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Systematic Review

Falls from height: analysis of 114 cases

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Abstract

Paper aims: To study fall-accident cases in order to analyze the commonly missing or not adequately applied risk management measures (RMM) and its consequences depending on falling height.

Originality: First study to analyze failed RMM for preventing falls from height.

Research method: The study reviewed court cases published by the journal "Safety & Health Practitioner". NIOSH recommendations were used to define RMM to apply to this study.

Main findings: Finally, in 98% of analyzed cases, the fall from height was a result of several non-adequate or missing RMM: in 81.6% procedures of work, 65.8% guardrails and edge protection, 60.5% risk assessment, and 60.5% platforms or scaffolds. It can be concluded that falls from height pose a significant risk for workers, which could be prevented by adequately apply RMM.

Implications for theory and practice: The focus in the prevention of falls should be given on most common RMM.

Keywords

Injury. Fall accidents. Risk control. Workplace fatalities. Safety in construction.

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1. Introduction

Every day, people die as a result of occupational accidents or work-related diseases. In total, it reaches more than 2.78 million deaths and some 374 million non-fatal work-related injuries and illnesses each year (International Labour Organization, 2017). The human cost of this daily adversity is vast, and the economic burden of poor occupational safety and health practices is estimated at 3.94% of global Gross Domestic Product each year (International Labour Organization, 2017). Globally, among all, unintentional injuries represent a major public health problem and a leading cause of deaths (Centers for Disease Control and Prevention, 2017). After road traffic injuries, falls represent the second leading cause of unintentional injury deaths worldwide. An estimation is a number of 646 000 fatal falls and some 37.3 million non-fatal falls each year, severe enough to require medical attention (World Health Organization, 2017). The construction industry represents the most influential group in these numbers, with around 21.4% of USA's workers fatalities, where the leading causes were falls (38.8%) (Occupational Safety and Health Administration, 2017) and around 31% of UK's workers fatalities, where the primary cause of falls from height (20%) (Bomel, 2003). The severity of fall-risk was investigated in many studies, analyzing the risk depending on occupation, age and location (Beavers et al., 2006; Dong et al., 2009; Johnson et al., 1999). Some went further, analyzing heights from which people mostly fell, the type and value of projects where fall-accidents mostly occurred (Huang et al., 2003; Kang et al., 2017).

Despite all of these studies and the risk of falling from height is clearly identified as a challenge to be solved. Even after several studies have investigated the reasons why they continue to occur and solutions to minimize hazards or eliminate their risk, the number of accidents due to falls from height continues to grow.

The objective of this study was to analyze the consequences depending on falling height and to investigate the risk management measures that were commonly missing or not adequately applied in preventing and controlling at the time when falls from height occurred.

2. Methodology

The methodology of this review was based on the PRISMA Statement for Reporting Systematic Reviews and Meta-Analyses (Liberati et al., 2009). The searching process was conducted by using the Brazilian CAPES searching tool (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior, 2017), by using the institutional IP address of the University of Pernambuco federate credentials. The following two keywords were defined: "fall" AND "height". The selection process included first applying the exclusion, and afterward inclusion criteria.

2.1. Exclusion and inclusion criteria

The review only included court cases, as studies, published in the English language by the journal "Safety & Health Practitioner" (Institution of Occupational Safety & Health, 2017), as this journal made all the analyzed information open access. Afterward, the studies were excluded if repeated, then screened and excluded by title, considering only those related to falls from height, excluding if the fall height was unknown, if falls were from a standing height, if the person fell on material which absorbed the impact, or if suffered multiple falls. As inclusion criteria, only accidents were considered, while suicidal and homicidal events were excluded.

Additionally, this study included a previously conducted systematic review on falls from height (Zlatar & Barkokébas, 2018). This article serves as state of the art on the topic of falls from height, give indicators for the data analysis (fall accidents by height and by location) and develop the discussion part by comparing the results from this study with the results from previously conducted studies.

2.2. Data analysis

Statistical analysis was done by using excel statistical toolbox. The data were analyzed in accordance with rules specified in the following sections:

A) Fall height and place

In order to be able to compare data with previous studies (Huang et al., 2003; Kang et al., 2017), the cases were distributed in four height-groups as given by previous studies:

- Falls from a height between 0 to 3 m;
- Falls from a height between 3 to 6.1 m;
- Falls from a height between 6.1 to 9.0 m;
- Falls from a height of more than 9.1 m.

The analyzed results include activities which were conducted before falling, the fall height and where it occurred.

B) Consequence analysis

In order to better analyze the consequences of falls from height, the cases were divided into four groups according to the consequences:

- Nothing injured (bruising, minor burns, and blisters, minor cuts on the head);
- Temporary disability (fractured leg, ankle, ribs);
- Permanent disability (serious spinal injuries or paralyzed from the waist down);

- Death (including instant death and death which occurred after some time, but which was related to injuries suffered by the fall).

The consequences of the falls were then related and grouped according to the height of fall, determined by studies previously mentioned section in the "*A) Determination of fall-height*".

C) Risk management analysis

For risk management analysis, five categories were selected in order to evaluate which measures were applied to prevent and control workplace hazards, and therefore minimize or eliminate safety hazards. For this study, the NIOSH recommendations (National Institute for Occupational Safety and Health, 2018) on the hierarchy of controls were reflected, considering the following categories and measures:

- Risk Assessment (including identification and evaluation of the risk);
- Elimination (to physically remove the hazard) or Substitution (to replace the hazard);
- Engineering Controls (to isolate people from the hazard, including the use of work platforms, scaffolds, ladders, stepladders, guardrails, handrails, barriers, edge protection, and nets);
- Administrative Controls (to change the way people work, including procedure, method, and plan of work, training certification, signs, lighting, warning labels, and supervision);
- Personal Protective Equipment – PPE (to protect the worker).

This recommendation is commonly accepted by Safety at work engineers and practitioners to always start with the most effective possible measure (elimination), and when not feasible to apply it, go to the next measure of the hierarchy.

3. Results

The identification process resulted in 386 studies. All were screened thoroughly in order to exclude those that were not in accordance with the exclusion and inclusion criteria. Finally, 114 cases were included in this analysis (illustrated in Table 1A of the Appendix A).

3.1. Fall height and place

In the included studies, falling height ranged between 1.2 to 42 meters, where the numbers were: 19 cases between 0 to 3 m; 52 cases between 3 to 6.1 m; 21 cases between 6.1 to 9.0 m; and 22 cases of more than 9.1 m. The distribution of cases per group is illustrated in Figure 1.

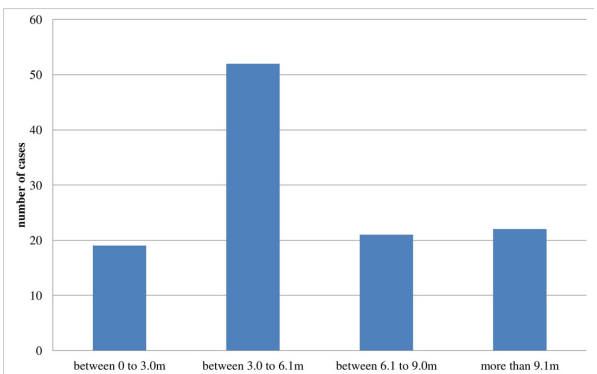


Figure 1. Distribution of encountered cases by fall height.

The location of all included cases was in the United Kingdom, ranging from the year 2003 to 2014. Nevertheless, this review did not analyze fall cases fluctuation during the years on one specific territory, but was primarily focused on consequences depending on fall height, among other analyzed questions. The building height and

type was not specified by included articles. The type of working activity was mostly (in 65 cases, 57%) related to construction working activities (building, reforming or demolishing buildings), in three cases it was related to leisure time, while other (in 46 cases) were related to other working activities, such as sewage maintenance, vehicle repairing or boat building.

Figure 2 illustrates the most common places where falls from height occurred: on scaffolds/platforms (26-22.8%); roofs (30-26.3%); collapses, including collapses of floors, walls and staircases (4-3.5%); through opening, including falls through stairwells, trapdoors, lift wells or the glass panels in construction (15-13.2%); ladders and stepladders (10-8.8%); lifting, including lifting's with forklifts (10-8.8%), and other (19-16.7%).

