OCCUPATIONAL ACCIDENTS AND DISEASES IN TURKISH CONSTRUCTION INDUSTRY

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

YUNUS EMRE TAŞYÜREK

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF MASTER OF SCIENCE
IN
DEPARTMENT OF CIVIL ENGINEERING

NOVEMBER 2007

Approval of the Thesis

"OCCUPATIONAL ACCIDENTS AND DISEASES IN TURKISH CONSTRUCTION INDUSTRY"

Submitted by **YUNUS EMRE TAŞYÜREK** in partial fulfilment of requirements for the degree of **Master of Science in Civil Engineering** by,

Prof. Dr. Canan Özgen
Dean, Graduate School of **Natural and Applied Sciences** _____

Prof. Dr. Güney Özcebe
Head of Department, **Civil Engineering** _____

Assoc. Prof. Dr Murat Gündüz
Supervisor**, Civil Engineering, METU** _____

Examining Committee Members:

Assist. Prof. Dr. Metin Arıkan
Civil Engineering, METU _____

Assoc. Prof. Dr Murat Gündüz
Civil Engineering, METU _____

Assoc. Prof. Dr. Can E. Balas
Civil Engineering, GAZİ U. _____

Assist. Prof. Dr. Ali Murat Tanyer
Architecture, METU _____

Chemist Ümit Tarhan
Ministry of Labour and Social Security _____

Date: 13 / 11 / 2007

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name, Last Name : Yunus Emre Taşyürek

Signature :

ABSTRACT

OCCUPATIONAL ACCIDENTS AND DISEASES IN TURKISH CONSTRUCTION INDUSTRY

Taşyürek, Yunus Emre
M.S., Department of Civil Engineering
Supervisor: Assoc. Prof. Dr. Murat Gündüz

November 2007, 175 pages

The aim of this thesis is to determine the state of occupational health and safety of the construction industry among other industries in Turkey. For this purpose, data such as the number of occupational diseases, the number of occupational injuries, the number of cases of permanent incapacity to work and the number of fatal occupational injuries in each industry are derived from official sources. The comparison of the construction industry with other industries in terms of occupational health and safety is made with the comparative measures calculated with these data. In addition, it is intended to determine some characteristics of the occupational injuries and victims in the construction industry. Therefore, the distribution of more than 22,700 data concerning occupational injuries according to some selected variables is taken into account.

Keywords: Occupational health and safety, occupational safety, occupational accidents, occupational diseases, construction industry

ÖZ

TÜRK İNŞAAT SEKTÖRÜNDE
İŞ KAZALARI VE MESLEK HASTALIKLARI

Taşyürek, Yunus Emre
Yüksek Lisans, İnşaat Mühendisliği Bölümü
Tez Yöneticisi: Doç. Dr. Murat Gündüz

Kasım 2007, 175 sayfa

Bu tezin amacı inşaat sektörünün Türkiye'deki diğer sektörlere göre iş sağlığı ve güvenliği durumunu belirlemektir. Bu amaç için resmi kaynaklardan her sektörde kaydedilen meslek hastalığı sayıları, iş kazası sayıları, sürekli iş göremezlik sayıları ve ölüm sayıları gibi veriler derlenmiştir. İnşaat sektörünün diğer sektörler ile iş sağlığı ve güvenliği bakımından karşılaştırılması bu veriler kullanılarak hesaplanan karşılaştırma ölçütleri ile gerçekleştirilmiştir. Bunun dışında inşaat sektöründeki iş kazaları ve kazazedelere ilişkin bazı özeliklerin belirlenmesi amaçlanmıştır. Bunun için ise iş kazaları ile ilgili 22,700'den fazla verinin seçilen bazı değişkenlere göre dağılımı göz önünde bulundurulmuştur.

Anahtar Kelimeler: İş sağlığı ve güvenliği, iş güvenliği, iş kazaları, meslek hastalıkları, inşaat sektörü.

ACKNOWLEDGEMENTS

The author would like to express his greatest gratitude to his supervisor Assoc. Prof. Dr. Murat Gündüz for his encouragement, patience, guidance, endless suggestions throughout this research and for his support in the preparation of this thesis.

The author would also like to thank Ümit Tarhan, the Head of the Department of the Occupational Safety of DGOHS, for her continuous support in the preparation of the thesis and Erhan Batur, the Director General of Occupational Health and Safety, for his support to academic studies.

The author wishes also to express his thanks to his friends Deniz and Cem.

TABLE OF CONTENTS

LIST OF TABLES

TABLES

LIST OF FIGURES

FIGURES

LIST OF ABBREVIATIONS

SII	Social Insurance Institute
ILO	International Labour Organization
EU	European Union
EUROSTAT	Statistical Office of the European Communities

CHAPTER 1

INTRODUCTION

Occupational accidents and diseases are a major problem of the working life. Some fundamental figures from the world and Turkey are presented below to illustrate the severity of this problem.

1.1 General

The ILO (International Labour Organization) estimates that some 2.2 million women and men around the world succumb to work-related accidents or diseases every year. Worldwide, there are around 270 million occupational accidents and 160 million victims of work-related illnesses annually. [1]

According to the statistics of the Social Insurance Institute, 73923 accidents occurred in 2005 in Turkey and 1096 workers died because of an occupational accident or disease. [2]

1.2 Construction Industry

According to ILO estimates:
Each year at least 60,000 fatal accidents occur on construction sites around the world – or one fatal accident every ten minutes.
1. One in six fatal accidents at work occurs on a construction site.

2. In industrialized countries, as many as 25-40 percent of work-related deaths occur on construction sites, even though the sector employs only 6-10 per cent of the workforce.
3. In some countries, it is estimated that 30 percent of construction workers suffer from back pains or other musculoskeletal disorders. [1]

According to the statistics of the Social Insurance Institute 290 fatal occupational accidents occurred in the construction industry corresponding to 27 per cent of all fatal occupational accidents in Turkey in 2005. This is a high ratio when it is considered that 8,8 per cent of all occupational accidents occurred in the construction industry and 13,5 per cent of the workforce was employed in the construction industry in this year. [2]

1.3 Objectives

The discussion above implies that the figures of the occupational accidents and diseases in the construction industry compose an important part of the overall figures. Thus one of the objectives of this study is set, to determine the state of occupational health and safety of the construction industry among other industries in Turkey. The comparison of the construction industry with other industries in terms of occupational health and safety will be made with the comparative measures calculated with the parameters derived from the statistics.

