



# Analysis of Occupational Accidents According to The Sectors in Turkey

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## ABSTRACT

Occupational accidents lead to serious problems in Turkey and in many other countries. The most important results of occupational accidents are deaths, injuries or disabilities. In addition, many other important work-related accidents cause serious financial losses. As it is all around the world, there are certain sectors in which occupational accidents mostly occur. Taking the number of accidents, the number of permanent incapacities and the number of deaths into account, these sectors can be listed as *Mining, Metal, and Construction*. These three sectors are indicated as the priority sectors by Republic of Turkey Ministry of Labour and Social Security in terms of the struggle against occupational accidents. When the data on the accidents at work between 2004 and 2010 is analyzed, it is seen that 46,4% of the accidents and 41,1% of the deaths in Turkey occurred only in these three sectors. Therefore, examining these three sectors would enable to reveal their specific problems regarding occupational safety. In this study, using the accident data from the year 2004 to 2010 by SSI (Social Security Institution), all the accidents which occurred in Turkey and the accidents specifically in Mining, Metal and Construction sectors were compared in terms of the parameters, which are also used by the international accident statisticians. (Since it has not been completed yet, the accident data on the year 2011 was not included in this study.)

**Keywords:** *Occupational accidents, job safety, mining, metal, construction, statistics, Turkey.*

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## 1. BACKGROUND AND PURPOSE

The right to work and right to live are the most basic rights for all people. The latter cannot be neglected for the sake of the former. Therefore, improving the working environment has a great importance. Production is a process carried out by people for other people. While production systems are designed and operated, people, the most important element of production, should not be neglected [1,2].

Although work-related accidents are the common problems of all countries, by taking the necessary measures it can be reduced in certain proportions. Countries which do not take enough measures are more affected in work-related accidents [1,3-5]. Even though

there is a serious improvement in terms of healthy and safe working environment, it can not be ignored that there is still a lot to do in Turkey. In recent years the ratio of accidents per working individual has fallen down. However, the accident statistics for the last seven years examined in our country still shows 73937 accidents and 1152 employees lost their lives in these accidents [5-12].

Occupational accidents lead to serious problems in Turkey and in many other countries. The outcomes of occupational accidents can be divided into two categories—social costs and economic costs. As a result of occupational accidents, deaths and permanent disabilities occur. The death of workers or their permanent disability leads to social and psychological

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problems for these workers and their families. Every year, nearly 1152 workers die and 1900 workers are injured, becoming permanently disabled due to occupational accidents in Turkey. These results constitute social part of cost of work related accidents. On the other hand, economic losses also emerge due to occupational accidents. Economic costs include work day losses, productivity losses, production losses, payments for hospital, physician, and allied health services, rehabilitation, home health care, medical equipment, burial costs, insurance administrative costs for medical claims, payments for mental health treatment, police, fire, emergency transport, coroner services, and property damage. In Turkey, the annual economic loss stemming from occupational accidents estimated around 40 billion TL [5-12].

**Mining** has always been considered as a very difficult job. Rich people did not work at the mines that require physical force years ago. Slaves, captives and criminals used to work at these jobs. This was a punishment for them. Accidents, illnesses or even deaths weren't important for anyone. But when surface mining ended, underground mining started and this required special knowledge and skill. Thus, the illness or death of a sophisticated and skillful worker was started to be considered as an important matter and safety and health at mines became a current issue [13].

**Mining sector** is in the '**Very Dangerous**' category according to the Notification List of Hazard Classes regarding Occupational Health and Safety by the Ministry of Labour and Social Security [14]. Mines are too risky workplaces in terms of various accidents. Sharp, penetrative pickers and explosives are used in mines. Different constructions are made to support the underground frame against collapsing. Accidents may happen while using these objects or exploding or as a result of roof caving. But the most important reason for accidents in mines is firedamp explosion [15].

