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A Comparative Study of Occupational Safety and Health (OS&H) Regulations in United States, United Kingdom, Australia, South Africa, and Oman

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Abstract. This article identifies the gaps in OS&H regulations in Omani construction using a critical review and analysis of relevant literature. Four countries United States of America (USA), United Kingdom (UK), Australia (AUS), and South Africa (SA) were then compared to Oman in relation to selected regulations. The study reveals fall from a height is one of the main causes of accidents in different sectors in Oman however there are no specific regulations that cover this cause of accidents in detail. The only regulation which applies to the “fall from a height” is the regulation of OS&H, issued by the Ministry of Manpower. Overall, the whole regulations applicable in Oman shows that although the term fall, appear several times in the regulation, the full spectrum of the fall protection is not covered in detail. The provision of chemical hazards in Omani regulations is not of the standards as adopted in the USA, UK, AUS, and SA. There is limited information for the regulated to support adequate compliance. While the term “scaffolding” was not found in the current regulations enforced in Oman, the term “ladder” was, however, used at five different instances in the regulations which obviously cannot substitute the scaffolding.

1. Introduction

Poor occupational safety and health (OS&H) results in an economic burden of 4% of the total world Gross Domestic Product (GDP) – [1]. OS&H is one of the projects and business performance indicators [2] and has been reported a poor in the construction industry in many studies and countries (Occupational Safety and Health Administration (OSHA), 2017 for America [3]; Health and Safety Executive (HSE), 2018 for the UK [4]; Construction Industry Development Board (CIDB) 2020 for SA [5]; and Al-Anbari et al. for Oman [6]).

Literature demonstrates that effective OS&H regulations and their implementation are some of the main factors in achieving improved safety performance. For instance, a research which reviewed a total of 164 journal articles published from 1990 to 2017 reveals that 16% of these articles looked at the role of legislation in design for safety implementation [7]. Similarly, the study conducted by Simpson and Sam [8] which aims to investigate the contemporary strategies for Health and Safety (H&S) management practices at the construction sites in Ghana reveals that that most of the construction sites that display improved safety performance adopt either one or a combination of



mandatory OS&H standards. On the other hand, the traditional project parameters in the form of cost, quality, and time are still perceived to be substantially more important than health and safety.

While effective OS&H regulations and their implementation are one of the main factors in achieving improved safety performance, the relevant regulations need to meet certain requirements and require a lot for optimum efficiency. The OS&H regulatory environment of Oman has been criticised for its effectiveness [9].

The background so far shows that there is the need to examine the Omani OS&H regulatory environment. Consequently, the overarching aim of this paper is to investigate the gaps in the OS&H regulations applicable to both employees and employers in Oman and suggest areas for improvement. In doing this, it reviews selected regulations and compares them with the regulations in four countries such as the USA, UK, SA, and AUS, and provide suggestions for improvement. This approach would enable salient points in relation subject and adequately address the aim of the study. Despite the extant research on OS&H in Omani construction, there is a dearth of a comparative study that goes into the level of detail that the current study does [10].

The review covers in this research include the existing literature on OS&H regulations in Oman with the following key aspects.

- A brief comparison of Oman's OS&H regulations with USA, UK, AUS, and SA regulations. As discussed in the first section, UK, USA and AUS countries have significantly improved their safety performance with the help of up to date and robust OS&H regulations. For this comparative study, Oman's regulations are considered, and a comparison of the regulations, standards, and guidelines around (i) fall protection, (ii) hazard communication standard related to chemicals, and (iii) scaffolding was made with the USA, UK, AUS, and SA.
- Recommendations for improvement.

