Regional Government, 2020). The Health and Safety Department, which is in charge of providing a secure and healthy work and learning environment for all staff members, students, and visitors in the Kurdish area, was merged into the Ministry of Higher Education in 2010. It is a component of the quality assurance efforts of the research process. The directorate's duties include overseeing the university's general health and safety in addition to developing and enforcing policies and procedures (Kurdistan Regional Government, 2022a). Maintaining current policies, procedures, standards, and objectives while keeping up with the newest advancements presents a significant challenge for occupational health and safety. Regulating and standards related to occupational health and safety are among the many issues that have not been thoroughly examined in the area of occupational health and safety in the Kurdish region.

5.2.1 The safety and health system in the Kurdish region is dedicated to occupational safety and health.

The Kurdistan Region is well known for its explosive development in a number of fields, like as infrastructure, industry, and housing. Numerous foreign corporations and regional associations have set up shop in the Kurdish area of Iraq. The number of diseases, mishaps, and workplace deaths has grown along with the number of local and foreign workers. Iraq established its first health and safety division in 1964, under the Ministry of Health. The Institute for Health Protection was also established by the Ministry of Labor and Social Affairs (MLSA). The National Center for Occupational Safety and Health was established in 1981 as a result of the merger of the two organizations. It was tasked with promoting occupational safety and health and had formal affiliation with the Ministry of Health. The Iraqi National Center for Occupational Safety and Health was acknowledged as one of the most important and distinguished institutions in the Middle East during this period, and safety and health services for the country's vocations saw a tremendous expansion. The National Center for industrial Safety and Health was moved from the Ministry of Health to the Ministry of Labor and Welfare (MLSA) in 2004, marking a momentous change in the history of industrial safety. In the Kurdistan

Region, the process of moving occupational safety and health under the jurisdiction of the Ministry of Labor and Social Affairs (MLSA) was delayed until 2009. The labor force of the Kurdistan Region may be broadly classified into two sectors: the private sector (which includes non-governmental work) and the public sector (which includes government employment). Government Law 150 of 1987, which was passed in Iraq, classifies all workers in the public sector as civil servants and subjects them to the Civil Service Law. Employees and laborers are governed by laws pertaining to employment, safety and health, and social security since they work directly in the private sector (Articles 71, 39, and 22). Employees in the private sector are divided into two categories: official and informal. The phrase describes workers who have official documents from the General Directorate of Labor and Social Security and are employed by factories, corporations, or other private entities. Because of this, individual workers or their families are protected by social security and labor regulations in the case of an accident, disease, or death, unlike informal workers who have a single employer. Because no study has been done on these workers and we don't know how many of them there are, this presents a serious problem. Therefore, occupational health and safety only protects people who are lawfully engaged in the private sector.

5.2.2 The Kurdistan Region's Occupational Health and Safety Department:

The Occupational Safety and Health Department was controlled by the Kurdistan Ministry of Health before to 2013. The General Directorate of Labor and Social Security of the Ministry of Labor and Social Affairs of the Kurdish region now houses the Occupational Safety and Health Department. The six occupational safety and health units and committees that make up the department have their headquarters located in the following areas, according to the Ministry of Labor and Social Affairs (2024): The following labor directories are available: Jamian Employment and Vocational Training Directory, Soran Labor and Vocational Training Directory, Zakho Vocational Training Directory, Erbil Labor Directory, Sulaymaniyah Labor Directory, Tuhok Labor Directory. In June 2021, the General Directory of Social Security delineated the principal responsibilities of the Occupational Safety and Health Committees. These duties include visiting industrial facilities on-site, recommending safety precautions for both employers and workers, and keeping track of incidents involving accidents, deaths, and injuries connected to the job (the Ministry of Labor and Social Affairs, 2024).