**Metal** production tasks are both physically demanding and stressful. The metal workers have been significantly exposed to prolonged hammering and cutting activities in excessive noise and with awkward body postures. Moreover, stressors from heat and humidity, welding fumes and metal dusts often cause excess strain and are reflected in a deterioration of their physical work performance. Such workers frequently suffer from ache or pain in the musculoskeletal system and do have significantly more diagnosed musculoskeletal diseases. Accidental exposure to electricity and magnetic field remains an additional factor affecting human body. Apart from high noise level, poor illumination and a variety of chemical agents have been the area of primary concern in such operations [16].

**Metal** is one of the leading sectors which involve many subsectors structurally. This sector mainly depends on manpower and it is really costly. An important part of the workers work in this sector in Turkey. According to the statistics of SSI in 2010, it is the first sector with a rate of % 26,05 of occupational accidents and it is among the leading ones with a rate of % 8,03 fatal accidents [12]. Metal sector is in the '**Dangerous**'

category according to the Notification List of Hazard Classes regarding Occupational Health and Safety by the Ministry of Labour and Social Security [14].

**Construction** is one of the most dangerous industries in Turkey. Despite efforts to reduce the risk of occupational injuries and illnesses in construction, the industry continues to account for a disproportionate share of work-related injuries in Turkey. In 2010, construction workers were 14.46% of the Turkey workforce, but suffered 32.90% of the nation's 1444 reported work-related deaths. In addition, there were 319 permanent incapacity cases resulting from occupational accidents in construction this year. The rate was higher than that for all industry as a whole [12].

**Construction** is an industry that affects many other production areas directly and that involves %15 of the work power of the country and which is thus has an important place in terms of the national economy. Despite the developments in the sector, it mostly depends on manpower. The fact that workers have low level of education, work place changes often, it is done outdoors, the sector is mostly unrecorded and the employers do not take necessary precautions, make this sector risky on account of accidents [17,18,19]. Construction sector is in the '**Very Dangerous**' category according to the Notification List of Hazard Classes regarding Occupational Health and Safety by the Ministry of Labour and Social Security [14]. There are approximately 7000 accidents every year in this sector [12]. Most of the accidents result in death and this makes a study on safety obligatory.

In this study, accidents occurring in whole Turkey (for all sectors) and the accidents occurring in mining, metal and construction sectors in Turkey are compared in terms of various parameters used by international accident statisticians [20]. These three sectors are the highest sectors in terms of work-related-injuries and work-related-deaths. Therefore, this examination of the three sectors will help to improve preventing fragilities in these sectors.

## 2. METHODOLOGY

In this study, the statistical yearbooks regularly published by Social Security Institution (SSI) have been used as a data source. The most comprehensive data related to occupational accidents is gathered and published by SGK which is a public institution. In the yearbooks, the occupational accidents occurring in all provinces are presented numerically in terms of many criteria [6-12, 21]. According to data gathered from this statistical yearbooks, the number of insured workers, number of occupational accidents, number of deaths and number of permanently disabled persons in Turkey (for all sectors) and *Mining, Metal* and *Construction* sectors separately are given between the years 2004 and 2010. We calculated three different *incidence rates* (for the total (fatal+nonfatal) number of accidents, for the number of permanent incapacity and for the number of fatal accidents) and *accident frequency* values for Turkey (for all sectors) and *Mining, Metal* and

Construction sectors separately between the years 2004 and 2010. Moreover, occupational accidents occurring in Turkey (for all sectors) and the accidents occurring in Mining, Metal and Construction sectors have been compared with respect to incidence rates and accident frequency values. Consequently, some recommendations have been presented to prevent or reduce occupational accidents.