Another objective of this study is to determine some characteristics of the occupational injuries and victims in the construction industry in order to determine and to indicate the possible problematic areas, where then the prevention activities can be scrutinized or improved.

Assessments and interpretations will be made only with parameters during this study, since this study aims to be a reference document to the construction industry.

In addition it is also aimed to illustrate the comparability of the statistics in the field of occupational health and safety. Thus the perception of the statistics of occupational health and safety in the international area and the discrepancies in the statistics of different sources will be investigated.

1.4 Structure of the study

To accomplish the aforementioned objectives the study is structured as follows:

The second chapter of this study is devoted to the importance of the statistics. The purposes of the statistics, their perception in the international area and the discrepancies in the statistics of different sources are examined in this chapter.

The third chapter focuses on the definitions of the terms concerning occupational accidents and diseases and on the measures that can be used in the comparisons. Approaches of different researchers and institutions are outlined. Comparative measures that will be used in the comparisons are determined in this chapter.

The fourth chapter examines the occupational diseases in the construction industry and other industries. Explanations of the use of the statistics are also made in this chapter.

The fifth chapter of this study aims to determine the safety performance of the construction industry among other industries in Turkey.

The sixth and seventh chapters of this study intend to determine some characteristics of the victims and occupational accidents in the construction industry.

The sixth chapter includes many distributions of the results of the occupational accidents according to the provinces in which they occurred. The comparison of the provinces according to their safety performance in construction industry is made in this chapter.

Other variables are considered in the seventh chapter.

CHAPTER 2

STATISTICS OF OCCUPATIONAL ACCIDENTS AND DISEASES

In this chapter, some fundamental information about the purpose of the statistics in the area of occupational health and safety is given. The regulations in the international area are examined to underline the importance of statistics and to determine the requirements and the recommendations to related parties. The sources and coverage of statistics are mentioned briefly and discrepancies in these are highlighted. Some of the efforts are illustrated to overcome the problems arising due to the differences in the statistics.

2.1 General

Accident figures are the core data for most safety approaches. Accidents are screened to compare and evaluate safety standards and practices of different nations, industries, companies and work places. They serve as figures for insurance companies to predict the expected risk of work activities. They lead to better safety standards by localizing hazards at work places, and are employed to initiate safe working procedures, working equipment and environment, and safe working behaviour. [3]

The resolution concerning statistics of occupational injuries (resulting from occupational accidents), adopted by the Sixteenth International Conference of Labour Statisticians implies that the statistics may be used for a number of purposes, such as:

(a) to identify the occupations and economic activities where occupational injuries occur, along with their extent, severity and the way in which they occur, as a basis for planning preventive measures;
(b) to set priorities for preventive efforts;
(c) to detect changes in the pattern and occurrence of occupational injuries, so as to monitor improvements in safety and reveal any new areas of risk;
(d) to inform employers, employers' organizations, workers and workers' organizations of the risks associated with their work and workplaces, so that they can take an active part in their own safety;
(e) to evaluate the effectiveness of preventive measures;
(f) to estimate the consequences of occupational injuries, particularly in terms of days lost or costs;
(g) to provide a basis for policy-making aimed at encouraging employers, employers' organizations, workers and workers' organizations to introduce accident prevention measures;
(h) to assist in developing training material and programmes for accident prevention;
(i) to provide a basis for identifying possible areas for future research. [4]

Occupational accident and disease prevention requires the availability of consistent, comparable information on the frequency and severity of occupational injuries and diseases occurring within countries or firms. Such comparative information can help countries or firms to identify successes and failures of their health and safety policies, to target major remaining problem areas, and to make informed decisions about the channelling of resources.

It's clear that more than just frequency and severity data is necessary to achieve the purposes mentioned above. The type of collected data should be expanded as much as possible. Furthermore the data should be comparable, consistent, reliable, and should be able to represent the country (or firm) as a whole.

2.2 International conventions and recommendations

Many conventions, recommendations, resolutions etc. concerning statistics are published by ILO (International Labour Organization) to ensure the members:

- to establish and apply procedures for the notification of occupational accidents and diseases
- to publish, annually, information on measures taken to prevent accidents and injury to health
- to publish annually statistics concerning occupational accidents, occupational diseases etc.
- to establish the related statistics following international classification schemes
- to establish the statistics as to be representative of the country as a whole and to classify injuries according to some parameters

A brief summary of these regulations are presented below:

Article 11 of the Convention concerning Occupational Safety and Health and the Working Environment (C155 Occupational Safety and Health Convention, 1981) adopted by the General Conference of the International Labour Organisation, and also ratified by Turkey includes the following provisions:

"Article 11
To give effect to the policy referred to in Article 4 of this Convention, the competent authority or authorities shall ensure that the following functions are progressively carried out:
…
(c) the establishment and application of procedures for the notification of occupational accidents and diseases, by employers and, when appropriate,

insurance institutions and others directly concerned, and the production of annual statistics on occupational accidents and diseases;

…

(e) the publication, annually, of information on measures taken in pursuance of the policy referred to in Article 4 of this Convention and on occupational accidents, occupational diseases and other injuries to health which arise in the course of or in connection with work;

…" [5]

Supplementary to this convention, The General Conference of the International Labour Organization adopted the Protocol of 2002 to the Occupational Safety and Health Convention, 1981 (P155) by also noting the provisions of Article 11 of the Occupational Safety and Health Convention, 1981, in particular (c) and (e). This Protocol of 2002 to the Occupational Safety and Health Convention came into force on 09.02.2005 and is ratified by 4 countries except Turkey due to September, 2007. The first part of this protocol contains definitions of occupational accident, occupational disease etc., which were not available in the convention (C155) and the second part contains many provisions about recording and notification of occupational accidents and diseases. The third part is composed of 2 articles and is concerned with national statistics:

"III. National Statistics

Article 6

Each Member which ratifies this Protocol shall, based on the notifications and other available information, publish annually statistics that are compiled in such a way as to be representative of the country as a whole, concerning occupational accidents, occupational diseases and, as appropriate, dangerous occurrences and commuting accidents, as well as the analyses thereof.