5.2.3 The responsibilities of the Kurdistan Government and organizations employers in regards to occupational health and safety.:

Sulaymaniyah's municipal government established a Safety Committee for employees to make sure companies abide by rules pertaining to occupational safety and health. A representative of the Sulaymaniyah Labor and Social Security Department leads the group, which also includes a number of members from the municipality, the Sulaymaniyah Trade Union, and the Health Department. When the Safety Department and the Sulaymaniyah administration employ a sizable labor force, the committee is also empowered to evaluate compliance at industrial sites (ILO, 2022). In 1992, the General Federation of Trade Unions was established in Kurdistan. He committed his life to ensuring the health and safety of laborers in a variety of sectors, including textiles, oil, power, transportation, building, and agriculture. The General Federation of Trade Unions has offices in Erbil, Sulaymaniyah, Duhok, Solan, Halabja, and Ghamian, among other places in the Kurdistan Region. It is widely acknowledged as the largest employee advocacy group in the area. The yearly fluctuation in the number of unionized members is mostly due to the regular payment of dues. Membership in the organization is only retained by individuals who regularly pay their dues. The committee in charge of the association's financial audits releases the membership number. There are 28,696 firms in the Kurdish area that get social benefits, according to figures from the General Directorate of Labor and Social Security. 83,057 people work for registered businesses overall; they are split between Erbil (11,545), Sulaymaniyah (11,255), and Dohuk (6,896) (ILO, 2022). It was previously indicated that a variety of union members who represent workers take part in health and safety-related activities. There is no strategy for inspection operations since the organization simply gathers relevant data and reacts to industrial accidents and deaths. There were no documented infractions in 2020 for the governors of six Kurdish areas. Nonetheless, it's critical to acknowledge that occupational injury reports are erratic and untrustworthy. The system's flaws are apparent in the general undervaluation (ILO, 2022). Thirty-five persons lost their lives while working in the Kurdistan Region and the six governorate districts between 2016 and 2020. In a span of four years, Duhok had 17 deaths, with 10 being the greatest number in a single year. These numbers and details remain unknown. The Sulaymaniyah Trade Union's statistics showing 10 deaths in the first three months of 2021 and 35 fatalities in 2020 serve as examples of this. Furthermore, reports of uneven reporting procedures have come from the General Directorate of State Labor Inspection and Safety's Occupational Safety and Health Department.

Seven deaths were reported in 2018 and ten in 2017 according to these figures (the Ministry of Labor and Social Affairs, 2024).

5.2.4 The responsibilities of the Ministry of Higher Education and Scientific Research in the field of occupational safety and health in the Kurdish region:

The Ministry of Higher Education and Scientific Research oversaw the establishment of the Health and Safety Department in the Kurdistan Region in 2010. Ensuring a safe and healthy work environment for all workers, students, and visitors is their main goal. The organization is in charge of managing a thorough approach to university occupational health and safety (OHS). This entails developing, improving, and putting into practice policies and processes to guarantee that pertinent legal requirements are met. It is important to remember that Kurdistan has 14 state institutions and 19 private universities in total (Kurdistan Regional Government, 2022a). The Public Universities Health and Safety Director is in charge of occupational health and safety. Each college has established a health and safety committee and chosen one representative from each department to serve on the committee in order to take on this responsibility. OHS is a constituent of the private school sector. There is a committee for each college, made up of students from all the colleges. The Health and Safety Committee is committed to ensuring a workplace free from illness or injury based on these core principles. More precisely, the Public University Council and the Private University Unit are responsible for the following tasks: 1. Prevent occupational illnesses and injuries; 2. Keep your workplace safe; 3. Guarantee the security of your workspace; 4. Offer health and safety instruction to staff, visitors, and students. Salahaddin University's Safety and Health Department is in charge of making sure that all staff members, students, and visitors are safe and healthy. The main objective of a group of seasoned professionals who handle workplace health and safety is to avoid illness and accident-related circumstances. Employees may get training in fire safety, laboratory safety, hygiene, injury prevention, and accommodating people with special needs via the Ministry's Central Directory of Health and Safety and the University Health and Safety Directory. Furthermore, Salahaddin institution (2024) reports that the community and the institution work together in the areas of environmental preservation and safety.