**3. BASIC CONCEPTS**

**3.1. Occupational Accident and Job Safety**

Eventhough there are lots of descriptions of occupational accidents, it can be described as events not planned before, usually causing injuries, loss of equipment or interruption of production [1]. According to Turkish laws in the 13th clause of Social Insurance and General Health Insurance law numbered 5510, a broaden definition takes place. According to this definition occupational accident is an event occurring in any one of the circumstances or situations indicated below which causes immediately or subsequently a physical or mental disability to an insured person:

- \* When the insured person is in the work place,
- \* In connection with the work carried on by the employer,
- \* When the insured person has been sent by the employer to perform duties at another place,
- \* During the period allocated for nursing of the child of the insured women,
- \* While insured persons are carried, as a group on a vehicle supplied by the employer to and from the place where the work is being done [22].

Job safety means to provide healthy and safe working conditions to prevent occupational accidents and diseases thus minimize the moral and material losses and increase the productivity.

**3.2. Occupational Disease**

Occupational disease is a case of temporary or permanent sickness, disability or mental trouble suffered by an insured person due to continuing causal factor which is characteristic of the conditions required to perform such a work [22].

$IR_1$  represents the number of accidents per 1000 workers in one calendar year.

$$IR_1 = \frac{\text{Number of Accident} * 1000}{\text{Number of Workers}}$$

2. **Incidence rate-II (Permanent Incapacity Incidence Rate)** value calculated for the number of permanent incapacity resulting from occupational accidents ( $IR_2$ ):

$IR_2$  represents number of permanent incapacity per 1000000 workers in one calendar year.

$$IR_2 = \frac{\text{Number of Permanent Incapacity} * 1000000}{\text{Number of Workers}}$$

**3.3. Permanent Incapacity**

Permanent incapacity is the situation an insured person loses a part of or the complete earning capacity due to an employment injury or occupational disease, in spite of the medical treatment performed. The insured person who has lost at least 10 percent of his earning capacity in the profession shall be entitled to an amount of income against permanent incapacity for work [22].

**3.4. Temporary Incapacity**

Due to occupational accidents or occupational diseases the insured person is temporary incapable of working [22].

**3.5. Deaths Resulting From Occupational Accident or Occupational Disease**

This includes deaths as a result of occupational accident or occupational disease, death of an individual who lost 50% or more his/her earning power on the job and having treatment while getting their permanent pension.

**3.6. Comparison Criteria**

Since each sector has a different numbers of workers, comparison based on only recorded accidents will be meaningless. The important point is the ratio between the number of workers and the accidents, not the number of individuals who's got an accident. That's why there are different parameters and measurements in work-related-accidents [22].

**3.6.1. Incidence Rate**

European Union's Statistical Office (Eurostat) determined the incidence rate as accidents per 1000 workers. In the literature, incidence rate is calculated per 1000, 10000 and 100000 workers. In this study three different incidence rate values are calculated.

1. **Incidence rate-I (General Incidence Rate)** value calculated for the total (fatal+non-fatal) number of occupational accidents ( $IR_1$ ):

3. **Incidence rate-III (Fatal Incidence Rate)** value calculated for the number of deaths resulting from occupational accidents ( $IR_3$ ):

$IR_3$  represents number of deaths per 1000000 workers in one calendar year.

$$IR_3 = \frac{\text{Number of Deaths} * 1000000}{\text{Number of Workers}}$$

### 3.6.2. Accident Frequency

Accident frequency represents the number of accidents per 1000000 working hours in one calendar year (AF).

$$AF = \frac{\text{Number of Accidents} * 1000000}{\text{Total Working Hours Worked by All Insured Workers During Calendar Year}}$$

## 4. OVERVIEW OF OCCUPATIONAL ACCIDENTS IN TURKEY

### 4.1. Number of insured workers

According to data gathered for the years 2004-2010, Turkey in general, mining, metal and construction sectors, the number of insured workers and percentage values are given in Table 1 [6-12].

