



Risk perception of construction equipment operators on construction sites of Turkey



G.E. Gürcanlı^a, S. Baradan^{b,*}, M. Uzun^a

^a Technical University of Istanbul, Department of Civil Engineering, Division of Construction Management, Ayazaga Campus, Maslak, 34469 Istanbul, Turkey

^b Ege University, Department of Civil Engineering, Division of Construction Management, Bornova, Izmir, Turkey

ARTICLE INFO

Article history:

Received 28 March 2014
Received in revised form
10 November 2014
Accepted 14 December 2014
Available online 23 January 2015

Keywords:

Construction equipment
Heavy equipment operator
Risk perception
Occupational safety and health

ABSTRACT

Turkey has been an attractive country for construction industry in the last decade. Many large-scale construction projects, which have been realized by both international and local construction firms, helped the economy and provided employment opportunities for many. At the same time, many construction workers have been losing their lives on construction sites, which involve the usage of heavy equipment on a daily basis.

Past research studies suggest that employee participation and their perception of safety risks could be valuable for determining and eliminating hazards on construction site. Therefore, this study aimed to determine and evaluate the risk perception of construction equipment operators in Turkey. The study is mainly based on a questionnaire survey performed in 51 construction projects that involved 198 heavy equipment operators. A statistical analysis was first performed on the results of the survey to observe the frequency distribution of parameters, such as safety and health training, using flagger, experience, type of equipment, working conditions and other project related data. Then, statistical methods such as, t-test, ANOVA analysis, Kruskal–Wallis one way analysis of variance, and Mann–Whitney U test were performed to seek statistically meaningful differences in risk perception of operator groups with different attributes.

Results revealed the importance of safety and health training as well as working with an assistant, such as a flagger. It was observed that operators who took safety and health training and operators who worked with flaggers perceived risk differently than others. It was also found that the project type influences the risk perception of equipment operators due to diversity of construction equipment activities performed, as well as number of incidents occurred in those projects.

Relevance to industry: The authors expect this research to lead to discussion and further research on risk assessment for construction industry. The risk assessment findings of this study, in particular, could help the safety professionals detect possible unforeseen risks and design safety and health plans for construction sites that require usage of heavy equipment on a daily basis. Heavy equipment manufacturers could also devise a similar research that involves operators' risk perception to design more ergonomic and safe equipment.

© 2014 Elsevier B.V. All rights reserved.

1. Introduction

Utilization of heavy equipment on construction sites is on the rise for the last three decades in Turkey due to unique and complex construction projects that feature creative, ergonomic and effective design, and the ever-increasing demand for residential projects. Heavy equipment unquestionably provides efficiency and speed in

construction projects, but at the same time it creates a hazardous work environment for all workers who are directly or indirectly involved in heavy equipment operation. Workers that are directly involved mainly consists of: operators who are specially trained to drive and operate the vehicle, and co-operators (flaggers, signal persons and spotters) who direct traffic through a construction site and help to backup vehicles using gestures, signs or flags. Workers that are indirectly involved are usually on-foot construction workers who are engaged in other construction activities in the same construction site. Variety of fatal hazards exist on heavy

* Corresponding author.

E-mail address: sbaradan@gmail.com (S. Baradan).

Table 1
Comparison of fatal accidents and fatal incidents rates between Turkey, EU-15, U.S.A. and P.R of China, 2000–2010.

Fatal construction accidents and share (%) in total, fatal incidence rate								
Years	Turkey ^a		EU-15 ^b		U.S.A. ^c		P.R of China ^d	
2000	379 (32.3)	49.8	1285 (24.3)	11.3	1154 (19.5)	16.8	3778 (32.3)	50.8
2001	341 (33.8)	50.0	1223 (24.6)	10.6	1225 (20.8)	17.4	4056 (32.3)	55.3
2002	319 (36.6)	44.7	1198 (24.8)	10.4	1121 (20.3)	16.0	4538 (30.4)	60.0
2003	274 (33.8)	39.9	1248 (26.7)	10.6	1131 (20.4)	16.1	4522 (30.1)	58.5
2004	263 (31.3)	35.0	1119 (25.4)	9.6	1234 (21.4)	16.9	4274 (30.5)	55.0
2005	290 (27.1)	31.1	1065 (21.8)	8.8	1186 (20.8)	15.6	4202 (30.1)	49.2
2006	397 (24.9)	33.5	1151 (23.4)	9.0	1239 (21.2)	15.6	4157 (29.8)	45.7
2007	359 (34.4)	28.8	1019 (28.2)	7.5	1204 (20.9)	15.3	4121 (29.7)	42.9
2008	297 (34.3)	24.0	831 (26.2)	N/A ^e	969 (19.1)	13.0	4055 (29.4)	41.8
2009	156 (13.3)	12.7	774 (26.1)	6.0	834 (18.3)	13.4	4017 (29.1)	40.5
2010	475 (33.1)	33.2	693 (22.6)	5.5	774 (16.5)	13.4	3945 (28.4)	39.2

^a Social Insurance Institution General Directory and Statistical Institution of Turkey Statistics.