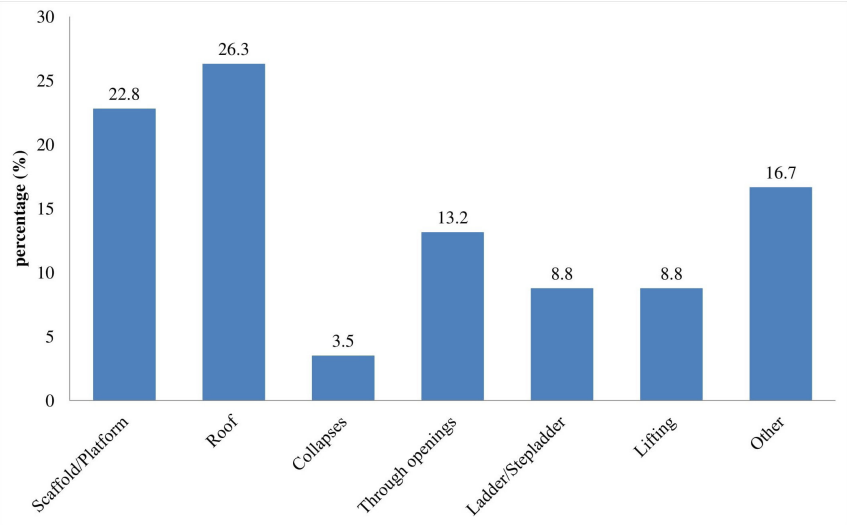


Figure 2. Most common places for falls from heights.

3.2. Consequence analysis

The consequences depending on fall height were illustrated in Table 1, showing the number of cases and percentages for each of the four analyzed consequences.

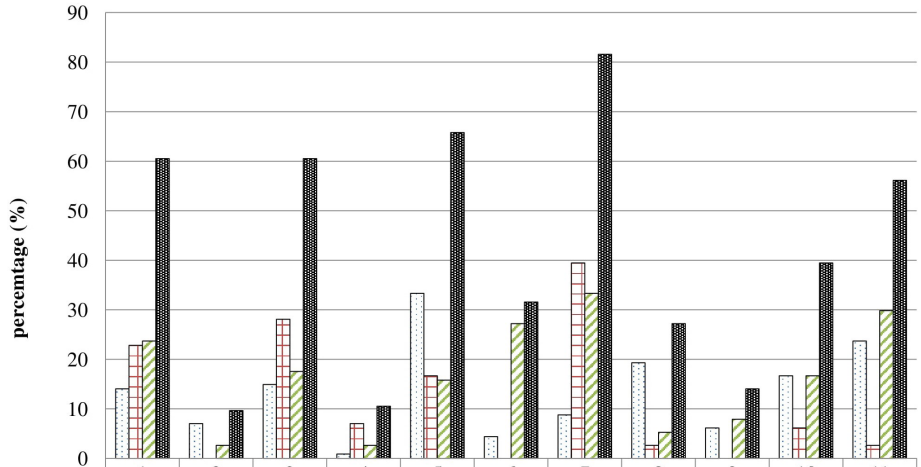
As it could be seen from the Table 1, the consequence of not having anything injured was present only in fall heights below 6.1 meters.

Table 1. Fall consequences per height groups.

Fall height (m)	Nothing injured	Temporary disability	Permanent disability	Death	Total
between 0 to 3.0	1 (5%)	12 (63%)	4 (21%)	2 (11%)	19 (100%)
between 3.0 to 6.1	4 (8%)	27 (52%)	8 (15%)	13 (25%)	52 (100%)
between 6.1 to 9.0	0 (0%)	8 (38%)	3 (14%)	10 (48%)	21 (100%)
≥9.1	0 (0%)	4 (18%)	2 (9%)	16 (73%)	22 (100%)
Global	5 (4%)	51 (45%)	17 (15%)	41 (36%)	114 (100%)

3.3. Risk management analysis

Figure 3 illustrates missing or non-adequate safety procedures. In total, 5 main categories with 11 measures were illustrated: category 1 – identification, evaluation and risk control (measure 1); category 2 – risk elimination/prevention (measure 2); category 3 – engineering controls and measures (measures 3, 4, 5 and 6); category 4 – administrative controls and measures (measures 7, 8, 9 and 10); and category 5 – using of PPE. The data for each analyzed measure was divided into: missing (if the measure was not applied); not adequate (if the measure was not appropriate); additionally (if the measure should be revised if appropriate); and total (the total number the three mentioned situations).



	1	2	3	4	5	6	7	8	9	10	11
Missing	14.0	7.0	14.9	0.9	33.3	4.4	8.8	19.3	6.1	16.7	23.7
Not adequate	22.8	0.0	28.1	7.0	16.7	0.0	39.5	2.6	0.0	6.1	2.6
Additionally	23.7	2.6	17.5	2.6	15.8	27.2	33.3	5.3	7.9	16.7	29.8
Total	60.5	9.6	60.5	10.5	65.8	31.6	81.6	27.2	14.0	39.5	56.1

Figure 3. Measures failed while working at heights. Measures: (1) Risk Assessment; (2) Risk Elimination (Prevention); (3) Work platform, Scaffold; (4) Ladder/Stepladder; (5) Guardrails, Handrails, Bariers, Edge Protection; (6) Nets; (7) Procedure of work (method, plan); (8) Training and Certification; (9) Signs, Lighting, Warning labels; (10) Supervision; (11) Personal Protective Equipment.

4. Discussion

4.1. Fall height and place

Table 2 illustrates groups depending on falling height and compares the results from this study with results from two other studies. It is important to notice that percentages were a product of the analyzed cases and that in reality, it is probable to expect a much higher number of falls from lower heights, where falls are probably passing not recorded.

Table 2. Fall accidents by height.

Fall height (m)	This study	Kang et al. (2017)	Huang et al. (2003)
between 0 to 3.0	16.7%	22.1%	23.0%
between 3.0 to 6.1	45.6%	42.5%	28.0%
between 6.1 to 9.0	18.4%	6.8%	9.0%
≥9.1	19.3%	15.5%	40.0%

As it could be concluded from Table 2, this study found a lower number of cases with falling heights between 0 to 3.0 meters. The results from falling heights between 3.0 to 6.1 meters are in accordance with the findings from one study (Kang et al., 2017). The percentage of falls between 6.1 to 9.0 meters was higher, while the percentage of falls from heights ≥9.1 meters was in between both previously conducted studies.

In Table 3, the fall accidents by location were compared with findings from other studies.

Table 3. Fall accidents by location.

Location of falls	This study	Kang et al. (2017)	Huang et al. (2003)
Scaffold	22.8%	19.5%	15.4%
Roof	26.3%	24.7%	28.7%
Through opening (other than roof)	13.2%	5.6%	7.7%
Ladder	8.8%	16.0%	13.0%
Lifting	8.8%	5.3%	3.2%
Other	16.7%	28.9%	32.0%

Data analyzed through this review show that falls from height occur mostly when working on roofs, scaffolds, and platforms, representing almost 50% of all analyzed cases. Therefore, workers working at these positions are most endangered, were all mentioned risk management measures and procedures should be applied and revised on a regular basis. In accordance with the Table 3, some studies concluded that scaffolders and roofers are among the most exposed working activities, which is understandable as they spent more time working on heights (Bobick, 2005; Wong et al., 2016), and as they typically carry heavy and bulky materials on slippery and inclined walking/working surfaces (Wiersma & Charles, 2006). Further-on, innovative safety solutions should be considered, because as compared with one study (Cheung & Chan, 2012) comparing scaffolds, it could benefit to the safety of workers, reduce the cost of the equipment in use, increase durability and speed of setting the equipment, among other advantages. Most of the challenges about falls from height might be solved through tools (Ezisi & Issa, 2018) for implementing the approach of Prevention through Design.

4.2. Consequence of falls from height

Other studies did not analyze the consequence of falls from height; therefore it was not possible to compare the results. By comparing consequences among analyzed studies, the number of cases which resulted in no injury was very low (5; ≈4% of all analyzed cases). With only 5 cases it could be assumed that this is probably the most biased category, as it is reasonable to assume that many low-altitude fall cases happen on a daily basis, but most of them end with no or light injuries, therefore ending up unreported.

The number of cases which resulted in a temporary disability was the highest (51; ≈45% of all analyzed cases). Although workers did not suffer the more severe consequence, it can be seen that falls from height temporarily disabled further working activities, where it is probable to expect rehabilitation costs and loss of production.

Serious consequences were represented in a high number of cases, the permanent disability was encountered in 17 (≈15%), while deaths in 41 (≈36% of all analyzed cases). The fatal falls from a height above 9.1 m were responsible for 33.9% of fatal falls, which is in accordance with the findings from another study where falls above 9.1 m (30 feet in the article) were accounted for more than one-third of fatal falls (Dong et al., 2017).