**Table 1. N' of insured workers and percentages.**

Year	Total Turkey	%	Mining Sector	%	Metal Sector	%	Construction Sector	%
2004	6181251	100	86366	1,40	467810	7,57	752136	12,17
2005	6918605	100	97186	1,40	509339	7,36	933498	13,49
2006	7818642	100	107805	1,38	570004	7,29	1185723	15,17
2007	8505390	100	109092	1,28	628446	7,39	1247970	14,67
2008	8802989	100	114962	1,30	974199	11,07	1238888	14,07
2009	9030202	100	118626	1,31	841814	9,32	1227689	13,60
2010	10030810	100	128660	1,28	887758	8,85	1450291	14,46

When this table is analyzed, a significant rise in the number of workers in Turkey can be seen. Number of workers in 2010 raised by approximately 62% compared with 2004 and 28% comparing with 2006. Construction sector has the highest employment (14%) field comparing with others. This shows construction industry is one of the leading sectors in Turkey.

### 4.2. Number of occupational accidents

According to data gathered for the years 2004-2010, Turkey in general, mining, metal and construction sectors, the number of accidents occurring and percentage values are given in Table 2 [6-12].

**Table 2. N' of occupational accidents and percentages.**

Year	Total Turkey	%	Mining Sector	%	Metal Sector	%	Construction Sector	%
2004	83830	100	6421	7,66	22632	27,00	8106	9,67
2005	73923	100	6930	9,37	20122	27,22	6480	8,77
2006	79027	100	7635	9,66	21876	27,68	7143	9,04
2007	80602	100	7218	8,96	22644	28,09	7615	9,45
2008	72963	100	6516	8,93	18118	24,83	5574	7,64
2009	64316	100	9091	14,13	16973	26,39	6877	10,69
2010	62903	100	9081	14,44	16387	26,05	6437	10,23
Average	73937	100	7556	10,22	19822	26,81	6890	9,32

Especially in recent years, a serious decline in the number of accidents throughout Turkey can be seen on the Table 2. The number of accidents in 2010 has

declined 25% compared to 2004, 22% compared to 2007 and 14% compared to 2008.

In our country most of the proportional accidents are in metal sector. In years 2004-2010 there were 19822 accidents at annual average in this sector and over the years average number of accidents hasn't declined. Therefore metal sector's accidents ratio has gone up compared to other sectors.

Mining sector is one of the most accidental sectors in our country. When the table above is examined, contrary to the country average, a significant increase in the number of occupational accidents in recent years could be seen. The number of accidents in 2010 increased by 42% as compared to 2004. In terms of job

safety, this situation indicates the mining sector needs to be under the spotlight.

A significant reduction in accidents in the construction sector can be seen in Table-2. In 2010 the number of accidents decreased by 21% as compared to 2004.

**4.3. Number of Death Cases As a Result of occupational Accidents**

According to data gathered for the years 2004-2010, Turkey in general, mining, metals and construction sectors, the number of deaths occurring as a result of occupational accidents and percentage values are given in Table 3 [6-12].

**Table 3. N'of death and percentages.**

Year	Total Turkey	%	Mining Sector	%	Metal Sector	%	Construction Sector	%
2004	843	100	68	8,07	66	7,83	263	31,20
2005	1096	100	121	11,04	64	5,84	290	26,46
2006	1601	100	80	5,00	75	4,68	397	24,80
2007	1044	100	77	7,38	80	7,66	359	34,39
2008	866	100	66	7,62	81	9,35	297	34,30
2009	1171	100	20	1,71	30	2,56	156	13,32
2010	1444	100	131	9,07	116	8,03	475	32,90
Average	1152	100	80	6,98	73	6,35	320	27,77

When we analyze Table-2 and Table-3 together, even though there is a decrease in the number of accidents, there is no significant change in the number of deaths in 2004-2010 in Turkey in general. This is a remarkable result that should be examined. Although until 2009 in mining, metal and construction sectors, there was no improvement, only in 2009, there is a remarkable decrease in these three sectors. According to data gathered for the years 2004-2010, most deaths in Turkey were seen in the construction sector with 27,77 % average. The main reasons of this image are construction sector related problems like non-institutionalized small businesses in the sector, too

much work-force transfer in the sector, low educational level of workers, constantly changing working environments problems. However, the need to investigate the causes of this problem in detail is obvious.