5.3 Prior researches on workers' safety practices related to occupational health and safety:

As was already established, it is typical for safety and health procedures to be poorly followed in projects. Numerous studies have been conducted to address health and safety issues, particularly as they relate to

construction sites (Koehn et al., 1995; Yorio and Watcher, 2014). Table 2 provides a summary of a thorough analysis of the literature on the difficulties in

obtaining high performance in terms of health and safety. Prior to starting to create workable remedies, it is essential to comprehend the root reasons of the issue.

Table.2: Identifying issues related to health and safety

Authors	Safety and health concerns
Koehn et al. (1995)	Concerns were centered on the stressful jobs, lack of awareness or knowledge among employees, and poor institutional structures.
Tam et al. (2004)	Personal protective equipment (PPE) shortages, unconventional safety requirements, a lack of awareness or understanding of these regulations, inadequate training, and a reluctance to invest money in safety measures were among the challenges..
Toole (2002)	Issues documented included insufficient training, lack of focus on safety, lack of equipment, poor technology, incorrect procedures, hazardous working conditions, lack of respect for safety, and negative attitudes towards safety.
Haslam et al. (2005)	Topics discussed included project management, safety, and construction, as well as the impact on clients and the economy.
Choudhry et al. (2008)	The behavior can be altered by lack of knowledge, which is characterized by insufficient information regarding safety and health. This can cause people to disregard safety regulations and harbor a negative attitude towards health and safety. Healthy and hazardous workplaces can also have an effect on behavior. Additionally, employees may lack the necessary health and safety knowledge or experience that causes them to fail to recognize hazardous or unhealthy conditions in the workplace.
Hadjimanolis & Boustras, (2013)	This problem is caused by a variety of causes, such as inadequate policies, a lack of training in health and safety, a lack of dedication to the health and safety organization, the educational background and job satisfaction of employees, and their attitudes about their jobs.
Idubor and Oisamoje (2013)	It is linked to a number of problems, including low levels of education in the workforce, a broken legal system, high unemployment, cultural problems, a lack of training, limited budgets, and a lack of managerial commitment.
Smallwood (2013)	The issues noted are thought to be caused by a number of factors, including poor worker engagement, lack of understanding of dangers and hazards, lack of supervision, lack of health and safety training, overtime, and the industry's preponderance of small contractors.
Umeokafor et al. (2015)	The reasons of these problems include a lack of government support, a dismal informational system, quick economic and technical advancement, cultural influence, faulty legislation, pervasive bribery and

	corruption, a defective judicial system, severe punishment, political scheming, and a shortage of trained labor.
Awwad et al. (2016)	Several problems have been noted, such as the prevalence of subcontracting, inadequate training in health and safety, low public awareness of health and safety, ineffective laws and regulations, a lack of management commitment, a dearth of participants in health and safety, a shortage of personal protective equipment, and inadequate oversight of health and safety procedures.
Choudhry & Zahoor (2016)	Employee risks are addressed by health and safety training. Safety concerns are a typical topic of discussion in health and safety meetings. It's important to keep in mind, however, that contractors are not required to have a safety and health plan in place prior to work commencing.
Zahoor et al. (2016)	Issues include minimal employee engagement, inadequate training, and a lack of health and safety provisions in contract papers.

In addition, Table.3 indicates 8 health and safety indicators and corresponding practices that were discovered by Choudhry and Zahoor (2016).

Table.3: Eight safety and health aspects and methods.