Figure 4 illustrates the severity of the consequence depending on fall height (distance) and the percentage of occurrence of each consequence. It also illustrates the logarithmic tendency lines (chosen because they minimize the overall R^2 value) with their equations for each consequence. The severity of injuries varied according to the falling height. Although falling from any altitude may result in any of considered consequences, the results show that falls from heights above 20m should result in death consequence, while other consequences could happen only by chance, therefore set up to height until 20m. Some cases were removed for the construction of the interpolations as have been considered as cases by chance and therefore withdrawn from Figure 4 (For example, the percentage of death consequences gradually increased as falling height increased, reaching 75% of death cases on height of 10m, and then being 100% on heights from 12 to 42m. From analyzed data, on falling height of 16m, there was a death consequence of 50%, not following the logical trend, and therefore considered as cases by chance and withdrawn from the figure).

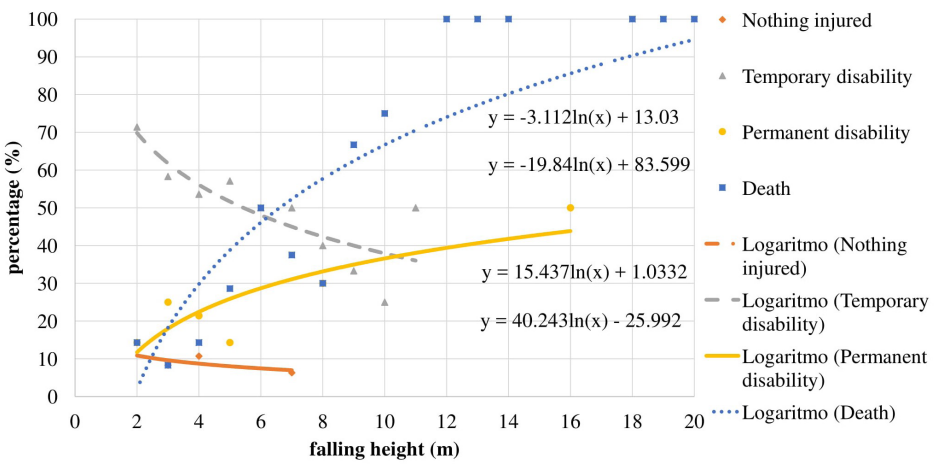


Figure 4. Consequences depending on falling height.

The Figure 4 illustrating the tendencies of consequences depending of falling height, show that as the fall height increase there was a tendency of:

- Decrease for consequence "nothing injured" (y = -3.112ln(x) + 13.03);
- Decrease for consequence "temporary disability" (y = -19.84ln(x) + 83.599);
- Increase for consequence "permanent disability" (y = 15.437ln(x) + 1.0332);
- Increase for consequence "death" (y = 40.243ln(x) – 25.992).

It is also important to notice that in some cases a consequence resulted in temporary disability, while it could as easily result with death. For example, in one case fall resulted in a person being on life support machines for 10 days (The Safety & Health Practitioner, 2006b) or in another case, being unable to return to work for 2 years (The Safety & Health Practitioner, 2013b).

The lowest altitude from which the person died was 1.8 m. By analyzing death cases from low altitudes, it was noticed that all died due to falling headfirst, received severe head injuries, fractured skulls or hit their head on the kerb (The Safety & Health Practitioner, 2005, 2006a, 2009, 2010a, b, 2013a). These findings are in accordance with a study (Türk & Tsokos, 2004) which found that head trauma was the cause of death in 11 of the 19 cases that were from 9m or less (58%). Therefore, as head injuries were found to be responsible for deaths on lower heights, it can be concluded that helmets would be an effective life-protection equipment for lower heights. On the other hand, analyzed deaths from heights over 10m (Türk & Tsokos, 2004) were caused mainly due to polytrauma (72%), and in only ≈24% cases (8/33) by head trauma.

In practice, falls from height typically occur when carrying heavy and bulky materials on slippery and inclined walking/working surfaces (Wiersma & Charles, 2006). Therefore, for working activities when this is the case, wearing helmets could be considered for activities on the same level, while for activities on height, special attention should be taken in applying risk management measures.

4.3. Risk management analysis

Figure 3 illustrates a total percentage of 11 failed risk management measures for analyzed cases. The administrative measure - the procedure of work (method and plan) was found to be the most common safety measure noted as "not adequate" or as "should be revised", within 81.6% of analyzed cases. The engineering measure - guardrails, handrails, barriers and edge protection were found to be the second most failed safety measure with 65.8% (where it was missing in 33.3% of cases). Further two most commonly failed measures were risk assessment (60.5%) and the engineering measure - work platform/scaffold (60.5%). Inadequate PPE or missing PPE was noticed in 56.1% of the cases. By comparison, one previously conducted study found that in 48% of the cases workers fell due to their loss in balance while not wearing adequate fall protection devices (Wong et al., 2016).

It is also interesting to notice that training and certification were missing in 19.3% of the workers. This is important because training increases workers' perception and reaction to risk and, when conducted regularly, can improve safety performance and therefore the worker is more likely to identify, evaluate and control risks (Chan et al., 2008; Hinze & Gambatese, 2003; Rodríguez-Garz et al., 2015). In addition, it is essential to consider that training should be conducted in accordance with the individual characteristics of workers as age, position, trade, number of years of work, past experience with accidents, and personality, which was all found to contribute on how effective would be the training (Kim et al., 2011). Kang found that workers were not equipped with fall protection in 70.7% of cases, and were equipped incorrectly in 17.9% of cases (Kang et al., 2017). Although this could not be directly compared with results from this study, the same conclusions could be adopted – there is an urgent need to improve working safety culture and adopt adequate occupational risk management measures.

Missing or not adequate supervision was found in 22.8% of the analyzed cases. One study found that supervision is important as scaffolders failed to anchor their harness, not due to poor safety attitude, but due to a subjective norm (perceived social pressure) (Goh & Binte Sa'adon, 2015).

The 11 risk management measures illustrated in Figure 3 were further analyzed by each case separately. It was noted that most of the cases had failed several risk management measures. In the following Figure 5 were illustrated all 114 cases (100%) by the number of failed risk management measures (both missing and not adequate risk management measures) by each case, where 1 failed measure was only present in 2% of analyzed cases, 2 failed measures in 15%, 3 in 19%, 4 in 20%, 5 in 15%, 6 in 19% and 7 in 10% of analyzed cases.

As it is shown in Figure 5, only 2% of the analyzed cases could be associated with one failed risk management measure, while in other 98%, the fall from height was a result of several non-adequate or missing risk

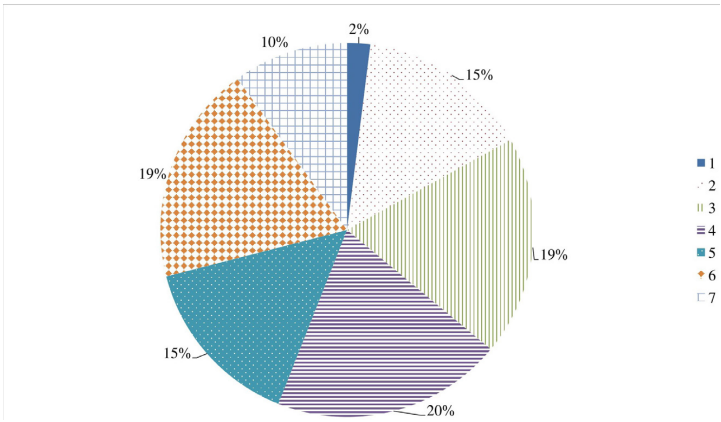


Figure 5. Number of failed risk management measure from the analyzed cases.

management measures. Therefore, it is possible to conclude that in the majority of cases, falls from height were not a coincidence or an unlucky event due to only one fail, but that it could be promptly easily noted due to various failures, and prevented with daily safety screening of the working process.

4.4. Future studies

In order to be able to analyze fall consequences further and understand better how some factors benefit to the survival of falling from greater heights, there is a need to include more data on persons which fell and explain how it occurred. For example, fall (impact) energy could be calculated through data on fall height and human body mass: *E=mgh (J)*.

Results on calculations regarding fall energy for four different persons (body mass of 60, 75, 90 and 105kg) were illustrated in Figure 6.