^b http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database; <http://laborsta.ilo.org/>. In 2008, EU statistical classification changed and Norway was excluded from the database. Therefore, the figures in the last 3 rows do not contain Norway data.

^c http://www.bls.gov/iif/oshwc/foi/worker_memorial_data.htm#fatal_injuries.xls, <http://www.bls.gov/iif/oshcfoiarchive.htm#rates> (calculated as the number of new cases of injury (fatal) during the calendar year divided by the number of workers in the reference group during the year, multiplied by 100,000. US figures were converted).

^d <http://laborsta.ilo.org/>, <http://www.stats.gov.cn/english>.

^e Data for Greece was not available due to the change in classification system in 2008.

construction sites that harbor such workers, mainly physical hazards such as struck by vehicle, struck by objects, rollovers and caught in/between.

In Turkey, not only heavy equipment but also every loading-unloading operation must be performed by the aid of a flagger or spotter as mandated by safety and health regulations for both general industry (article 379, 1974) and construction works (article 17, 1974). After the arrival of new "Safety and Health Law, 2013" in Turkey, all the regulations were updated. Health and Safety in Construction Works Regulation (Article 52 and 54) obliges a trained flagger in equipment operations, excavation works and material hauling, handling and moving operations. Health and Safety Symbols and Signals Regulation (Article 2.1–2.6) describes principal duties and responsibilities, on-site tasks and garments of flaggers. Even though it is clear that working with a flagger is required by the legislation in Turkey, using flaggers is not a common practice in Turkish construction sites yet due to the regulations being rather new.

Statistics also reveal that heavy equipment fatalities rank fourth in Turkish construction industry and 7.3% of the workers who lost their lives on construction sites are equipment operators (4%) and co-operators (3.3%) (Gurçanlı et al., 2008). According to U.S. Bureau of Labor Statistics, construction equipment operators' deaths comprised 4 and 6 percent of fatalities in construction in the years of 2008 and 2009 respectively, which are very similar to the figures in Turkey. If Turkey and European Union (EU) countries are compared, Turkey's fatal incidence rate in the construction industry is almost 4 to 6 times of EU's. Table 1 shows the grim safety and health record of Turkey since 2000, when compared with EU-15¹ countries, United States of America and Public Republic of China.

Implementing a comprehensive safety and health program or management system is usually considered as the key to systematically decreasing injuries and deaths in such hazardous work sites. Participation of workers in determining and mitigating occupational risks is recognized as an invaluable component in such safety management systems. Particularly, work activities requiring team work and communication, as established between heavy equipment operators and co-operators (flaggers and spotters), would

benefit from a safety approach that embraces workers' participation and their perception of risk.

Research topics, such as workers participation and risk perception have been areas of interest for several safety researchers in the past. According to Vredenburg (2002), Worker participation (or employee involvement) is a behavioral-oriented technique that involves individuals or groups in the upward communication flow and decision-making process within the organization. The amount of participation can range from no participation, where the supervisor makes all decisions, to full participation, where everyone connected with, or affected by the decision is involved. Debbeleer and Beland (1991) state that management's safety concerns and actions should be highly publicized among the workers and that "workers' involvement" can include participation in the development of safety programs, conduct of safety audits, and identification of solutions. Meridian Research Report (1994) highlights some of the examples of meaningful employee participation as participating in the development of safety programs and in workplace inspections, having a membership on joint labor/management committees, and actively getting involved in accident and "near-miss" investigations.

Hallowell (2008) states that risk perceptions must be carefully solicited in a standardized fashion to quantify and compare among risk tolerances (i.e. an individual's subjective assessment of acceptable risk). Risk perception is defined as the subjective judgment that one makes about the frequency and severity of particular risks. Typically, these values are obtained by questioning individuals about specific risk scenarios and aggregating the data. According to Starr (1969), some individuals may rate the same environment differently but the statistical aggregation of risk perceptions represents actual circumstances when the major sources of bias have been minimized. Hallowell's article presents a good literature research on risk studies and risk perception in construction industry and he cites his doctorate dissertation, which presents that construction workers are capable of identifying and rating occupational safety and health risks with a reasonable level of accuracy and he puts forward an objective method of quantifying safety risk using frequency estimates defined as incidents per 200,000 worker-hours (w-h) and severity based on impact of the accident to the worker (Hallowell, 2010). In Zohar's study (2000), there are specific findings about the measure of employees' perceptions on the relative importance of safe conduct in their occupational behavior. According to Zohar, their occupational behavior

¹ For consistency purposes only the 15 countries who were part of the European Union since 2000 were included in the data. Countries who are a member of EU since 2007 were excluded.

Download English Version:

<https://daneshyari.com/en/article/1095908>

Download Persian Version:

<https://daneshyari.com/article/1095908>

[Daneshyari.com](https://daneshyari.com)