Factors	Practices
Management's commitment to Health and Safety	The company's health and safety are of more importance to the management than success per se; High levels of tension are experienced by employees, and time management is reliant on the company's security and well-being; Other workers take part in routine tasks linked to health and safety; The business encourages worker health and safety...
Involvement of workers	Employees pay close attention to health and safety procedures and rules; Employees respond forcefully to any violation of these regulations by coworkers; Even without supervision, people continuously follow a safe and healthful work environment.
Health and safety in contract documents	Under the agreement, the contractor must create a safety and health policy for the project. Employees are covered. The contractor must create a plan of the site that takes into account safety and health concerns prior to beginning the job.
Regulations, guidelines, and directives concerning health and safety	The company creates health and safety policies that follow health and safety regulations; it prepares and implements safety analyses on the job site and administers operation-specific first aid supplies; it carries out routine health and safety inspections and standard physical examinations of its staff.
Accident investigation and reporting	having a systematic system in place to look into and record accidents; Every mishap is consistently reported and documented; conducting inquiries to identify the fundamental reasons behind mishaps.
Training for Health and Safety	Health and safety requirements are covered in obligatory training that is required of all new hires. All staff also complete monthly refresher courses to make

	sure they are complying with the rules. The name, title, and responsibilities of the employee in charge of health and safety are clearly demonstrated by the organization's structural organization, and health and safety signs and posters are strategically placed in the workplace to ensure that workers are knowledgeable and perceptive. Additionally, Subcontractor employees receive health and safety instruction...
Health and Safety meetings	Hold weekly meetings dedicated to discussing safety and health issues; these also serve as a forum for safety and health concerns in all projects and pre-construction discussions; another purpose of these meetings is to actively participate in these discussions with subordinates..
Workers' Incentives and disincentives	Offering incentives to employees who follow safety guidelines while carrying out their jobs; punishing and educating those who break health and safety rules.

5.4 Types, causes and prevention of accidents at construction workplace

According to research by Lingard (2013), the construction sector in affluent nations employs 6%–10% of the labor force overall, but it also causes 25%–40% of deaths. Approximately 802 people lost their lives in the US construction business in 2010, which employed 5.5 million people. Chi and Han (2013) state that these deaths account for 17% of all injuries sustained in the nation's sectors. In contrast to other sectors, the rate is around three to six times greater in developing nations (Cokeham & Tutesigensi, 2013). According to researchers Gurcanli and Mungen (2013), the Turkish construction sector claims 108,000 worker deaths annually. Furthermore, according to Cokeham and Tutesigensi (2013), less developed nations do not publicly disclose accident-related data. This implies a lack of dedication on the part of regions, businesses, governments, and industry. Research has indicated that various scenarios can lead to accidents: an individual may fall from a considerable height, become entangled in something, be struck by something, be electrocuted, be struck, experience respiratory failure, inhale toxic substances, or fall from a comparable height (Chowdhury et al., 2008). Of the 1,117 incidents that

happened in Turkey, researchers Gurcanli and Mungen (2013) found that 54.1 were caused by falls, 12.9% by things that fell or were hurled, 9.9% by building collapses, and 7.5% by electric shock. According to Cockerham's team (2013), the most frequent causes of accidents include falls, slips, trips, and physical injuries. Furthermore, there are differences in accident rates based on the kind of job, the number of workers present, and the geography. According to Ottman (2012), falls, collisions with objects, fires, malfunctioning equipment, explosions, and injuries from earthmoving vehicles are the main causes of accidents. 70% of the problems were caused by the team or employees, 49% by workplace issues, 56% by equipment failures (including PPE), 27% by the suitability or condition of the equipment, and 84% by issues related to risk management, according to Haslam's study from 2005. Furthermore, it was noted by Othman (2012) and Hamid, Abd Majid et al. (2008) that inadequate health and safety training, faulty building techniques, worker inattention, and a lack of safety assessments are some of the contributing factors to this problem. The characteristics that affect construction accidents are presented in Table 5.5. These variables are thoroughly discussed and categorized in the next subsections. Factors influencing accidents at construction site.

Table.5: Factors at construction sites that contribute to accidents'.