Article 7

The statistics shall be established following classification schemes that are compatible with the latest relevant international schemes established under the

auspices of the International Labour Organization or other competent international organizations." [6]

In addition, Labour Statistics Convention, 1985 (C160), not yet ratified by Turkey but ratified by 46 other members requires the members to regularly collect, compile and publish basic labour statistics which shall cover the following subjects:
(a) economically active population, employment, where relevant unemployment, and where possible visible underemployment;
(b) structure and distribution of the economically active population, for detailed analysis and to serve as benchmark data;
(c) average earnings and hours of work (hours actually worked or hours paid for) and, where appropriate, time rates of wages and normal hours of work;
(d) wage structure and distribution;
(e) labour cost;
(f) consumer price indices;
(g) household expenditure or, where appropriate, family expenditure and, where possible, household income or, where appropriate, family income;
(h) occupational injuries and, as far as possible, occupational diseases; and
(i) industrial disputes.

Article 1 (h) is described in more detail in Article 14:

"Article 14
1. Statistics of occupational injuries shall be compiled in such a way as to be representative of the country as a whole, covering, where possible, all branches of economic activity.
2. As far as possible, statistics of occupational diseases shall be compiled covering all branches of economic activity, and in such a way as to be representative of the country as a whole." [7]

Supplementing this Labour Statistics Convention, 1985; the General Conference of the International Labour Organisation adopted the Labour Statistics Recommendation, 1985 (R170), which has further provisions about statistics of Occupational Injuries and Occupational Diseases in Article 12:

"Statistics of Occupational Injuries and Occupational Diseases
Article 12
(1) Statistics of occupational injuries should be compiled at least once a year.
(2) These statistics should be classified at least according to branch of economic activity and, as far as possible, according to significant characteristics of employees (such as sex, age group and occupation or occupational group or level of qualifications) and of establishments." [8]

More detail on statistics of occupational injuries is given in the Resolution concerning statistics of occupational injuries (resulting from occupational accidents), adopted by the Sixteenth International Conference of Labour Statisticians. This resolution contains sections related to the following: Terms and definitions, Coverage, Types of data, Measurement, Comparative measures, Dissemination, Classification, etc. [4]

Another document providing information on statistics in this area is the ILO code of practice "Recording and notification of occupational accidents and diseases." It serves as guide for recording and notification of occupational accidents and diseases together with the compilation, publication and classification of statistics of occupational accidents and diseases. [9]

In addition to the conventions of ILO, EU also forces its members to keep up statistics. The Framework Directive 89/391/EEC on the introduction of measures to encourage improvements in the safety and health of workers at work, which is at the harmonization process in Turkey, introduces, in Article 9, paragraphs c) and d), the obligation for employers to keep a list of occupational accidents resulting

in a worker being unfit for work for more than three days, and, in accordance with national laws and/or practices, to draw up reports on occupational accidents suffered by their workers. [10]

The importance of statistics of occupational accidents and diseases come to light when we consider the wide variety of purposes statistics are used for. The provisions of international conventions to compile, publish, classify and disseminate statistics strengthen this argument.

2.3 Sources of statistics

Requirements for the sources of statistics in the resolution concerning statistics of occupational injuries (resulting from occupational accidents), adopted by the Sixteenth International Conference of Labour Statisticians are:

- In compiling statistics of occupational injuries, various sources of information should be used in order to provide as full a picture as possible of the situation at a given point in time and to give an estimate of any under-reporting which may occur. For example, consideration could be given to periodically supplementing the information available from systems for the notification of compensation of occupational injuries by adding brief modules of questions to existing survey questionnaires, such as those used for establishment surveys for employment and wages, and for labour force surveys. In addition, the feasibility of developing new sources should be examined.

- Where data from different sources are used together, attempts should be made to ensure that the concepts, definitions, coverage and classifications used by the different sources are consistent. To this end, it would be useful to establish a coordinating committee at the national level, comprising representatives of government, other producers of statistics on occupational injuries, and employers'

and workers' organizations. In addition, efforts should be made to harmonize the statistics compiled from different sources and by different bodies. [4]

The OECD employment book reports three sources collecting occupational accident and diseases statistics in different countries. It also outlines some drawbacks and advantages of these sources.

1- In large part, data on occupational injuries and diseases are collected and published via insurance companies and social security agencies. This situation leads to a variety of data limitations.

- First, in general only compensated injuries are covered by the statistics and many minor injuries - knowledge of which could be equally important for the development of preventive policy - are not registered.
- Second, insurance companies - especially those that combine health and accident insurance - may not be sufficiently precise in differentiating occupational injuries, diseases and sickness absenteeism, because these categories may be treated alike in terms of compensation. This is less the case in countries such as Austria, Germany, Italy and Switzerland, whose injury compensation schemes are separate from general health insurance.
- Third, changes in the organisational setup of insurance systems or in the amount of compensation available to accident victims may have direct consequences for a country's reported number of occupational injuries.

In addition, insurance agencies - often with particular historic jurisdictions - adhere to those traditional jurisdictions in their statistical reporting and data gathering, and so continue to compile statistics for industry divisions or worker collectives that are often not comparable and not consistent with the International Standard Industrial Classification (ISIC) (examples of such agencies are the Berufsgenossenschaften in Germany and the Comités Techniques Nationaux in France).

Some industries, such as agriculture, shipping or public administration, may be covered only partly, or not at all, by national insurance schemes; accidents occurring in these industries may subsequently be only partially counted.

2- In some countries, such as the United Kingdom, labour inspectorates serve as the principal data-collecting agency. Where inspectorates are only an auxiliary source of information, and injury and illness are, in theory, reportable both to them and to the insurance agencies, important data disparities often arise, partly due to widespread ignorance about reporting requirements. In Germany, for example, only half of the injuries handled by insurance agencies are also recorded by the labour inspectorate.