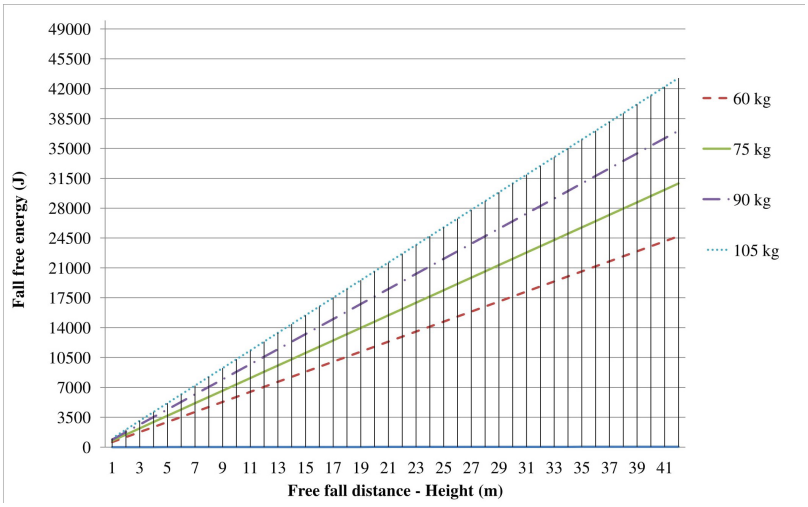


Figure 6. Human body mass an its relation to fall energy and fall height.

As it is illustrated in Figure 6, the fall energy of 10,500J correspond to fall of a human with a body mass of 105kg from a height of 10m, 90kg from 12m, 75kg from 14m and 60kg from 18m. Therefore, a fall impact from the same height would be much lower for those humans having lower body mass compared with those with higher, representing a heavy person less chance of surviving a fall.

Future studies should also consider exploring with more details the employment conditions of workers which suffered falls from height, including the type of employment contract, the age, and experience of the worker.

5. Limitations

The limitations of this study lay in analyzing cases which were reported and recorded by the reviewed source. A bias probably lays in the number of no reported cases of falls from height, especially when the fall resulted in minor or no injuries which could be expected in falls from lower heights. Therefore, the percentages on injuries and death occurrences might not correspond to actual values, especially for lower heights. Finally, the analyzed data do not contain information on workers body mass, which would be interesting to analyze as it might have influenced the energy of fall impact, explaining why some persons survived falls from greater heights. Analyzing more cases would help in more consistent results and therefore understanding better the consequences of falls from heights, and possibly result with more or different consequence-based groups.

6. Conclusions

The falls from height represent one of the leading risks, causing more than 2.78 million deaths and some 374 million non-fatal work injuries each year. Through the analysis of included studies, it was found that a typical accident of falls from height would be in 45.6% from heights between 3 to 6.1 meters and in 49.1% occurring from scaffolds or roofs. The consequences this fall would result in death if the person fell on head and suffered head trauma, while if not, the percentage representing survival would be ≈55%, depending on the persons mass and also material on which he would fall. As the data show, there would be a percentage of ≈98% that several risk assessment measures were not applied. Among those not applied (failed) measures the reason would be: in 81.6% the procedures of work (administrative measure); in 65.8% the guardrails, handrails, barriers and edge protection (engineering measure); in 60.5% risk assessment; and in 60.5% work platform/scaffold (engineering measure). Therefore, it can be concluded that falls from height pose a great risk for workers, which could be prevented by adequately apply management measures.

Future studies should include more cases with data on body mass of persons which fell from heights, and evaluate how falling height affect each body part.

Acknowledgements

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Appendix A. Falls from height: analysis of 114 cases.

This appendix file contains 4 tables, which illustrate all included and analysed cases within the article "Falls from Height: Analysis of 114 Cases":

- Table 1A: Included articles, illustration of the article title, reference, year, type of industry and age of the injured worker;
- Table 2A: Included articles, illustration of the falling height by articles, consequence, injured body parts and recovery period;
- Table 3A: Included articles, illustration of the measures which were Not Appropriate (NA), were missing (0) or should be Additionally (A) considered among each one of included cases;
- Table 4A: Included articles, illustration of accidents which were related to most common falling places.

Table 1A. Included articles, illustration of the article title, reference, year, type of industry and age of the injured worker.

Nr	Title	Reference	Fall year	type of industry	age of injured worker (yrs)
1	Fall from height: lack of access equipment led to injury	The Safety & Health Practitioner, May, 2006, Vol.24(5), p.14(1)	2006	logistic group	
2	Boat-building company sinks below safety standards. (FALL FORM HEIGHT)	The Safety & Health Practitioner, July, 2012, Vol.30(7), p.15(1)	2012	boat building	
3	Fall from height: site visitor fell into unguarded and unlit pit	The Safety & Health Practitioner, Nov, 2006, Vol.24(11), p.12(1)	2006	motor vehicle repair and maintenance	
4	Fall from height: ladder fall costs firm	The Safety & Health Practitioner, March, 2006, Vol.24(3), p.16(1)	2006	meat packing and processing	
5	Injured worker flouted company policy by borrowing ladder, says employer. (FALL FROM HEIGHT)	The Safety & Health Practitioner, May, 2008, Vol.26(5), p.16(1)	2008	dust control	
6	Lack of work-at-height checks contributed to ladder death. (FALL FROM HEIGHT)	The Safety & Health Practitioner, Jan, 2013, Vol.31(1), p.14(1)	2013	pub cleaning	65
7	Caretaker fell from unprotected platform. (FALL FROM HEIGHT)	The Safety & Health Practitioner, August, 2011, Vol.29(8), p.14(1)	2011	construction	54
8	Lightning strikes twice for ladder-fall spray-painter. (FALL FROM HEIGHT)	The Safety & Health Practitioner, Nov, 2012, Vol.30(11), p.12(1)	2012	a truck body shop	51
9	Double fall during poorly-planned maintenance job. (FALL FROM HEIGHT)	The Safety & Health Practitioner, August, 2012, Vol.30(8), p.15(1)	2012	vehicle engineering firm	
10	Double fall during poorly-planned maintenance job. (FALL FROM HEIGHT)	The Safety & Health Practitioner, August, 2012, Vol.30(8), p.15(1)	2012		
11	Film volunteer badly injured in fall. (FALL FROM HEIGHT)	The Safety & Health Practitioner, July, 2011, Vol.29(7), p.11(1)	2011	film firm	34
12	Fall from height: stage collapse and audience injuries see theatre companies in the dock	The Safety & Health Practitioner, May, 2006, Vol.24(5), p.16(1)	2006	theater	
13	Fall from height: stage collapse and audience injuries see theatre companies in the dock	The Safety & Health Practitioner, May, 2006, Vol.24(5), p.16(1)	2006		
14	Fall from height: "simple solution" could have prevented fall from ladder	The Safety & Health Practitioner, Oct, 2006, Vol.24(10), p.18(1)	2006	unspecified	
15	Fall from height: unprotected edge costs electric co [pounds sterling]17k	The Safety & Health Practitioner, May, 2005, Vol.23(5), p.24(1)	2005	construction	
16	Fall from height: unsecured ladder implicated in worker's fatal fall	The Safety & Health Practitioner, May, 2005, Vol.23(5), p.22(1)	2005	panel installer	
17	Fall from height: accident was "easily avoidable". (Construction company fined over and accident in which bricklayer falls from the building)	The Safety & Health Practitioner, June, 2006, Vol.24(6), p.15(1)	2006	construction	

Table 1A. Continued...