Factors	Sub-factors
Community	Social concerns, economics, education and training, development of culture, race and ethnicity, social support, and environmental effect are all factors.
Organization	Information management, task and project planning, resource management, agreements and subordinates, policies and procedures, environment and culture, roles and hierarchy, etc.

Work group	group norms and attitudes, cooperation, and interaction.
Site conditions	hazardous operations, hazardous environments, welfare services, climate, stage of construction, and machinery.
Individual factors	Age and experience, competitiveness, aptitude and competence, substance misuse, unintentional behaviors, perception and attitude, and psychological traits.
Contractor	Subcontractor atmosphere, subcontractor rate, size, interaction, incentives, experience, and competence.
Supervision	Effective enforcement, safety, and health and safety-based supervision, communication, and performance pressure.
Project management	Safety and health leadership, participation, communication style, ability, feedback and review.

(Source: Khosravi et al., 2014)

5.5 Accident Causation Models

When one or more parts are faulty, an accident occurs. Scientists started looking at the reasons behind construction mishaps as early as 1960. Since then, a wide range of hypotheses have been put up in various literary works and other sources addressing the origins of catastrophes. You will see a clear trend if you look at the changes in accident causes from 1961: the models have become increasingly complex (Li and Poon, 2010). A hypothesis of accidents has been developed by University of Manchester medical professor James Reason. A model that divides the causes of accidents into three categories—the immediate work environment, organizational structure and procedures, and hazardous behavior—was presented by Reason (1997). By accomplishing a goal, the approach aims to bring human error into the workplace. This theory centers on the importance of the environment or settings in which an individual strives to undertake behaviors that are meant to generate a result or mistake, according to researchers Elliott, Page, and Worrall-Carter (2012). The Theory of Reason's main strength is in its focus on the environment or system that surrounds the event. Accidents are classified by reason into two groups: those that impact individuals and those that impact organizations. Organizational accidents are defined by Reason as situations in which teams, people, or local events inside the company actively fail to meet expectations, paired with underlying circumstances brought on by things like cultural impact or managerial choices (Reason, 1997). Prior to Henry's death, Petersen's 1971 popularization of the multiple cause theory—which was distinct from the domino theory—had a profound effect on scientists (Hamid, Majid, & Singh, 2008). According to Heinrich Domino's idea, there is only one cause of an accident. According to the many cause hypothesis, environmental and behavioral variables are among the many random combinations of influencing elements that lead to

accidents. This theory stems from his conviction that there are many factors that contribute to an accident, such as a careless attitude toward one's responsibilities. Identifying as many of these factors as you can is crucial while conducting an accident investigation. According to Petersen, the main reasons for accidents are unsafe conduct and forbidden circumstances. According to Taylor, Easter, and Hegney (2004), accidents may be attributed to a variety of factors that lead to risky conduct and deplorable circumstances. A multiple-cause approach may be used to identify context-specific accident causes (Abdelhamid and Everett, 2000)..

5.6 System thinking (ST)

The system is represented by a diagram when using systems thinking to solve an issue. Our basic method of thinking is changed by the concept of systems thinking. The strategy works well because it emphasizes the many parts of a system and how they interact with one another. One way to improve the objectivity of safety and health concerns is to use systems thinking. It may also distinguish between the multiple related causes and consequences that a system has. In contrast to the conventional approach of answering a research issue, this makes it easier to investigate other angles and answers. The linear method used in traditional problem-solving techniques concentrates on a single direct link between cause and effect at a particular point in time. Subsystems and systems themselves are dynamic entities made up of many interactions. These relationships lead to complicated challenges that are challenging to resolve, as do the interactions between clients, professionals, and workers in the construction business, as well as environmental changes. Numerous research in the area of construction management are typified by the use of straightforward methodologies, which have an impact on the findings of these investigations. Senge (2006) contends that the problem cannot be fully resolved by using just straightforward linear solutions. Rather, the

focus ought to be on using the system and understanding its architecture. Systems thinking produces an adjustment in the way issues are treated within the construction sector, rather than treating safety and health concerns as distinct entities. We must take into account the concept's broader context and acknowledge the presence of various dimensioned thinking skills inside the framework in order to completely understand the idea of systems thinking. These elements include mental models, personal mastery, group learning, and the development of a common goal that encompasses the system as a whole, according to Senge (2006). This makes problems easier to solve and helps find possible roadblocks along the way...