2. Literature Review

2.1. *The Omani construction industry in context*

Statistics published by the Oman Society of Contractors in 2016 show that the total number of residents working in this industry was 738,593 [11]. In the financial year 2015–2016 projects in the construction sector stand out as having the largest value of US\$ 43.16 billion. According to the budget report, spending on development projects is estimated at US\$3.12 billion per year, representing the amount to be paid during the year 2017 [12]. It is expected that the value of the construction industry in Oman, which was US\$ 5.87 billion in 2016, will grow to US\$ 17.88 billion. Similarly, the construction GDP in Oman is forecasted to grow to 15.4% of the total GDP by 2026. Overall, the percentage construction growth rate was forecasted to be at peak after 2020 [13]. The statistics further reveals that the majority (92%) workers employed in the Omani construction industry are foreigners [14]. These workers are, however, not insured under the government agency scheme. As per the law of the land, construction organisations need to pursue private insurance for their workers. Since the risk connected with construction workers is huge, the insurance premium for workers in construction is relatively more than those workers in other sectors.

It has been observed that OS&H has been of importance to the Omani government since 1970. Different regulations have been introduced to tackle the Occupational Safety and Health status effectively in different industries. Since its membership with International Labour Organization (ILO) in 1994, Oman has ratified four out of the eight core Conventions. The current Regulation applies to all establishments which are subject to the Labour Law. Its provisions are covered by 4 Chapters and 43 Articles [15].

2.2. *Main causes of fatal injuries in construction in UK, USA, AUS, SA and Oman*

A study conducted in the UK reported the construction industry as being first or second worst offender for reported fatal injuries during 1995 to 2000 [16]. Similarly, the statistics published by the OSHA show that there were four different causes of the reported 582 workers' deaths, roughly equal to 60% of the total fatalities in construction in 2017 [3]. These four causes were (i) falls from height [381/971

= 39.23%), (ii) struck by object [80/971 = 8.23%], (iii) electrocutions [71/971 = 7.31%], and (iv) caught-in or between [50/971 = 5.14%].

The 2018 statistics published by the HSE in the UK reveal that there was a total of 141 workers were killed at the workplace during the past year [4]. Construction was accounted for a total of 38 deaths (38/141 = 26.95%). The “falls from a height” was one of the main causes of these fatalities in the UK which was accounted for 38 workers (26.95%) deaths [4]. Other causes of fatal accidents were;

Falls from height [38/141 = 26.95%]; Struck by moving vehicle [26/141 = 18.43%]; Struck by moving object [23/141 = 16.31%]; Trapped by something collapsing/ overturning [16/141 = 11.34%]; Contact with moving machinery [13/141 = 9.21%].

Similarly, construction in Australia is regarded as a major industry not only because of the current employment which stood at 9% of the total employment in Australia but also due to the future economic and employment growth [17]. Construction in Australia, however, is also regarded as third-highest number in fatalities and stood at 6th highest fatality rate [three workers deaths out of 100,000] in Australia. The main causes of the fatal accidents in construction in Australia were;

Falls from height = 28% [112 deaths]; Vehicle collision = 16% [65 deaths]; Electrocution = 15% [61 deaths]; Being hit by a moving object = 12% [48 deaths]; Being hit by a falling object = 11% [46 deaths]; Being trapped between or in equipment = 8% [31 deaths]; Other causes = 9% [38 deaths].

The CIDB in SA recognized fall from heights, struck, and striking against as the key domination causes of accidents in construction [5]. The CIDB further recognize the HSE as one of the best practice guidelines providers that construction practitioners can access. In other words, information sharing and learning from each other experience is the key to improve safety performance in construction. In Oman, the major portion of work-related injuries arises from road traffic accidents (36.6%) followed by slipping and falling of workers (19%) and then getting crammed between solid objects (12.4%). This represents the data of Omani workers registered with Public Authority of Social Insurance in Oman, thus the collection and analysis of such data for all workers in Oman will help to develop strategies to avoid such causes of accidents in the future [10].