Nr	Title	Reference	Fall year	type of industry	age of injured worker (yrs)
18	Fall from height: skull fracture sustained in fall through unguarded stairwell	The Safety & Health Practitioner, Nov, 2005, Vol.23(11), p.15(1)	2005	construction	19
19	Internal fall risk overlooked. (FALL FROM HEIGHT)	The Safety & Health Practitioner, March, 2009, Vol.27(3), p.12(1)	2009	construction	
20	Boss cut corners to save money. (FALL FROM HEIGHT)	The Safety & Health Practitioner, Dec, 2009, Vol.27(12), p.16(1)	2009	construction	
21	Builder fractures neck in fall. (FALL FROM HEIGHT)	The Safety & Health Practitioner, Oct, 2013, Vol.31(10), p.16(1)	2013	construction	
22	Company director "wholly culpable". (FALL FROM HEIGHT)	The Safety & Health Practitioner, July, 2009, Vol.27(7), p.14(1)	2009	construction	53
23	Fall from height: "rubbish" scaffolding costs Norfolk construction firm	The Safety & Health Practitioner, June, 2007, Vol.25(6), p.14(1)	2007	construction	
24	Construction firm fined over death at premier-league club. (FALL FROM HEIGHT)	The Safety & Health Practitioner, Nov, 2010, Vol.28(11), p.14(1)	2010	construction	42
25	Construction giant admits safety oversight. (FALL FROM HEIGHT)	The Safety & Health Practitioner, Feb, 2009, Vol.27(2), p.14(1)	2009	construction	
26	Death of Polish worker a wake-up call to construction bosses. (FALL FROM HEIGHT)	The Safety & Health Practitioner, Jan, 2010, Vol.28(1), p.18(1)	2010	construction	49
27	Factory worker fell following catalogue of safety errors. (FALL FROM HEIGHT)	The Safety & Health Practitioner, March, 2012, Vol.30(3), p.14(1)	2012	boat building	59
28	Fall from height: corroded ladder snapped in two, hurling worker to the ground	The Safety & Health Practitioner, Nov, 2007, Vol.25(11), p.18(1)	2007	brick and stone cleaning firm	
29	Fall from height: engineer fell from forklift truck while repairing door	The Safety & Health Practitioner, March, 2006, Vol.24(3), p.14(1)	2006	maintenance	
30	Fall from height fatality results in [pounds sterling]75k fine for major scaffolding firm	The Safety & Health Practitioner, June, 2003, Vol.21(6), p.6(1)	2003	construction	
31	Fall from height: missing safety rail contributed to fall	The Safety & Health Practitioner, March, 2005, Vol.23(3), p.18(1)	2005	maintenance	
32	Fall from height: repair job wasn't properly planned	The Safety & Health Practitioner, Dec, 2006, Vol.24(12), p.14(1)	2006	maintenance	
33	Fall from height: steelworks fined for uncovered pit hole	The Safety & Health Practitioner, April, 2005, Vol.23(4), p.24(1)	2005	construction	
34	Fall from height: warning on overloading floors under construction following collapse	The Safety & Health Practitioner, March, 2008, Vol.26(3), p.16(1)	2008	construction	
35	Forklift service firm didn't consider risk of working on truck roof. (FALL FROM HEIGHT)	The Safety & Health Practitioner, Nov, 2011, Vol.29(11), p.16(1)	2011	a truck body shop	29
36	Legoland hits back at HSE over "unjustified" prosecution. (FALL FROM HEIGHT)	The Safety & Health Practitioner, March, 2013, Vol.31(3), p.16(1)	2013	maintenance	42
37	Pound stretcher fined after teenage employee breaks ankle. (FALL FROM HEIGHT)	The Safety & Health Practitioner, August, 2006, Vol.24(8), p.14(1)	2006	unspecified	16
38	Recycling firm's risk assessment was unrealistic. (FALL FROM HEIGHT)	The Safety & Health Practitioner, Nov, 2008, Vol.26(11), p.18(1)	2008	unspecified	
39	Fall from height: worker fined for lifting colleague on forks of truck	The Safety & Health Practitioner, Oct, 2005, Vol.23(10), p.14(1)	2005	unspecified	

Table 1A. Continued...

Nr	Title	Reference	Fall year	type of industry	age of injured worker (yrs)
40	Fall from height: McDonald's isn't "lovin' it" after [pounds sterling]35,000 fine	The Safety & Health Practitioner, Jan, 2005, Vol.23(1), p.14(1)	2005	maintenance	
41	Fall from height: worker fell through unprotected gap in high-rise platform	The Safety & Health Practitioner, Oct, 2006, Vol.24(10), p.14(1)	2006	construction	
42	Fall from height: young worker fell from makeshift platform	The Safety & Health Practitioner, Dec, 2005, Vol.23(12), p.13(1)	2005	warehouse	22
43	Fall from height: broken back leads to fines for two firms	The Safety & Health Practitioner, May, 2005, Vol.23(5), p.24(1)	2005	clothing shop	
44	Fall from height: worker paralysed in fall through trapdoor	The Safety & Health Practitioner, May, 2006, Vol.24(5), p.18(1)	2006	chemical manufacturer	
45	Fall from height: developer fined [pounds sterling]10,000 after worker falls through unguarded opening	The Safety & Health Practitioner, Dec, 2004, Vol.22(12), p.18(1)	2004	construction	60
46	Fall from height: no surprises as retailer is fined over unguarded edge	The Safety & Health Practitioner, April, 2005, Vol.23(4), p.19(1)	2005	leisure	22 months
47	Advanced rock-climbing lessons banned after pupil's 4m fall. (FALL FROM HEIGHT)	The Safety & Health Practitioner, July, 2013, Vol.31(7), p.12(1)	2013	leisure	
48	Construction co failed to plan or monitor renovation project. (FALL FROM HEIGHT)	The Safety & Health Practitioner, March, 2013, Vol.31(3), p.14(1)	2013	construction	
49	Fall from height: contractor hit with [pounds sterling]150,000 penalty for work-at-height deficiencies	The Safety & Health Practitioner, Feb, 2005, Vol.23(2), p.16(1)	2005	construction	54
50	Fall from height: 'loose' sub-contracting in sewerage death case	The Safety & Health Practitioner, Dec, 2006, Vol.24(12), p.11(1)	2006	sewage maintenance	51
51	Fall from height: worker needed facial reconstruction after fall	The Safety & Health Practitioner, Feb, 2006, Vol.24(2), p.14(1)	2006	construction	
52	No alternative available to dangerous lifting practice. (FALL FROM HEIGHT)	The Safety & Health Practitioner, August, 2009, Vol.27(8), p.18(1)	2009	unspecified	
53	Fall from height: fatal fall was easily preventable	The Safety & Health Practitioner, Nov, 2006, Vol.24(11), p.14(1)	2006	storehouse	62
54	Fall from height: scaffolding boards were not properly supported	The Safety & Health Practitioner, July, 2005, Vol.23(7), p.16(1)	2005	construction	
55	Fall from height: airline caterer fined over "very serious" incident	The Safety & Health Practitioner, Oct, 2006, Vol.24(10), p.16(1)	2006	airline	
56	Fall from height: fines follow fatal fall from defective ladder	The Safety & Health Practitioner, Sept, 2005, Vol.23(9), p.17(1)	2005	electrical company	
57	Fall from height: firms pay high price for scaffolding collapse	The Safety & Health Practitioner, Dec, 2006, Vol.24(12), p.12(1)	2006	construction	
58	Fall from height: roof fall leaves worker in wheelchair	The Safety & Health Practitioner, August, 2005, Vol.23(8), p.14(1)	2005	agriculture	
59	Lack of edge protection led to fatal scaffold fall. (FALL FROM HEIGHT)	The Safety & Health Practitioner, Oct, 2009, Vol.27(10), p.16(1)	2009	construction	
60	Boss tried to blame brother who sub-contracted him for demolition job. (FALL FROM HEIGHT)	The Safety & Health Practitioner, Sept, 2010, Vol.28(9), p.12(1)	2010	construction	
61	Crane fall leaves worker fighting for life. (FALL FROM HEIGHT)	The Safety & Health Practitioner, June, 2009, Vol.27(6), p.11(1)	2009	construction	41

Table 1A. Continued...