**4.4. Number of Permanent Incapacity**

According to data gathered for the years 2004-2010, Turkey in general, mining, metals and construction sectors, number of permanent incapacity as a result of occupational accidents and percentage values are given in Table 4 [6-12].

**Table 4. N'of permanent incapacity and percentages.**

Year	Total Turkey	%	Mining Sector	%	Metal Sector	%	Construction Sector	%
2004	1693	100	334	19,73	229	13,53	349	20,61
2005	1639	100	314	19,16	211	12,87	324	19,77
2006	2267	100	448	19,76	342	15,09	428	18,88
2007	1956	100	481	24,59	246	12,58	364	18,61
2008	1694	100	257	15,17	273	16,12	377	22,26
2009	1885	100	121	6,42	211	11,19	284	15,07
2010	2085	100	123	5,90	300	14,39	319	15,30
Average	1888	100	297	15,72	259	13,71	350	18,50

For the years 2004 to 2010, when the tables above are examined, although there is a serious reduction in the number of accidents in Turkey, there is no significant change in the number of permanent incapacity.

Until 2009 for mining, metal and construction sectors, there was no improvement in the number of permanent incapacity as a result of accidents, but in 2009, a remarkable decrease can be seen in these three sectors. But in 2010 the permanent incapacity number in metal

sector became more than the average value of the last seven years.

According to data gathered for the years 2004-2010, highest permanent incapacity rate is in construction sector with 18,50 %. 48 % of all permanent incapacity cases are in these three sectors (mining, metal, construction).

## 5. COMPARISON OF MINING, METAL AND CONSTRUCTION SECTORS

### 5.1. Incidence Rate I

According to data gathered for the years 2004-2010, general incidence rate, accidents per 1000 workers in Turkey in general, mining, metal and construction sectors is given in table 5.

Table 5. Incidence rate I (  $IR_1$  )

Year	Total Turkey	Mining Sector	Metal Sector	Construction Sector
2004	13,56	74,35	48,38	10,78
2005	10,68	71,31	39,51	6,94
2006	10,11	70,73	38,38	6,02
2007	9,48	66,16	36,03	6,10
2008	8,29	56,68	21,52	4,50
2009	7,12	76,64	21,49	5,60
2010	6,27	70,58	18,46	4,44

When the Table-5 above is examined from 2004 to 2008, in Turkey in general and in the mentioned sectors, a significant reduction in incidence rates can be seen. In 2009 though, in mining sector, the incidence rate value of accidents increased by approximately 35% compared to the previous year, a remarkable change was not observed in other sectors.

When we look at incidence rates between 2004 and 2010 in Turkey in general,  $IR_1$  in 2010 dropped down approximately by 54% compared to 2004, 34% compared to 2007 and 25% compared to 2008.  $IR_1$  was 13,56 in 2004, in 2010, it is 6,27. In other words in 2004 approximately 14 worker in 1000 had an accident, in 2010, 7 worker had accidents in 1000 workers.

Mining sector's incidence rates are calculated as 74,35 in 2004 and 70,58 in 2010. In other words, mining

sector had approximately 75 accidents per 1000 in 2004 but in 2010, 71 accidents occurred per 1000 workers. Considering incidence rates in the metal sector are calculated as 48,38 in 2004 and in 2010 it was calculated as 18,46. In other words, in 2004 approximately 49 work accidents and in 2010, 19 occupational accidents occurred per 1000 workers in the sector.

Looking at the construction industry incidence rates, in 2004 it was 10,78, in 2010 it was 4,44. In other words, in construction sector 11 accidents in 2004, and 5 accidents in 2010 occurred per 1000 workers.