3- In Japan and the United States, surveys on occupational injuries and diseases are conducted by statistical offices. While this method may represent a more accurate approach than the others mentioned above, the comparability of such survey data is limited by omissions from the sampling frame, such as the omission of establishments below a certain size (for example 100 employees in Japan and 11 employees for agriculture in the United States).
[11]

2.4 Sources of statistics of occupational accidents and diseases in Turkey

Turkey is in the group of countries collecting occupational accident and diseases statistics via insurance companies and social security agencies. The statistics of occupational accidents and diseases in Turkey are collected by the Social Insurance Institute. The employers within the coverage of the Social Insurance Law have the obligation to notify the Institution in cases of an occupational accident or disease according to the Social Insurance Law:

“Article 27-
The employer shall notify in writing the local police immediately and the Institution within two days, at the latest, of any work accident. This notification shall be made on the form prescribed by the Institution.
…”

“Article 28-
If the employer learns or is informed that an insured person has contracted an occupational disease; he shall inform the Institution within the following two days on a form prescribed by the Institution.
…” [12]

Social Insurance Institution is founded according to the Social Insurance Institution Law, numbered 4958 and is the relevant establishment of Social Security Institution which has the attached establishment status of the Ministry of Labour and Social Security. [13] During this study it will be called as “SII”.

A statistical yearbook will be prepared by Department of Finance Actuary and Planning of Social Insurance Institution and published by SII covering many statistics concerning social insurance implementations and also occupational accidents and diseases. This yearbook is composed of three main chapters. The first chapter contains the statistics related to the workplaces and insured persons covered by the Social Insurance Law, numbered 506. The second chapter contains the statistics of insurance cases notified to SII. The third chapter contains the figures showing the medical treatment activities performed in the medical facilities of the institution along with those realized by the physicians and institutions on contractual basis. [2] [14] [15] [16]

There is no other official source in Turkey which publishes such statistics yearly. Thus the use of the statistics of SII is inevitable for this study. But it should be mentioned that these yearbooks provide very limited industry specific data.

Statistics representing all industries are gathered from these yearbooks. Statistics representing only the construction industry has been gathered from these yearbooks when provided. Other additional industry specific statistics have been compiled from SII sources, in cooperation with Directorate General of Occupational Health and Safety of the Ministry of Labour and Social Security.

2.5 Coverage of statistics

Requirements for the coverage of statistics in the resolution concerning statistics of occupational injuries (resulting from occupational accidents), adopted by the Sixteenth International Conference of Labour Statisticians, are:

- The various sources of statistics should, where practical, cover all occupational injuries, as defined in paragraph 5, including non-fatal injuries causing an absence from work of at least one day, excluding the day of the accident, and fatal injuries. Where it is practical and considered relevant to include injuries resulting from commuting accidents, the information relating to them should be compiled and disseminated separately.
- Where practical, the statistics should cover all workers regardless of their status in employment (for example, employee, employer and own-account worker). The coverage should include child workers (should not be interpreted as condoning child labour), informal sector workers and homeworkers, where they exist.
- The statistics should in principle cover the whole country, all branches of economic activity and all sectors of the economy. A case of occupational injury occurring while a worker is outside the country of normal residence should be included in the statistics of the country within whose jurisdiction the accident took place.

The extent to which people employed are covered by national reporting systems differs highly. The proportion of employed people covered by the statistics

generally ranges between 30 and 70 per cent, but can fall as low as 10 percent. [17] The number of occupational accidents and diseases may represent reported or compensated accidents depending on the source of data. The coverage may be limited to certain types of workers (employees, insured persons, self-employed persons, etc.), certain economic activities, establishments employing more than a given number of workers etc. In addition members of public involved in an occupational accident may or may not be within the coverage depending on the country.

Countries also differ as to what are considered to be reportable or notifiable occupational accidents. While in some countries, such as Belgium, Spain and the United States, reporting of all accidents which have caused injury is required, in others accidents are counted only if they have caused worker incapacity for a specified number of days (such as 1 day or more in Denmark, France, the Netherlands and Portugal, or 3 days or more in Germany, Italy and the United Kingdom). In addition, some countries may include accidents occurring on the way to and from work, while others exclude or list separately such “in transit” occurrences. A similar problem arises with traffic accidents during working hours, which are excluded, for example, in the United Kingdom although they cause everywhere a considerable number of occupational injuries, especially of fatalities. [11]

ILO collects statistics worldwide. Brief details of the coverage of the national sources of member countries concerning health and safety can be seen in the synoptic table prepared by ILO. It contains information about following differences in its columns: (see Appendix A)

- Type of data and source
- Minimum period of absence from work
- Maximum period for death after accident
- Coverage - Workers - Type

- Coverage - Workers - % of total emp. (Workers covered by the statistics as a percentage of total employment)
- Coverage - Economic Activities
- Coverage - Occupational Diseases
- Coverage - Commuting accidents
- Days lost
- Reference year
- in addition, the types and sizes of establishments covered, such as all types and sizes of establishments, those above a specified size of employment (given as notes).

The following information can be extracted from this table about Turkey:

- Type of data and source is indicated as “Reported injuries” and “Insurance scheme” respectively.
- Only insured employees are covered by the statistics.
- % of total emp. (Workers covered by the statistics as a percentage of total employment) is given as 25,3.
- All economic activities are covered.
- Occupational diseases are included in the statistics.
- Commuting accidents are excluded.
- Time lost is given as workdays.
- Reference year is the calendar year.
- Minimum period of absence from work and maximum period for death after accident is not defined.

As it is illustrated in the synoptic table many differences exist in the statistics of the different member countries. The differences in these statistics must be taken into account when a comparison of the statistics of these countries is attempted. Thus harmonisation and standardization of the data is necessary so that a more accurate comparison can be undertaken.

2.6 Efforts on harmonisation and standardization of data

As it can be deduced by the examination of the synoptic table in the previous part, harmonization of data is a necessity to achieve the purposes listed at the beginning. The conventions and resolutions of ILO can actually be interpreted as efforts in this area, since they contain provisions to establish statistics following classification schemes that are compatible with the latest relevant international schemes established under the auspices of the international organizations. But ILO doesn't implement them; it just publishes practice of codes to serve as a guide to member countries.