Nr	Title	Reference	Fall year	type of industry	age of injured worker (yrs)
62	Fall from height: Earls Court fined for poor safety procedures	The Safety & Health Practitioner, Feb, 2007, Vol.25(2), p.14(1)	2007	exhibition center	
63	Fall from height: edge protection was not installed for farm roof work	The Safety & Health Practitioner, Feb, 2006, Vol.24(2), p.16(1)	2006	construction	
64	Fall from height: firm owner's friend died in roof fall	The Safety & Health Practitioner, Sept, 2006, Vol.24(9), p.16(1)	2006	construction	
65	Fall from height: fragile roof was "totally unprotected"	The Safety & Health Practitioner, March, 2008, Vol.26(3), p.16(1)	2008	construction	62
66	Fall from height: lack of edge protection led to fall	The Safety & Health Practitioner, Nov, 2012, Vol.30(11), p.11(1)	2012	construction	
67	Fall from height: next employee died during training exercise	The Safety & Health Practitioner, August, 2005, Vol.23(8), p.14(1)	2005	warehouse	
68	Fall from height: young worker blacked out and fell through unguarded lift well	The Safety & Health Practitioner, March, 2007, Vol.25(3), p.14(1)	2007	construction	16
69	Foam firm fined for second time in a fortnight. (FALL FROM HEIGHT)	The Safety & Health Practitioner, Jan, 2011, Vol.29(1), p.12(1)	2011	construction	
70	Lack of edge protection led to contractor fall. (FALL FROM HEIGHT)	The Safety & Health Practitioner, Nov, 2012, Vol.30(11), p.11(1)	2012	construction	
71	Fall from height: scaffolding fall costs two Welsh businesses	The Safety & Health Practitioner, July, 2006, Vol.24(7), p.14(1)	2006	construction	
72	Fall-prevention measures didn't work. (FALL FROM HEIGHT)	The Safety & Health Practitioner, Jan, 2012, Vol.30(1), p.16(1)	2012	construction	
73	Firm failed to discharge its duties as construction client	The Safety & Health Practitioner, March, 2010, Vol.28(3), p.12(1)	2010	construction	
74	Firms fined [pounds sterling]400k in scaffold-death case	The Safety & Health Practitioner, May, 2011, Vol.29(5), p.11(1)	2011	construction	
75	Fall from height: roofer death lands building boss in jail	The Safety & Health Practitioner, Feb, 2005, Vol.23(2), p.11(1)	2005	construction	
76	"Shambolic" system of work cost scaffolder his life. (FALL FROM HEIGHT)	The Safety & Health Practitioner, Nov, 2004, Vol.22(11), p.16(1)	2004	construction	
77	Director failed to recognise risks posed by fragile roof. (FALL FROM HEIGHT)	The Safety & Health Practitioner, Nov, 2009, Vol.27(11), p.12(1)	2009	construction	28
78	Fall from height: workers told to use ladder for fragile roof job	The Safety & Health Practitioner, March, 2007, Vol.25(3), p.12(1)	2007	construction	
79	Maintenance contractor fell from unsecured makeshift platform. (FALL FROM HEIGHT)	The Safety & Health Practitioner, Dec, 2012, Vol.30(12), p.12(1)	2012	maintenance	34
80	Fall from height: boss tried to deceive investigators after fatal roof fall	The Safety & Health Practitioner, Jan, 2008, Vol.26(1), p.13(1)	2008	construction	
81	Fall from height: companies to pay [pounds sterling]125k after worker is paralysed	The Safety & Health Practitioner, April, 2005, Vol.23(4), p.20(1)	2005	construction	
82	Fall from height: company's "eyes were opened" by fall case	The Safety & Health Practitioner, Sept, 2006, Vol.24(9), p.18(1)	2006	maintenance	19
83	Fall from height: construction boss jailed for failing to provide safe equipment for working at height	The Safety & Health Practitioner, March, 2006, Vol.24(3), p.11(1)	2006	construction	worker 1 (40), worker 2 (21)

Table 1A. Continued...

Nr	Title	Reference	Fall year	type of industry	age of injured worker (yrs)
84	Fall from height: construction boss jailed for failing to provide safe equipment for working at height	The Safety & Health Practitioner, March, 2006, Vol.24(3), p.11(1)	2006	construction	worker 1 (40), worker 2 (21)
85	Fall from height: ladder did not provide safe access to crane	The Safety & Health Practitioner, April, 2005, Vol.23(4), p.22(1)	2005	foundry	
86	Fall from height: lack of planning led to fall from height fatality on farm	The Safety & Health Practitioner, August, 2007, Vol.25(8), p.14(1)	2007	agriculture	
87	Fall from height: no method statements in roof fall	The Safety & Health Practitioner, Feb, 2007, Vol.25(2), p.11(1)	2007	construction	
88	Fall from height: roofer injured in eight-metre fall	The Safety & Health Practitioner, July, 2006, Vol.24(7), p.12(1)	2006	construction	23
89	Architects and building firm both at fault in fatal-fall case. (FALL FROM HEIGHT)	The Safety & Health Practitioner, Sept, 2010, Vol.28(9), p.14(1)	2010	construction	
90	Fall from height/lifting: worker fell to his death during complicated lifting operation	The Safety & Health Practitioner, Feb, 2005, Vol.23(2), p.15(1)	2005	construction	
91	Fall from height: unguarded hole cost worker his life and property owners [pounds sterling]120,000	The Safety & Health Practitioner, June, 2005, Vol.23(6), p.14(1)	2005	construction	37
92	Fall from height: practice of hand-winding lift ends in disaster	The Safety & Health Practitioner, Jan, 2007, Vol.25(1), p.12(1)	2007	unspecified	
93	Fall from height: rooflight plunge costs contractor	The Safety & Health Practitioner, Dec, 2004, Vol.22(12), p.18(1)	2004	construction	
94	Fall from height: three firms fined over bus garage plunge	The Safety & Health Practitioner, Jan, 2006, Vol.24(1), p.10(1)	2006	construction	
95	Firm that ignored HSE advice fined [pounds sterling]145k. (FALL FROM HEIGHT)	The Safety & Health Practitioner, Dec, 2011, Vol.29(12), p.12(1)	2011	construction	
96	Miscommunication led to worker's stairwell plunge. (FALL FROM HEIGHT)	The Safety & Health Practitioner, August, 2013, Vol.31(8), p.12(1)	2013	construction	32
97	Potentially fatal fall costs firms [pounds sterling]214k. (FALL FROM HEIGHT)	The Safety & Health Practitioner, August, 2009, Vol.27(8), p.18(1)	2009	unspecified	
98	Fall from height: death at second Edinburgh hotel leads to [pounds sterling]400k fine	The Safety & Health Practitioner, Dec, 2005, Vol.23(12), p.14(1)	2005	hotel	
99	Fall from height: window ledge was not high enough to prevent fatal fall	The Safety & Health Practitioner, Jan, 2007, Vol.25(1), p.12(1)	2007	construction	
100	Big fines for two firms over power-station death. (FALL FROM HEIGHT)	The Safety & Health Practitioner, July, 2011, Vol.29(7), p.11(1)	2011	construction	
101	Ignorance of regulations is no excuse, firm told. (FALL FROM HEIGHT)	The Safety & Health Practitioner, August, 2006, Vol.24(8), p.16(1)	2006	construction	
102	Fall from height: sailor plummeted 12ft to his death on ship's deck	The Safety & Health Practitioner, Nov, 2007, Vol.25(11), p.14(1)	2007	ship in a dry dock	
103	Fall from height fatality results in [pounds sterling]75k fine for major scaffolding firm	The Safety & Health Practitioner, June, 2003, Vol.21(6), p.6(1)	2003	construction	
104	Fatal fall during T5 project caused by faulty fixings. (FALL FROM HEIGHT)	The Safety & Health Practitioner, Dec, 2009, Vol.27(12), p.15(1)	2009	construction	
105	Fatal fall during T5 project caused by faulty fixings. (FALL FROM HEIGHT)	The Safety & Health Practitioner, Dec, 2009, Vol.27(12), p.15(1)	2009	construction	

Table 1A. Continued...

Nr	Title	Reference	Fall year	type of industry	age of injured worker (yrs)
106	Carillion to pay [pound sterling]94K after young employee fell to his death. (FALL FROM HEIGHT)	The Safety & Health Practitioner, Sept, 2008, Vol.26(9), p.16(1)	2008	construction	young
107	Fall from height: three parties prosecuted over fatal fall	The Safety & Health Practitioner, August, 2005, Vol.23(8), p.12(1)	2005	construction	
108	Maintenance worker jailed for four years after toddler's death. (FALL FROM HEIGHT)	The Safety & Health Practitioner, March, 2014, Vol.32(3), p.11(1)	2014	unspecified	2
109	£42 k to pay following scaffolding death fall (same page as Fall from height: ladder did not provide safe access to crane)	The Safety & Health Practitioner, April, 2005, Vol.23(4), p.22(1)	2005	construction	
110	Carillion fined [pounds sterling]130,000 for fatal fall. (FALL FROM HEIGHT)	The Safety & Health Practitioner, Jan, 2013, Vol.31(1), p.12(1)	2013	construction	
111	Massive fine for fatal fall in 2004. (FALL FROM HEIGHT)	The Safety & Health Practitioner, August, 2012, Vol.30(8), p.14(1)	2012	construction	
112	MD jailed for manslaughter of 20-year-old roof worker. (FALL FROM HEIGHT)	The Safety & Health Practitioner, March, 2009, Vol.27(3), p.12(1)	2009	construction	20
113	Fall from height: contractor died when staircase collapsed	The Safety & Health Practitioner, May, 2006, Vol.24(5), p.14(1)	2006	power station	
114	Fall from height: failure to maintain lifts costs firm [pounds sterling]545,000	The Safety & Health Practitioner, May, 2006, Vol.24(5), p.13(1)	2006	leisure	worker 1 (27), worker 2 (25)

Table 2A. Included articles, illustration of the falling height by articles, consequence, injured body parts and recovery period.