3. Research Methodology

As described by Umar [18], the methodology used in this research is mainly qualitative in nature in which relevant literature is reviewed to deliver the aims and objectives of this paper. In the first instance of the literature review, the key organizations which are responsible for the OS&H in the selected countries were search and identified. In the second part of the literature review the top ten causes of accidents in construction were identified using the relevant organization in the selected countries. These organization include OSHA in United States, HSE in UK, Safe Work Australia (in Australia), CIDB in SA, and Public Authority for Social Insurance in Oman. The initial search on the main causes of accident in these countries was limited to the top 10 causes. For instance, in the United States the top 10 violated standards in the year 2019 include fall protection, hazard communication standard, scaffolding, control of hazardous energy, respiratory protection, ladders, powered industrial trucks, fall protection–training requirements, machinery and machine guarding, eye and face protection [19]. Likewise, the fall from height is one of the main causes of fatality in Australian construction industry [20]. These statistics from OSHA, HSE, CIDB and CWCP helped to search and identify the relevant regulations applicable in the selected countries to these causes of accidents. Considering the scope of the research and the data collected in the first set of literature review, further search was limited to the top three causes of accidents and the regulations applicable to these causes. The top three causes of accidents include fall from height, chemical hazard, and scaffolding. These items were used as keywords to search the relevant regulations applicable in all selected countries. The key regulations of selected countries applicable to fall protection, hazard communication, and scaffolding used of the comparison are indicated in table 1.

Table 1. Key regulations Used for Comparison

Coverage	Selected Countries/regulations
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of Regulation	USA	UK	AUS	SA	Oman
Fall Protection	Fall Protection Regulations (1926.502)	The Work at Height Regulations 2005	The Australian Code of Practice on managing the risk of falls at workplaces	Occupational Safety and Health (Work at Height) Regulations, 2013	Ministerial Decree No. 286/2008; Regulation of Occupational Safety and Health
Hazard Communication	Hazard Communication (1910.1200)	European Regulation No. 1272/2008	Classification of Hazardous Chemicals: Work Health and Safety Act and Regulations in Australia (GCHC, 2012)	Hazardous Chemical Substances Regulations (1995)	Ministerial Decree No. 286/2008; Regulation of Occupational Safety and Health
Scaffolding	OSHA:3150, 2002 [29] general requirements for scaffolds (1926.451); specific Scaffold (1926.452); aerial lift requirements (1926.453); and training requirements (1926.454).	Work at Height Regulations (2005) National Access and Scaffolding Confederation (NASC) Technical Guidance (TG20)	Construction Work, Code of Practice	Construction Regulations, (SA)	Ministerial Decree No. 286/2008; Regulation of Occupational Safety and Health

4. Results and Discussion

4.1. Fall Protection

There are a total of 25 articles in fall protection regulations (1926.502) enforce in the USA which addresses a variety of issues related to fall protection [21]. Similarly, there is a separate law in the UK known as “The Work at Height Regulations 2005” which has a total of 19 main articles, supported by several sub-articles and a total of eight schedules [22]. The Australian Code of Practice on how to manage the risk of falls at workplaces is an approved code of practice under section 274 of the Work Health and Safety Act [23]. This code of practice consists of 10 chapters and two appendices which deal with most of the issue related to fall protection. Similarly, in SA, the latest ‘Work at Height’ regulations came into force in 2013 [24]. There are a total of six schedules, supported by several main and sub-articles.

In Oman, fall from a height appears to be one of the main causes of accidents in different sectors; however, there are no specific regulations that cover this cause of accidents in detail. The only regulations which look into the fall from height are the Regulation of Occupational Safety and Health, issued by the Ministry of Manpower in 2008 [15]. To be more specific the terms ‘fall from a height’, ‘fall from height’ or ‘fall from’ are not used in this regulation at all. The terms ‘fall’ and ‘falling’ are, however, used 11 times at different instances in the regulation. After carefully reviewing these 11 terms, it was found that two of the terms were out of the context of ‘fall from a height’. The remaining nine terms were associated with the preview of ‘fall from height’.

Overall, the review of the whole regulation shows that, although it uses the terms fall, several times but do not cover the full spectrum of fall protection in detail. The regulation should be detailed in all aspects and should provide complete guidelines when dealing with any hazard related to fall protection. For instance, the Fall Protection regulation of USA (1926.502) [21], under article 1926.502(b)(1) which is related to ‘guardrail system’ states that “top edge height of top rails, or

equivalent guardrail system members, shall be 1.1 m plus or minus 8 cm (1.10 m \pm 8 cm) above the walking/working level. When conditions warrant, the height of the top edge may exceed the 114 cm height, provided the guardrail system meets all other criteria of this paragraph". Such through details were, however, not found in the 'Occupational Safety and Health regulation' applicable in Oman.