### 5.2. Incidence Rate II

According to data gathered for the years 2004-2010, permanent incapacity incidence rates calculated for Turkey in general, mining, metal, and construction sectors are shown in Table-6.

Table 6. Incidence Rate II (  $IR_2$  ).

Year	Total Turkey	Mining Sector	Metal Sector	Construction Sector
2004	274	3867	490	464
2005	237	3231	414	347
2006	290	4156	600	361
2007	230	4409	391	292
2008	192	2236	324	304
2009	209	1020	276	231
2010	208	956	338	220

Since permanent incapacity incidence rate values show how many workers out of 1000000 become permanently incapable due to occupational accidents every year, they are important in terms of figuring out the severity of accidents and intangible losses arising from them. When the whole Turkey and Mining, Metal and Construction sectors are compared in terms of the permanent incapacity incidence rates of accidents ( $IR_2$ ), it is seen that permanent incapacity incidence rates are very high in all these three sectors. In Turkey, Mining sector has the highest permanent incapacity incidence rates. It is followed by Metal and Construction sectors respectively. From 2004 to 2010, there have been remarkable decreases in the permanent incapacity incidence rates both in the whole Turkey and in Mining, Metal and Construction sectors. This situation can be explained with the efforts in the field of Occupational Health and Safety in Turkey in recent years.

Looking at permanent incapacity incidence rates of occupational accidents throughout Turkey 2004-2010 ( $IR_2$ ), in 2010, this value is calculated as 208, in 2004 it was calculated as 274. In other words, 274 workers in 2004 and 208 workers in 2010 had accidents which led to permanent disability per 1000000 workers.

Permanent incapacity incidence rates in mining sector are the highest. Mining sector in Turkey, with the highest permanent incapacity incidence rates ( $IR_2$ ) is

the most intensive sector (Table 6). This value was 14 times more than Turkey's average in 2004, 2010 it has been approximately 5 times more than Turkey's average. Permanent incapacity incidence rate for Mining industry in 2004 was 3867 and in 2010 it was 956. In other words, 3867 workers in 2004 and 956 workers in 2010, had accident which led to permanent disability per 1000000 workers in mining sector.

Permanent incapacity incidence rate ( $IR_2$ ) of metal sector was 490 in 2004, and 338 in 2010. In other words, 490 workers in 2004 and approximately 338 workers in 2010, had accident which led to permanent disability per 1000000 workers in metal sector.

For the construction industry, permanent incapacity incidence rate ( $IR_2$ ) value has a continuous improvement. While  $IR_2$  was calculated as 464 in 2004, it was calculated as 220 in 2010. In other words, in the construction sector in Turkey, 464 workers in 2004 and 220 workers in 2010 had accidents which led them to permanent disability per 1,000,000 workers.

**5.3. Incidence Rate III (Fatal Incidence Rate)**

According to data gathered for the years 2004-2010, Turkey in general, mining, metals and construction sectors' occupational accidents which led to death of the person per 1,000,000 workers Incidence Rate III are given in Table 7.

Table 7. Incidence Rate III ( $IR_3$ ).

Year	Total Turkey	Mining Sector	Metal Sector	Construction Sector
2004	136	787	141	350
2005	158	1245	126	311
2006	205	742	132	335
2007	123	706	127	288
2008	98	574	96	240
2009	130	169	38	127
2010	144	1018	131	328

Fatal incidence rate value is a very very important indicator which represents number of deaths resulting from occupational accidents per 1000000 workers in one calendar year. Because no economic value is more precious than human life. In addition, since fatal accidents cause the alienation of workers from their jobs, a decrease in yields and an increase in drop out rates can be seen.

If throughout Turkey and analyzed sectors will be examined in terms of the fatal incidence rates from 2004 to 2010, there is floating and already a course of recovery observed. Looking at fatal incidence rate ( $IR_3$ ), mining and construction sectors are seen as the most intensive sectors. In 2004 it was recorded as 787 and in 2010, this value was recorded as 1018 in mining sector. In other words, about 787 workers in 2004, and

1018 workers in 2010, per 1,000,000 workers died as a result of these accidents. Approximately 350 workers out of every one million workers in the construction sector in Turkey in 2004, and 328 workers out of every one million workers in Turkey in 2010, died due to accident at work.