Nr	Height (m)	NOTHING INJURED	TEMPORARY DISABILITY	PERMANENT DISABILITY	DEAD	Injured body part as described in articles	Treatment/recovery/lost working hours
1	1.2	0	1	0		injured his knee	
2	1.4	0	1	0		arm	received treatment for a broken arm, unable to return to work for more than five months
3	1.4	0	1	0		cut to his head, fractured his right shoulder, and sprained his ankle	
4	1.5	0	1	0		breaking his collar-bone and suffering concussion	
5	1.8	0	0	1	0	severe and lasting damage to his back	
6	1.8	0	0	0	1	fractured his skull	
7	1.9	0	1	0	0	broke two ribs and one arm	needed a three inch metal plate and multiple metal screws inserted into a broken arm
8	2	0	1	0	0	shattered left shoulder and collarbone, several broken ribs, a deep cut to his head	he is unable to work owing to his injuries and still suffer considerable pain in his shoulder
9	2.2	0	1	0	0	worker 2 (bruised eye, cut on the back of his head)	
10	2.2	0	1	0	0	worker 1 (broke his collarbone)	worker 1 (unable to return to work for six weeks owing to his injuries)
11	2.3	0	0	1	0	fractured vertebrae in her back and has been left permanently paralysed from the waist down.	
12	2.3	0	1	0	0	one individual underwent surgery to insert a metal rod in her shinbone and screws in both ankles,	

Table 2A. Continued...

Nr	Height (m)	NOTHING INJURED	TEMPORARY DISABILITY	PERMANENT DISABILITY	DEAD	Injured body part as described in articles	Treatment/recovery/lost working hours
13	2.3	1	0	0	0	others suffered shock and bruising	
14	2.5	0	1	0	0	shattering his left heel bone	
15	2.5	0	0	1	0	punctured lung and spinal fracture	
16	2.5	0	0	0	1	severe head injuries	
17	2.7	0	1	0	0	damaged ligaments in his left shoulder and a series of cuts to his head	
18	2.7	0	1	0	0	fracturing a bone in his skull	
19	2.7	0	0	1	0	severe head injuries	hospitalized for more than four months. It is unlikely he will be ever be able to return to work.
20	3	0	0	1	0	broken spine	had surgery to insert a metal disk into his back
21	3	0	1	0	0	fractured neck, arm, suffered soft tissue injuries to his kidney and hip	several months on recovery
22	3	0	0	0	1	multiple skull fractures	
23	3	1	0	0	0		
24	3	0	0	0	1	in a coma for three months	
25	3	0	0	1	0	fractured skull, broke all of the ribs on the left side of his body, and suffered spinal damage	
26	3	0	0	0	1		
27	3	0	1	0	0	fractured his right leg in four places	off work for 10 months
28	3	0	0	1	0	permanently disabled, serious spinal injuries, internal injuries and cuts	cant no longer work, suffers constant pain and psychiatric problems
29	3	0	0	0	1	fatal head injuries	
30	3	0	1	0	0	1) no serious injuries	
31	3	0	0	1	0	severe spinal injuries	
32	3	0	1	0	0	multiple injuries, including fractures to his vertebrae, ribs and wrist	
33	3	1	0	0	0	minor burns and blisters	
34	3	0	1	0	0	4 workers suffered spinal fractures, broken shoulders, and fractured ribs	
35	3	0	1	0	0	lost consciousness for several minutes after his head hit the ground, suffered severe headaches and a paintful swelling to his head,	unable to work for some time afterwards
36	3	0	1	0	0	breaking his shoulder and several ribs	off work for two months
37	3	0	1	0	0	broke his ankle	
38	3	0	1	0	0	dislocating fingers on his left hand, breaking his left wrist, fracturing vertebrae in his neck	kept in hospital for 5 days and had to wear a neck brace for three months
39	3.3	0	1	0	0	major injuries	
40	3.4	0	0	1	0	serious spinal injury	
41	3.4	0	1	0	0	shattered his ankle	
42	3.5	0	1	0	0	crushed vertebra and fractured pelvis	
43	3.6	0	1	0	0	serious injuries	

Table 2A. Continued...

Nr	Height (m)	NOTHING INJURED	TEMPORARY DISABILITY	PERMANENT DISABILITY	DEAD	Injured body part as described in articles	Treatment/recovery/lost working hours
44	3.6	0	0	1	0	paralysed from the waist down	
45	3.7	0	1	0	0	8 broken ribs, broken collarbone and life threatening internal injuries	
46	3.7	0	1	0	0	fractured skull	
47	4	0	1	0	0	fractured heel bone	
48	4	0	1	0	0	two fractured vertebrae and five broken ribs	
49	4	0	0	0	1	suffering severe head injuries	
50	5	0	0	0	1		
51	4	0	1	0	0	broken pelvis, four fractured ribs and a damaged spleen, as well as the facial injuries.	metal plates inserted in his mouth, jaw, nose, and eye sockets
52	4	0	1	0	0	fractured his leg and ankle	
53	4.6	0	0	0	1	multiple injuries	
54	4.8	0	0	1	0	paralysed below the waist	
55	5	0	1	0	0	broken right leg, broken femur in his left leg, and cuts and bruising	
56	5	0	0	0	1	fatally injured	
57	5	0	1	0	0	suffered a severe head laceration, broken wrist, and a broken rib	
58	5	0	1	0	0	multiple broken bones and head injuries	long recovery, still in wheelchair
59	5	0	0	0	1	serious head injuries	
60	6	0	0	1	0	16 skull fractures, damaging parts of the brain, removed parts of the brain, broken jaw in three places, deaf in his right ear and blind in his left eye.	
61	6	0	1	0	0	multiple fractures to his skull, a broken collarbone, several broken ribs, and swelling to his brain	discharged from hospital after five weeks but has been unable to return to work owing to the severity of his injuries
62	6	0	1	0	0	punctured lungs, broken ribs, broken limbs, bleeding on the brain	three weeks in intensive care
63	6	0	1	0	0	serious injuries	
64	6	0	0	0	1		
65	6	0	0	0	1	fatal injuries	
66	6	1	0	0	0	cuts on his head	
67	6	0	0	0	1	head injuries	
68	6	0	1	0	0	suffered fractured skull, brain haemorrhage, facial and leg injuries, and extensive bruising	
69	6	0	1	0	0	suffered tissue damage	off work for 6 weeks
70	6	0	0	0	1	serious head injuries	several months in hospital with gradual recovery, however the brain injury he suffered exposed him to a much higher degree of infection
71	6.1	0	1	0	0	sustained double fracture of the pelvis, fractured elbow and head lacerations	
72	6.5	0	1	0	0	suffered fractures to his spine, skull and ribs	unable to return to work owing to his injuries
73	6.5	0	1	0	0	two fractured vertebrae and serious injuries to his hands.	

Table 2A. Continued...

Nr	Height (m)	NOTHING INJURED	TEMPORARY DISABILITY	PERMANENT DISABILITY	DEAD	Injured body part as described in articles	Treatment/recovery/lost working hours
74	6.5	0	0	0	1	serious head injuries	
75	6.75	0	0	0	1	fatal injuries	
76	7	0	0	0	1		
77	7	0	0	1	0	fractures to his skull, pelvis, wrist, and right cheekbone, permanent damage to the optical nerve in his right eye	
78	7	0	1	0	0	broke both his wrists, his ankle, his lef elbow, sustained a fractured skull with bleeding on the brain, and lost four teeth	
79	7	0	0	1	0	multiple fractures to his skull, leg, back, wrist	spent 10 days in hospital and remains on crutches. It is still unclear if he will ever be able to return to work.
80	7.6	0	0	0	1	serious injuries	required surgery for a broken collar bone, after operation suffered a pulmonary fat embolism caused by his injuries
81	7.6	0	0	1	0	in coma for 6 weeks, now paralysed and confined to a wheelchair	
82	7.6	0	1	0	0	50 broken bones	
83	7.6	0	1	0	0	worker 2 (sustained a serious leg injury)	
84	7.6	0	0	0	1	worker 1 (died)	
85	7.6	0	1	0	0	suffering head injuries and a fractured pelvis	
86	8	0	0	0	1		
87	8	0	0	0	1		
88	8	0	1	0	0	fractured jaw and substantial soft tissue injuries to his body and face	
89	9	0	0	0	1		
90	9	0	0	0	1		
91	9	0	0	0	1		
92	9.1	0	1	0	0	severed her leg and broke her ankle	
93	10	0	1	0	0	injuries to his pelvis, back, heel bone and elbow	
94	10	0	1	0	0	serious injuries to his arms and pelvis, severely brushing his heart, and suffering a collapsed lung.	remained on a life support machine for ten days
95	10	0	0	0	1	fractured skull and developed post-traumatic epilepsy as a result of his injuries	
96	10	0	0	1	0	shattered right elbow, broken vertebrae, fractured pelvis, and ribs, and damage to internal organs.	he was unable to return to work for two years and can no longer work in construction
97	10	0	1	0	0	serious injuries	
98	10.7	0	0	0	1		
99	11	0	0	0	1		
100	12	0	0	0	1	fatal chest injuries	
101	3	1	0	0	0		
102	12	0	0	0	1		
103	13	0	0	0	1		

Table 2A. Continued...