Attention has to be drawn to European Commission at this point which also conducts projects to harmonize the statistics in addition to its legislative activities. Statistical Office of the European Communities (Eurostat) is responsible for statistics issues in Europe. Brief information on Eurostat is given below as described by the document "Eurostat's activities in the area of health statistics" prepared by the European Commission [18]:

Eurostat's mission is to provide the European Union with a **high-quality statistical information service**. Eurostat is the Statistical Office of the European Communities situated in Luxembourg and it is an integral part of the services of the European Commission. Its task is to provide the European Union with statistics at European level that enable comparisons between countries and regions. Thus, its overall objective is the provision of comparable statistics at the EU level, i.e. **regular data collection on a basic set of (official) statistics**.

Work is carried out within the **European Statistical System (ESS)**. The ESS comprises **Eurostat and the national statistical authorities**, i.e. all national providers of **official statistics** such as the statistical offices, but also ministries, agencies and central banks that collect official statistics in EU Member States, Iceland, Norway and Liechtenstein.

Member States collect data and compile statistics for national and EU purposes. The ESS functions as a network in which Eurostat's role is to lead the way in the harmonisation of statistics in close cooperation with the national statistical authorities. The rules within the ESS for the production of statistics are governed by the *European Statistics Code of Practice.*

The European Statistics Code of Practice is based on 15 principles, these are:

1. Professional independence
2. Mandate for data collection
3. Adequacy of resources
4. Quality commitment
5. Statistical confidentiality
6. Impartiality and objectivity
7. Sound methodology
8. Appropriate statistical procedures
9. Non-excessive burden on respondents
10. Cost effectiveness
11. Relevance
12. Accuracy and reliability
13. Timeliness and punctuality
14. Coherence and comparability
15. Accessibility and clarity [19]

Eurostat's work in the area of Health and Safety at Work statistics is structured according to three main topics:

- European Statistics on Accidents at Work – ESAW
- European Occupational Diseases Statistics – EODS
- Ad hoc Surveys on Health and Safety at Work

The difficulties encountered in the harmonization process of data is best visualized when the projects conducted by Eurostat are examined.

1- European Statistics on Accidents at Work – ESAW

The ESAW project was launched in 1990, aiming at harmonised data on accidents at work for all accidents entailing more than three days' absence from work. It is based on the Framework Directive on Health and Safety in the Workplace which specified that " … the employer shall keep a list of occupational accidents resulting in a worker being unfit for work for more than three working days" and "draw up, for the responsible authorities and in accordance with national laws and/or practices, reports on occupational accidents suffered by his workers …".

A "Methodology for the Harmonisation of European Occupational Accident Statistics" was published in 1992 by Eurostat and DG Employment and social affairs. The ESAW project has been an integral part of the framework programme for priority actions in the field of statistical information 1993 to 1997.

In addition, the Council Resolution 95/C 168/01 furthermore calls upon the Commission: "to complete the work in progress on harmonising statistics on accidents at the workplace...". The Programme concerning Safety, Hygiene and Health at Work (1996-2000) also foresees the continuation of the implementation of this project.

Furthermore, the European Community Statistical Programme 1998-2002, which defines the main fields and objectives of the community statistics, foresees the establishment of consistent series of data on a European level in order to provide the means for the monitoring of health and safety at work and the efficiency of regulation in this field. [20]

Aims of this project were:

- The aim of the ESAW project is “to collect Union-wide comparable data on accidents at work and establish a database." Comparable data on work accidents are a prerequisite for monitoring trends in health and safety at work in the Union and for promoting accident prevention both at Community level and in the individual Member States.
- The goals are to provide data on high-risk groups and sectors and indicators on both the causes and the socioeconomic costs of accidents at work. Consistent series of data should be established to provide the means for the monitoring of health and safety at work and the efficiency of regulation in this field.
- It is also an aim of the ESAW project to develop a methodology which is as far as possible comparable with other international statistics and to participate in the co-ordination of such work. The ESAW methodology is in accordance with the ILO Resolution of 1998 concerning “Statistics of Occupational Injuries: resulting from Occupational Accidents” [20]

“European Statistics on Accidents at Work (ESAW)”, Methodology, 2001 Edition; including the harmonised tools to analyse the causes and circumstances of accidents at work (data collection, classifications, codification rules) is the result of the comprehensive work carried out. Results of this work will be used also during this study.

2- European Occupational Diseases Statistics – EODS

Comparability of data is also a problem in occupational diseases.

EODS methodology was adopted as a first Phase on the basis of the experience from the pilot project developed by the Finnish Institute of Occupational Health (FIOH).

The statistics cover only the cases recognised as occupational diseases by the national authorities. Therefore, only those types of occupational diseases that are recognised by all the national systems are included (41 disease entities). [18]

The overall aim of EODS is to obtain gradually harmonised, comparable and reliable data and indicators on occupational diseases in Europe. [21]

3- Ad hoc Surveys on Health and Safety at Work

To complement the administrative ESAW and EODS data, ad hoc modules on health and safety at work outcomes are carried out. These aim to cover groups that are not comprehensively included in the administrative statistics (e.g. self-employed, the public sector), less severe accidents (less than 4 days of absence), and work-related diseases not recognised by national authorities. An ad hoc module on accidents at work and work-related diseases was included in the 1999 Labour Force Survey (LFS) and will be included in the 2007 LFS. These surveys are based on subjective information from the respondents. [18]

CHAPTER 3

DEFINITIONS AND COMPARATIVE MEASURES

Terms like “occupational accident” and “occupational disease” have to be defined for the purpose of this study since many definitions of these terms are available in the literature and vary considerably from a country to another. In addition there are also many comparative measures that are used or proposed by different institutions or researchers. Thus, a brief survey on the definitions of terms concerning occupational accidents and diseases will be conducted in the first part of this chapter and the legal definition of the terms in the Turkish Legislation will be presented. In the second part of this chapter, some approaches to the comparative measures will be illustrated.