For fatal incidence rates ( $IR_3$ ) the metal sector in these three sectors is seen to be in the best case. 141 workers in 2004 and 131 workers in 2010 for every 1,000,000 workers died due to the accidents at work. In other words, about 141 workers in 2004, and 131 workers in 2010, per 1,000,000 workers died as a result of these accidents in metal sector.

#### 5.4. Accident Frequency (Accident Repetition Rate)

According to data gathered for the years 2004-2010, Turkey in general, mining, metal and construction

sectors' occupational accidents frequency in one year per 1,000,000-work-hours values are given in Table 8.

Table 8. Accident Frequency Values ( AF ).

Year	Total Turkey	Mining Sector	Metal Sector	Construction Sector
2004	5,52	30,25	19,68	4,38
2005	4,27	28,47	15,77	2,77
2006	4,03	28,22	15,31	2,40
2007	3,61	25,18	13,71	2,32
2008	3,10	21,17	8,04	1,68
2009	2,76	29,67	8,32	2,17
2010	2,46	27,74	7,25	1,74

For the years 2004-2010 the accident frequency ( AF ) values dramatically decrease in Turkey in general. In 2004, the value calculated as 5,52, in 2010 the value was 2,46. In other words, the number of accidents in Turkey per 1,000,000-work-hours was nearly 6 in 2004, and less than 3 in 2010.

According to the table above, the accident frequency is the highest in mining sector. Looking at the accident frequency values for mining sector in the years 2004-2010, up to 2009 there is a decrease in accident frequency but in 2009 there is a significant increase. In 2004, the value was 30,25 in 2008 though, it was 21,17. In other words, per one million work hours in Turkey, there were 30 accidents in 2004, 21 accidents in 2008 and 28 accidents in 2010.

In the metal sector there is a decrease in accident frequency values for the years 2004-2010. In 2004, this value was calculated as 19,68 in 2010 it was calculated as 7,25. In other words, in the metal sector in Turkey per 1000000-work-hours there were 20 accidents in 2004, and 7 accidents in 2010.

A decrease in accident frequency values for the years 2004-2010 can also be seen in construction sector. This value was calculated as 4,38 in 2004 and it was calculated as 1,74 in 2010. In other words, in the construction sector in Turkey per 1,000,000-work-hours there were 4 accidents in 2004, and 2 accidents in 2010.

#### Important Note: When used in this study;

*The concept of social security statistics in Mining Sector*

'Coal and Lignite Removing', 'Crude Oil and Natural Gas Extraction', 'Metal Ore Mining', 'Other mining and stone quarries', 'Mining Supportive Services' operating groups, and then,

*The concept of social security statistics in Metal Sector*

'Basic Metal Industry', 'Manufacture of metal goods (except for machines)', 'Machinery and Equipment Manufacturing', 'Manufacture of motor vehicles and trailers', 'Other Transport Equipment Manufacturing', 'Machinery and Equipment Installation and Repair' action groups, and then,

*The concept of social security statistics in Construction Sector*

'Building Construction', 'Out of Building Construction of Structures', 'Special Construction Activities' contains groups of activities.