4.2. Hazard Communication (Chemicals)

Hazard communication related to chemicals and other dangerous liquid was one of the top OSHA standards that were frequently cited in 2018. The current standards applicable in the USA came into force in March 2012 [25].

Similarly, there are comprehensive guidelines on the Classification of Hazardous Chemicals which falls under the Work Health and Safety Act and Regulations in Australia [26]. These guidelines consist of 34 pages and 12 sections supported by 10 tables and seven appendices. Overall, the guidelines cover all aspects of the classification of hazardous chemicals.

The European Regulation No. 1272/2008 on classification, labelling, and packaging of substances and mixtures came into force on 20 January 2009 in all European Union Member States, including the UK [27].

There are many Acts and regulations in SA which aim to control the hazards of industrial chemicals including "National Environmental Management Act, 1998 (Act No.107 of 1998)", "Hazardous Substances Act, 1973 (Act No.15 of 1973)", "Occupational Health and Safety Act No.85 of 1993", and "Hazardous Chemical Substances Regulations, 1995". The review of the latest regulations Hazardous Chemical Substances Regulations, 1995 [28] (HCSR, 1995) shows that these regulations are complete in different aspects that cover topics related to chemical hazards. Overall, these regulations have a total of 87 pages and eight annexures that have a detailed description of different articles of the regulations.

Analogously, chemical hazards are also covered in a separate section of the OS&H Regulation applicable in Oman [15]. Article 37 of the regulations enforce in Oman states "precautionary measures shall be adopted to protect workers against the risks of exposure to the chemicals which lead to the work environment such as gases and dust and the liquids and acids which they may include". This article is further supported by 12 sub-articles that describe the precautions that need to be considered in relation to article 37. Overall, the chemical hazards precautions in the regulation span over two pages that only provides the basic information leaving the regulation with limited information. Since detailed guidelines on hazard communication are not available in the Omani regulations, it leaves both the employers and employees in a situation of high risk of accidents at workplace.

4.3. Scaffolding

In the USA, there are separate guidelines for scaffolding used in construction [29]. The content of these guidelines includes general requirements for scaffolds (1926.451); specific Scaffold (1926.452); aerial lift requirements (1926.453); and training requirements (1926.454).

Likewise, the Health and Safety Executive (HSE) in the UK provides the guidelines and checklist for the scaffold. In the UK it is a requirement of the Work at Height Regulations 2005 that unless a scaffold is assembled to a generally recognized standard configuration, such as 'National Access and Scaffolding Confederation (NASC) Technical Guidance (TG20) for tube and fitting scaffolds or similar guidance from manufacturers of system scaffolds, the scaffold should be designed by bespoke calculation, by a competent person, to ensure it will have adequate strength, rigidity, and stability while it is erected, used and dismantled.

In Australia, the scaffolds are covered in the Construction Work, Code of Practice [30]. These guidelines cover the full spectrum of the scaffold that includes Scaffold definition; Work health and safety duties; Managing risks; Before starting scaffolding work; Choosing a scaffold; Designing the scaffold; The system of work; Documentation; Competency and licensing; Inspecting scaffolds; and Types of scaffolds and scaffolding.

In relation to SA, the Construction regulations which came into force in 2017 cover the scaffold [31]. These regulations made the contractor responsible for appointing a competent person in writing who must ensure that all scaffolding work operations are carried out under his or her supervision and

that all scaffold erectors, team leaders, and inspectors are competent to carry out their work. Just like other countries aforementioned, the regulations state that any contractor using access scaffolding must ensure that such scaffolding when in use, complies with the safety standards of SA. The regulations further emphasize that the Scaffolds design must comply with the SA National Standards [32].