5.6.1 Systems Thinking applications in Health and Safety Studies

Construction workers are vital to the industry, and physical labor is vital to projects in developing nations.

The need for longer workdays may be the cause of the rise in deaths and injuries. Employee habits and healthy activities may make this challenging procedure easier (Masood et al., 2014). Consequently, mishaps at work might result in property damage. The concept of systems thinking views challenges as holistic in nature, analyzing and evaluating the interconnections between the system's constituent parts. Hence, in contrast to other alternatives, it provides better and more reliable outcomes. Systems thinking is linked to methodical methods for lowering the amount of accidents, as opposed to discrete human acts. Numerous research have shown a connection between building and system thinking (stress and strain) and health. Table 6 lists and provides an overview of earlier studies and initiatives that have used systems thinking to advance health and safety.

Table.6: System Thinking in Research on Health and Safety (Summary)

Author	Year published	Journal name	Method	Findings
Goh et al	2010	Safety Science	Case study	It shows how to use causal loop diagrams and systems thinking to illustrate how the case study participants dealt with outside factors that contributed to the absence of a culture of health and safety.
Leveson	2011	Safety Science	Review	A theoretical framework based on systems thinking has been presented, arguing that the methods currently used to analyze accidents and draw conclusions are limited.
Chi and Han	2013	International Journal of Project Management	Quantitative	Using a systems theory approach, the relationships between the primary risk factors linked to accidents and injuries and the accident components were investigated.
Goh et al.	2014	Accident Analysis and Prevention	Review	An increasing number of research on health and safety have shown an interest in using systems thinking..
Watcher and Yorio	2014	Accident Analysis and Prevention	Quantitative	The analysis showed that the relationship between safety and health is significantly impacted by employee engagement..
Yorio and Watcher	2014	Safety Science	Quantitative	It has been investigated how well health and safety management techniques may lower accident rates across a range of sectors..
Reiman and Rollenliagen	2014	Accident Analysis and Prevention	Review	It was acknowledged that there are theoretical barriers to comprehending and putting into practice a health and safety culture as a system idea; in order to address health and safety, this notion requires a system's viewpoint..

Bas	2014	Accident Analysis and Prevention	Quantitative	To improve the safety and health of construction workers (OSH), a combined methodological approach combining the Quality Function Deployment (QFD) and the 0-1 Knapsack Model is offered in software testing and system thinking.
Leveson	2014	Reliability Engineering and System Safety	Quantitative	A process for locating system-specific leading indicators has been put out in an effort to aid in the creation of a risk management framework..
Goh et al.	2015	Accident Analysis and Prevention	Grand theory and interview	Eight construction health and safety archetypes have been developed by the use of a methodical methodology and an awareness of the interactions between various factors..
Saurin	2016	Accident Analysis & Prevention	Qualitative	Using a comprehensive approach, complex relationships between inspection agents have been found..

6. Results and Discussion:

The findings point to the need for improved rule and regulation enforcement as well as more attention to the health and safety of construction workers in the Kurdish area. In order to avoid potential risks to construction companies and to prevent accidents that may occur during the building process, this page is meant to serve as a resource that encourages further research regarding the significance of safety and health in the Kurdistan Region's construction industry. Furthermore, systems thinking recognizes the intricate relationships between many elements that might result in illness or tragedy. Systems thinking may assist identify hazards in the actual world, which can then lead to long-lasting change, the prevention of illness or damage, and eventually beneficial consequences on business outcomes....

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