## 6. DISCUSSION AND CONCLUSIONS

With annual average of 73937 occupational accidents and 1152 deaths, Turkey still faces an important problem. The country exercises one of the lowest performances in job safety among the European Union countries. In Turkey, work related accidents have concentrated in certain sectors as all over the world. Among them mining, metal and construction sectors are leading ones in terms of number of accidents, permanent incapacities, and deaths. The results obtained for these three sectors in this study are summarized as follows:

- In recent years, a significant decrease in the number of accidents is observed although the number of insured workers is increased. This increase can be related to both economic development and insuring of previously uninsured employers. Unfortunately, recent numbers of death and permanent incapacity resulted from occupational accidents exceed the last seven year averages. This fact forces us to be more sensitive on, especially, mining and construction sectors where such events occur more frequently. An increase in periodic inspection seems to be a practical and quick solution. Determining root causes of accidents in such sectors, creating nationwide sectoral databases for use of preventional purposes and providing access of all companies to sectoral databases can be another solution. Additional safety measures can be adapted to sectors with high risks of deaths and permanent incapacities. For example, in construction sector, fall from height is one of the frequent accident cause, therefore, those who are above certain ages can be banned for such duties or they can be subjected to more frequent health exams.

- The construction sector, particularly in terms of fatal occupational accidents is seen as one of the most dangerous sector in Turkey. With 14% of the Turkish-workforce which is mostly employed in the construction sector is increase the importance of the problem. While the 9 % of accidents occur in the



construction sector in Turkey, 28 % of deaths and 18 % of permanent incapacity for work is also in this sector. This indicates that the construction sector has serious problems in terms of job safety.

- Metal sector is another sector where employment is intensive, 9% of Turkish workforce. In Turkey, with the maximum of 27 % of accidents occur in metal sector. 14 % of permanent incapacity for work and 6 % of death cases are also in this sector.

- While mining sector employs only the 1,3% of employees, it also has a high figures in terms of general incidence rate, permanent incapacity rate and fatal incidence rate. The frequency values calculated for this sector are well above the average in Turkey. With this aspect, mining sector appears to be very inadequate in terms of job safety.

Underreporting causes lack of information about existing safety problems and hinders preventive actions. Unfortunately, majority of the accidents occurring in Turkey are not being recorded. As in the rest of the world, underreporting of the accidents emerges as an important problem in Turkey as well. While about 800000 accidents per year are being recorded in Germany with population of 82 million, only 70000 accidents are being taken under record in Turkey with population of 74 million. Therefore, it is an undeniable fact that the real situation in Turkey in terms of occupational accidents, both for Turkey in general and Mining, Metal and Construction sectors are a lot higher than the numbers given in this study.

Ninety percent of the accidents are due to the human error. Lack of education and ignorance are one of the most important causes of accidents. In Turkey occupational safety and health (OSH) training is really inadequate both at vocational high schools and at universities. In most of the colleges, occupational health and safety is not studied or studied as an elective course. In Turkey occupational safety specialists are the ones who have graduated from various faculties. They just have 120 hours of training. There is not any special unit which gives OSH education at the level of college degree. As a consequence of this a person who has graduated from an irrelevant field and completed the 120 of training can have a job as an occupational safety specialist in the construction or metal sector. These people are incapable of creating a secure working place. In these sectors, just as in mining, an occupational safety specialist should be chosen from related fields.

Occupational accidents can be reduced by paying attention to the subject and taking effective and preventive measures. There are some tasks should be fulfilled in order to create a secure work place by employers, employees and associated public institutes. Employers should give importance to occupational health and safety, take preventative measures and train the employers regularly against work related accidents. Furthermore the employers are responsible for applying the identified precautions. Personnel should be conscious and careful about the accidents and should fulfill their obligations regarding to work safety while working. Public institutions should work on creating a secure work place and creating a culture of work safety. Also one of the public agency's duties is inspection on

obeying the legal statute by employers about the work safety.

In order to prevent or reduce the number of occupational accidents; the root factors causing the accidents should be identified with researches and analysis, there should be improvements in the system, necessary corrective measures should be taken, and finally whether the measures are applied effectively or not should be checked regularly. The problem which is usually seen in Turkey is that although the corrective measures are determined sensitively applications are not given that importance. As a result the important things in the occupational safety are to review the corrective measures regularly and checking whether the measures are applied effectively or not. The success in the prevention of the accidents depends on this process.

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