In terms of Oman, the term “scaffolding” was not found at all in the current ‘Occupational Safety and Health regulations’ enforced in Oman in 2008 [15]. The term “ladder” was, however, used at five different instances in the regulations which obviously cannot substitute the scaffolding. The absence of detailed guidelines on scaffolding, is one of the main limitations of the current OS&H regulations in Oman. The requirement for regular supervision and inspection by competent persons are also lacking in the Omani regulation. Likewise, the responsibilities of contractors in terms of the use of scaffolding cannot be found in the current regulations.

5. Conclusions, implications, and recommendations

In this article, Oman’s regulations, standards, and guidelines around (i) fall protection, (ii) hazard communication standard related to chemicals, and (iii) scaffolding was compared with USA, UK, AUS, and SA. There was a total of 25 articles in fall protection regulations enforce in the USA which addresses a variety of issues related to fall protection. Similarly, there is a separate law for fall protection in the UK which has a total of 19 main articles, supported by several sub-articles and a total of eight schedules. In Australia, there is a separate code of practice for working at height. This code of practice consists of 10 chapters and two appendices which deal with most of the issue related to fall protection. In SA, the latest ‘Work at Height’ regulations came into force in 2013 which has a total of six schedules, supported by many main and sub-articles. Fall from a height was established as one of the main causes of accidents in different sectors in Oman however there are no specific regulations that cover this cause of accidents in detail. The only regulation which applies to the “fall from a height” is the regulation of OS&H, issued by the Ministry of Manpower in 2008.

The current standards related to hazard communication (chemicals) applicable in the USA came into force in March 2012. The standards have a total of 10 main articles which are further supported by many sub-articles. The reviews show that there are comprehensive guidelines on the Classification of Hazardous Chemicals which falls under the Work Health and Safety Act and Regulations in Australia consist of 34 pages and 12 sections supported by 10 tables and seven appendices. The European Regulation [27] on classification, labelling, and packaging of substances and mixtures are applicable in European Union Member States, including the UK which consists of 1389 pages, 62 articles. Similarly, there are several Acts and regulations in SA which aim to control the hazards of industrial chemicals as discussed in section 4.5.2. In Omani regulations, chemical hazards are also covered in a separate section (Article 37) which has further 12 sub-articles that describe the precautions that need to be considered to protect workers against the risks of exposure to the chemicals. However, the information is limited to two pages of which the substance is not robust enough to provide the relevant information.

Furthermore, the term “scaffolding” was not found in the current regulations enforced in Oman. The term “ladder” was, however, used at five different instances in the regulations which obviously cannot substitute the scaffolding. In the USA, there are separate guidelines for scaffolding used in construction which include general requirements for scaffolds; specific Scaffold; aerial lift requirements; and training requirements. Health and Safety Executive (HSE) in the UK is responsible for providing the guidelines and checklist for the scaffold which are based on the National Access and Scaffolding Confederation (NASC) Technical Guidance (TG20) for tube and fitting scaffolds. In AUS, the scaffolds are covered in Construction Work, Code of Practice that covers the full spectrum of the scaffold. The Construction regulations in SA cover the scaffold which made the contractor responsible for appointing a competent person in writing who must ensure that all scaffolding work operations are carried out under his or her supervision and that all scaffold erectors, team leaders, and inspectors are competent to carry out their work.

The above comparison of some of the key areas shows that Omani OS&H regulation is not up to the standards as applied in some advanced countries that display improved safety performance. Since the safety performance of all GCC countries is not much different from each other, therefore Oman

and other GCC countries need to consider the key areas which cause accidents more frequently and developed up to date regulations for these areas. The top ten areas which need to be considered in the first stage are, fall protection, hazard communication standard related to chemicals, scaffolding and respiratory protection, control of hazardous energy, ladders, powered industrial trucks, training requirements, machinery, and machine guarding, and eye and face protection. The findings of the current study help policymakers, academics, sociological practitioners, contractors, and employers to understand the gaps in Omani OS&H regulations and the implications for compliance and OS&H performance.

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