3.1 Definitions concerning occupational accidents and diseases

Definitions of different researchers and institutions are given below in order to present an overview of the discrepancies in the definitions. The legal definitions of SII (Social Insurance Institute) which are used in insurance issues are also given.

It should be mentioned that not only the definitions vary. The term names also differ across nations and institutions. For instance, while ILO uses the term “occupational accident” Eurostat prefers the term “accident at work”.

3.1.1 Accident / Occupational accident

- An accident is defined by Heinrich as:
  "An accident is an unplanned and uncontrolled event in which the action or reaction of an object, substance, person, or radiation results in personal injury" [22]

- The Occupational Health and Safety Assessment Series (OHSAS) specification defines accident as an "undesired event giving rise to death, ill health, injury, damage or other loss" [23]

- The following was formulated by Neuloh, Graf, Mausolff, Rüssel & Ruhe (1957, 48); it has been frequently quoted ever since, in the following form cited or in a similar one: "We define an occupational accident as an undesired and unexpected disturbance of the normal completion of the work process, which has a direct work organization with the firm's itself, which is generally brought about by the combination of internal or external factors of a technical, physical, psychological or social nature and which leads to injuries." [3]

- According to Eurostat:
  An *accident* at work is defined as "*a discrete occurrence in the course of work which leads to physical or mental harm*". This includes cases of acute poisoning and wilful acts of other persons, as well as accidents occurring during work but off the company's premises, even those caused by third parties. It excludes deliberate self-inflicted injuries, accidents on the way to and from work (commuting accidents, see (Appendix F; *in the ESAW document*) and accidents having only a medical origin and occupational diseases. The phrase "in the course of work" means whilst engaged in an occupational activity or during the time spent at work. This includes cases of road traffic accidents in the course of work.

A fatal accident is defined as an accident which leads to the death of a victim within one year of the accident. [20]

- Japan Industrial Safety and Health Association (JISHA) defines an occupational accident as:
  Death, injury or disease suffered by a worker due to causes attributable to buildings, equipment, raw materials, gases, vapour, dust and other phenomena related to work or as a result of a worker's conduct while he/she is at work. Accidents while commuting to and from work are not included. [24]

- L. Bamber states in his study "Principles of the management of risk" the following:

  From research of some 40 accident definitions from general, legal, medical, scientific and safety literature, it appears that the ideal accident definition should have two distinct sections: a description of the causes, and a description of the effects.

  Causes should include: unexpectedness or unplanned events, multicausality and sequence of events; while the effects should cover: injury, disease, damage, near-miss and loss.

  Based on the research, the following definition is suggested: '*an accident is an unexpected, unplanned event in a sequence of events, that occurs through a combination of causes; it results in physical harm (injury or disease) to an individual, damage to property, a near-miss, a loss, or any combination of these effects*'.
  This definition requires recognition of a wider range of accidents than those resulting in injury. [25]

- The resolution concerning statistics of occupational injuries (resulting from occupational accidents), adopted by the Sixteenth International Conference of Labour Statisticians defines occupational accident as:

  "an unexpected and unplanned occurrence, including acts of violence, arising out of or in connection with work which results in one or more workers incurring a personal injury, disease or death;
  as occupational accidents are to be considered travel, transport or road traffic accidents in which workers are injured and which arise out of or in the course of work, i.e. while engaged in an economic activity, or at work, or carrying on the business of the employer." [4]

- Occupational accident in the Turkish Legislation is defined in the Social Insurance Law (numbered 506) in Article 11 – A:

  A work accident means an accident occurring in any one of the circumstances or situations indicated below which causes immediately or subsequently a physical or mental invalidity to an insured person:
  a) When the insured person is in the workplace;
  b) In connection with the work carried on by the employer,
  c) When the insured person has been sent by the employer to perform duties at another place;
  d) During the period allocated for the nursing of the child of the insured woman;
  e) 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. [12]

According to most of the definitions, occupational accidents have to result in an injury in order to be classified so. Only the accident definitions which are made for management purposes are more flexible and count damage property and other

loss also as the results of an accident. The definitions made by official institutions contain more detailed information about the place of accidents.

In addition, it should be kept in mind that the Framework Directive retains the concept of “absence from work of more than 3 working days". So it’s clear that Eurostat as statistical office is interested more in accidents that result in absence more than 3 working days. The definition of what constitutes a notifiable work accident ranges from any work accident, whether it results in an interruption of work or not, to a minimum absence of more than three days.

An accident is handled by SII only if it complies with the definition in the Social Insurance Law. Thus statistics in SII sources compulsorily comply with the definition in the Social Insurance Law. The accident data used in this study also comply with this law since the source of the data in this study is the Social Insurance Institution.

3.1.2 Commuting accident

- The resolution concerning statistics of occupational injuries (resulting from occupational accidents), adopted by the Sixteenth International Conference of Labour Statisticians defines commuting accident as:

  an accident occurring on the habitual route, in either direction, between the place of work or work-related training and:

  (i) the worker’s principal or secondary residence;
  (ii) the place where the worker usually takes his or her meals; or
  (iii) the place where he or she usually receives his or her remuneration;
  which results in death or personal injury. [4]

- The ILO code of practice, “Recording and notification of occupational accidents and diseases.” defines a commuting accident as:

an accident occurring on the direct way between the place of work and

(a) the worker's principal or secondary residence;
(b) the place where the worker usually takes his/her meals; or
(c) the place where the worker usually receives his/her remuneration,

which results in death or personal injury involving loss of working time. Traffic accidents in which workers are involved during working hours and which occur in the course of paid work are considered as occupational accidents. [9]

These two definitions are from the same source, namely ILO. The last sentence of the latter definition is actually a part of the definition of occupational accident. Thus, the part about traffic accident is now under the definition of occupational accident in the new resolution.

3.1.3 Occupational injury

- Occupational injury is defined by the resolution concerning statistics of occupational injuries (resulting from occupational accidents), adopted by the Sixteenth International Conference of Labour Statisticians as:

  any personal injury, disease or death resulting from an occupational accident; an occupational injury is therefore distinct from an occupational disease, which is a disease contracted as a result of an exposure over a period of time to risk factors arising from work activity.

The difference must be known between an occupational accident and occupational injury.