Nr	Height (m)	NOTHING INJURED	TEMPORARY DISABILITY	PERMANENT DISABILITY	DEAD	Injured body part as described in articles	Treatment/recovery/lost working hours
104	15.24	0	0	1	0	2) multiple serious injuries, including fractures to his back, leg and jaw	
105	15.24	0	0	0	1		
106	17	0	0	0	1		
107	17,5	0	0	0	1		
108	18	0	0	0	1		
109	18.3	0	0	0	1		
110	19	0	0	0	1		
111	22	0	0	0	1		
112	25	0	0	0	1	head injuries	
113	30	0	0	0	1		
114	42	0	0	0	1		

Table 3A. Included articles, illustration of the measures which were Not Appropriate (NA), were missing (0) or should be Additionally (A) considered among each one of included cases.

Nr	Risk Assessment	Risk Elimination (Prevention)	Work platform, scaffold	Stepladder	Guardrails, Handrails, Barriers, Edge protection	Nets, Other safety measures	Procedure of work (method, plan)	Training and Certification	Signs, Lighting, Warning labels	Worker's supervision	Personal Protective Equipment (PPE)
1				NA			A	A		A	
2	A		0		0		A			A	
3	0	0			0		A		0	A	
4	NA			NA			NA	A		A	
5	NA						A	NA		A	
6	NA			NA			0	0		0	
7	0		0		0		NA	0		0	
8			0	NA	0						
9	NA		0		0		A			A	
10	NA		0		0		A			A	
11		0			0				0		
12	A				0						
13	A				0						
14	A	0					NA				
15		0			0	A			A		
16			NA	NA	NA						A
17			NA		NA					A	A
18		0			NA	A			A		
19		0			0	0			A		
20	A		0		0	A	A				A
21	A		A		A	0	A				A
22	0				NA	A	A				A
23											
24			NA		NA						
25	NA		0		0		NA			A	A
26	NA		NA				A	0			A
27	0		A				0	0		0	
28				NA				A			
29	0			A			0	0		A	
30			NA	A			NA			NA	
31			NA				A				A
32			NA		NA		A	0		0	0
33		0			0						
34			NA		0		NA	0	A	A	
35	0		0	0			A			A	A
36	NA		A			A				NA	0

Table 3A. Continued...

Nr	Risk Assessment	Risk Elimination (Prevention)	Work platform, scaffold	Stepladder	Guardrails, Handrails, Barriers, Edge protection	Nets, Other safety measures	Procedure of work (method, plan)	Training and Certification	Signs, Lighting, Warning labels	Worker's supervision	Personal Protective Equipment (PPE)
37	NA	A					NA	0			A
38	NA				0		0				
39			NA	A			0			A	
40	NA				0		A		0		
41			NA		0					0	
42	0		0				0			0	
43		A	NA						A		
44							0	0		0	
45	A		A		0	A	NA				A
46	A				0				A		
47	NA					A	A	0		A	A
48			A				NA	A		NA	
49		0	0		0			0			0
50											
51			0				A				
52			0				A			A	
53	NA				NA				A		
54			NA				0	0		A	
55							A	0		0	
56				NA				0			
57			NA				NA			NA	A
58	0		A		A	A	NA				0
59			NA		NA		NA				A
60	0		A		A	A	A	0			0
61	NA							0		0	
62	NA				0		NA		0		
63					0		A	0		0	0
64	NA		0		0	A	A				A
65	0		A		A	A	A				0
66	A				0		A				A
67	NA					A	NA			0	A
68		A			0						0
69	0				A		NA				A
70	NA				0		NA				A
71			NA		A	A	A				0
72	0		0		0	A	A	0			0
73	A		A		A	A	NA			NA	A
74	NA		NA		NA		NA			NA	A
75	0		A		A	A	A	0			0
76	A		NA		NA	A	A				A
77	A		0		A	0	A				0
78	NA		0		0	A	NA			0	0
79			NA				NA	0		NA	
80	A		A		A	A	NA				0
81							NA	0			
82	A		A		0	0	NA			0	A
83			NA		NA						
84			NA		NA						
85					NA		NA				
86	NA		A		0	A	A	NA			A
87	0		A		A	A	0			0	0
88	A		A		A	A	NA				0
89	NA				0	A	NA				A
90	NA		A		0	A	NA			0	A
91					0						
92							NA			0	
93	A		NA		A	A	A				0

Table 3A. Continued...

Nr	Risk Assessment	Risk Elimination (Prevention)	Work platform, scaffold	Stepladder	Guardrails, Handrails, Barriers, Edge protection	Nets, Other safety measures	Procedure of work (method, plan)	Training and Certification	Signs, Lighting, Warning labels	Worker's supervision	Personal Protective Equipment (PPE)
94							NA				A
95	A		A		A	A	A				0
96			NA				NA			0	A
97							NA				0
98	A				NA				A		
99					NA		A				0
100			NA		NA		NA				0
101											
102							A	A			NA
103			A				NA			0	A
104			NA								NA
105			NA								
106	A		NA		A	A	NA			A	NA
107					0						0
108					0		A	A	0	A	
109			NA				NA				0
110	A					A	NA	NA			A
111			NA				NA				
112	A		NA		A	0	NA	0			0
113			NA				NA				
114	A				NA		NA				

Table 4A. Included articles, illustration of accidents which were related to most common falling places.

Nr	Scaffold/ Platform	Roof	Floor/ Wall/ Staircase Collapse	Stairwell/ Trapdoor/ Lift well/ Glass panel in construction	Ladder/ Stepladder	Lifting (forklift...)	Other
1							1
2							1
3							1
4					1		
5					1		
6					1		
7	1						
8					1		
9							1
10							1
11							1
12							1
13							1
14							1
15				1			
16	1						
17	1			1			
18	1			1			
19				1			
20		1					
21		1					
22				1			
23							1
24							1

Table 4A. Continued...

Nr	Scaffold/ Platform	Roof	Floor/ Wall/ Staircase Collapse	Stairwell/ Trapdoor/ Lift well/ Glass panel in construction	Ladder/ Stepladder	Lifting (forklift...)	Other
25				1			
26	1						
27						1	
28					1		
29						1	
30	1						
31							1
32							1
33							1
34			1				
35							1
36							1
37							1
38							1
39						1	
40		1					
41	1						
42	1						
43			1				
44							1
45				1			
46							1
47							1
48	1						
49				1			
50							1
51							1
52						1	
53							1
54	1						
55						1	
56					1		
57	1						
58		1					
59	1						
60		1					
61							1
62							1
63		1					
64		1					
65		1					
66	1						
67						1	
68				1			
69		1					
70		1					
71	1						
72		1					
73		1					
74	1						
75		1					
76	1						
77		1					

Table 4A. Continued...

Nr	Scaffold/ Platform	Roof	Floor/ Wall/ Staircase Collapse	Stairwell/ Trapdoor/ Lift well/ Glass panel in construction	Ladder/ Stepladder	Lifting (forklift...)	Other
78		1					
79						1	
80		1					
81	1					1	
82		1					
83		1				1	
84						1	
85							1
86		1					
87		1					
88		1					
89		1			1		
90		1					
91				1			
92							1
93		1					
94		1					
95		1					
96	1			1			
97							1
98							1
99							1
100				1			
101							1
102							1
103	1						
104							1
105							1
106	1						
107			1				
108				1			
109	1						
110	1				1		
111	1						
112		1					
113			1				
114				1			