In reality, when the terms "accident" and "injury" are so merged, it is assumed that no accident is of serious importance unless it produces a serious injury. Yet

thousands of accidents having the potential of producing serious injuries do not turn out to do so. There are certain types of accident, of course, where the probability of serious injury may vary in accordance with circumstances. [22]

An injury is merely the result of an accident. The accident itself is controllable. The severity or cost of an injury that results when an accident occurs is difficult to control. It depends upon many uncertain and largely unregulated factors – such as the physical or mental condition of the injured person, the weight, size, shape, or material of the object causing the injury, the portion of the body injured, etc. Therefore, attention should be directed to accidents rather than to the injuries that they cause. [22]

3.1.4 Incident

- The Occupational Health and Safety Assessment Series (OHSAS) specification defines an incident as:
  ”event that gave rise to an accident or had the potential to lead to an accident”

  An incident where no ill health, injury, damage, or other loss occurs is also referred to as a “*near-miss*”. The term “incident” includes “near-misses” [23]

- Incident is defined in the ILO code of practice, “Recording and notification of occupational accidents and diseases.” as follows:
  An unsafe occurrence arising out of or in the course of work where no personal injury is caused, or where personal injury requires only first-aid treatment.

3.1.5 Fatal occupational injury

Fatal occupational injury is an "Occupational injury leading to death." [9]

3.1.6 Occupational disease

- Occupational disease in the Turkish Legislation is defined in the Social Insurance Law (numbered 506) in Article 11 – B:

  Occupational disease is a case of sickness, invalidity or mental trouble, temporary or permanent, suffered by an insured person due to continuing causal factor, which is characteristic of the nature of the work he is doing, or arising out of conditions required for the execution of such work.

  Disputes arising as to whether any sickness not included in the list of diseases drawn up in accordance with the provisions of this Act, is to be considered as an occupational disease or not shall be settled by the Social Insurance Supreme Health Board. [12]

Another definition of occupational disease will be made in the next chapter.

Occupational diseases and occupational accidents are two different concepts as seen in the definitions above.

It is necessary to comment on the assertion made in familiar definitions of accidents (i.e., Skiba, 1973), that an accident is the result of a sudden encounter between a person and a hazard. A differentiation is thus made between accidents and occupational illnesses: the latter are seen as the result of harmful influences which have an effect over a long period of time. [3]

3.2 Comparative Measures

The information that there have been a certain number of accidents in an industry or in a firm is of little value without any information on the number of the workers and the working periods of these workers that worked in the hazardous area, since there is a distinction of safety performances between two reference groups recording the same number of occupational accidents but having different number of workers or working periods (duration). Therefore, interpretations undertaken with absolute accident figures are misleading and accident statistics should always base on relative values.

Below, a survey of different approaches of different researchers and institutions is outlined and differences and drawbacks of these approaches are presented.

3.2.1 ILO

In order to permit meaningful comparisons of the statistics, for example between different periods, economic activities, regions and countries, account needs to be taken of the differences in employment size, changes in the number of workers in the reference group, as well as in the hours worked by those in the reference group. [4]

A number of rates which take into account these differences may be calculated. ILO recommends the following measures which are reported to be the most useful for comparing information at both the national and international levels.

1. The frequency rate of new cases of occupational injury:

$$\frac{\textit{Number of new cases of occupational injury during the reference period}}{\textit{Total number of hours worked by workers in the reference group during the reference period}} \times 1.000.000$$

Ideally, the denominator should be the number of hours actually worked by workers in the reference group. If this is not possible, it may be calculated on the basis of normal hours of work, taking into account entitlements to periods of paid absence from work, such as paid vacations, paid sick leave and public holidays.

2. The incidence rate of new cases of occupational injury:

$$\frac{\textit{Number of new cases of occupational injury during the reference period}}{\textit{Total number of workers in the reference group during the reference period}} \times 1.000$$

This and the previous rates may be calculated separately for fatal and non-fatal injuries. The number of workers in the reference group should be the average for the reference period. In calculating the average, account should be taken of the hours normally worked by those persons. The number of those working part time should be converted to full-time equivalents.

3. The severity rate of new cases of occupational injury:

$$\frac{\textit{Number of days lost as a result of new cases of occupational injury during the reference period}}{\textit{Total amount of time worked by workers in the reference group during the reference period}} \times 1.000.000$$

This should be calculated only for temporary incapacity for work. The amount of time worked by workers in the reference group should preferably be measured in hours worked. [4]

4. Days lost per new case of occupational injury:

Median or mean of the number of days lost for each new case of occupational injury during the reference period.

The following information should be considered by the application of these formulas:

- All the measures may be calculated according to economic activity, occupation, age group, etc., or any combination of these.

- The term "workers in the reference group" refers to those workers in the particular group under consideration and covered by the source of the statistics of occupational injuries (for example those of a specific sex or in a specific economic activity, occupation, region, age group, or any combination of these, or those covered by a particular insurance scheme). [4]

- For each of the measures, the numerator and the denominator should have the same coverage.

3.2.2 EUROSTAT

Methodology of the European Statistics of Accidents at Work (ESAW) defines only one type of indicator on accidents at work. It defines the *incidence rate* as "the number of accidents at work per 100 000 persons in employment".

It can be calculated for Europe, a Member State, or any sub-population breakdown according to one or more of the variables above characterising the victim of the accident (economic activity, age, etc.). It can be established for all accidents or breakdowns according to one or more of the variables above characterising the accident (part of body injured, etc.). Separate incidence rates are calculated for fatal accidents and accidents leading to more than 3 days' absence. [20]

The standard formula given by ESAW is:

$$Inc.rate = \frac{Number\ of\ accidents\ (fatal\ or\ non\ -\ fatal)}{Number\ of\ employed\ persons\ in\ the\ studied\ population} \times 100.000$$

In addition ESAW designates the incidence rate also as "frequency". [20]

The similarity between this formula and the second formula recommended by ILO can be easily observed. While it is foreseen to calculate the number of accidents per 100.000 worker in this formula, the ILO formula foresees to calculate the number of accidents per 1000 worker. Furthermore the terms frequency and incident rate are used interchangeably by ESAW. But ILO distinguishes these two terms by the expression in the denominators. Frequency is related to time while incidence rate is related to number of persons.

3.2.3 Hoyos, C. G. & Zimolong, B. (1988) [3]

Some of the comparative measures outlined by Hoyos, C. G. & Zimolong, B. (1988) are presented below:

1. They define the 1000-man-rate as:

$$1.000\text{-}man\text{-}rate = \frac{A\ x\ 1.000}{E} \qquad (1)$$

where
A= number of accidents within a given period, e.g. calendar years;
E= number of employees throughout the report period (average number).

Whenever possible, the number of workers should be ascertained on the average in relation to the 12 moths of a year. The figures of part-time employees should be converted correspondingly and expressed in terms of full-time employment.

It's stated that the 1.000-man-rate represents only a rough estimate regarding the duration of hazard exposition, because the duration of exposition to hazards varies considerably between companies and different activities and the work hours per year is not a constant factor, depending on commissions and seasonal influences, e.g. cuts in work hours, overtime, increases in vacation, labour turnover, absenteeism, and occupational illnesses. [3]

This rate is the same as "the incidence rate of new cases of occupational injury" defined by ILO and is similar to the measure defined by ESAW.

2. Accident Frequency Rate (AFR)
   AFR refers to accidents per 1 million work hours.

$$AFR = \frac{A \; x \; 10^6}{W} \qquad (2)$$

where W = production time or work hours of all employees. [3]

This rate is the same as the "frequency rate of new cases of occupational injury" defined by ILO. Both suffer from the same drawbacks. The actual total work hours in the denominator are very difficult to estimate. According to ILO, it could also be calculated on the basis of normal hours of work, taking into account entitlements to periods of paid absence from work, such as paid vacations, paid sick leave and public holidays. But such data taking into account paid sick etc. is generally not available.

Estimation of the actual total work hours can be found by the multiplication of the average number of workers and the annual work hours of the reference groups. But when there is no specific information about the annual work hours of the groups, then the same value will have to be taken for each group. So the only varying parameter in the denominator will be "the number of workers" as it is in the incidence rate. Thus it can be drawn that the frequency rate reduces to incidence rate with a different constant when specific information about the annual work hours is not available. Consequently it is meaningless to calculate the frequency rates if the specific work hours of the compared groups are not known and the same value has to be taken for each groups. Comparisons whether made with incidence or made with frequency rate will yield the same results in these cases.

Actually comparisons undertaken with the frequency rates yield more accurate results than the comparisons undertaken with the incidence rates, since the frequency rate incorporates more information about the exposure of workers to accidents. (work hours) But this advantage of frequency

(being sensitive to working time) vanishes when the total work hours are calculated as in the paragraph before.

In addition, some incidence rate definitions indirectly take the working time into consideration which is not the case in the definitions of incidence rate presented before. Incidence rates, which take the working time also into account, possess the advantage of the frequency rate.

An incidence rate that does contain a dimension of working time is the rate per 1.000 "full-time equivalent" workers, as calculated, inter alia, by Germany, Italy, Switzerland and the United States. In this concept, the overall number of employed is recalculated on the basis of a fictional full-time worker who works, for example, 50 weeks at 40 hours each (such as in the United States) or a total of 1 620 hours yearly (such as in Germany since 1986). [11]

3. Fatal Accident Frequency Rate (FAFR)

   The Fatal Accident Frequency Rate (FAFR) expresses the number of fatalities occurring per 1 million work hours.

$$FAFR = \frac{F\,x\,10^6}{W} \qquad (3)$$

where F = number of fatalities in the report period. [3]

This rate differs from the previous definition in terms of the expression in the nominator. In this rate only the fatalities are considered instead of the number of accidents. It was stated that the first two formulas of ILO can also be used for fatalities. Thus this is also a similar measure to the measures described by ILO.

4. A further specification of FAFR represents the number of fatalities occurring in 10^8 work hours. It is the number of death from industrial injuries in a group of 1.000 persons during their working lives (Kletz 1977). Working life is fixed at 50 years; working hours per year are 2.000. [3]

$$FAFR = \frac{F\ x 10^8}{W} \qquad (4)$$

5. Accident Severity Rate (ASR)
   Accident Severity Rate (ASR) is the number of lost working days for all accidents occurring per one million work hours. [3]

$$ASR = \frac{LT\ x\ 10^6}{W} \qquad (5)$$

where LT = lost time in work days corresponding to all injuries.

Again, if the required value for actual work hours is not provided estimation of the actual total work hours can be found by the multiplication of the average number of workers and the annual work hours of the reference groups as described by the frequency rate. When there is no specific information about the annual work hours of the groups, then the same value will have to be taken for each group. So, the only varying parameter in the denominator will be “the number of workers”. In this case, this equation can be reduced to the following equation by taking the time as a unity.

$$ASR^* = \frac{LT\ x\ 10^6}{E} \qquad (5.1)$$

6. Average Days charged per Injury (ADI)

   Average Days charged per Injury (ADI) is the ratio between the severity rate and the frequency rate. [3]

$$ADI = \frac{ASR}{AFR} = \frac{LT}{A} \quad (6)$$

   ADI can be considered as "the lost time per accident" when the last fraction in the equation is taken into account.

3.2.4 Japan Industrial Safety and Health Association (JISHA)

Japan Industrial Safety and Health Association (JISHA) defines the "Annual accident rate per 1,000 workers" and the "accident frequency rate" which are parallel to the definitions of ILO. Another definition adopted by JISHA is the "Accident severity rate":

"The accident severity rate is expressed in terms of the number of workdays lost per 1,000 work-hours in the aggregate. The rate is gained by dividing the number of workdays lost (multiplied by 1,000) in occupational accidents that occurred during the survey period by the aggregate number of work-hours for all workers who were exposed to risks in the same period."

$$Accident\ severity\ rate = \frac{Number\ of\ workdays\ lost}{Aggregate\ number\ of\ work\text{ - }hours} \times 1.000$$

Number of workdays lost:

(a) Deaths: 7.500 days

(b) Workdays lost with physical disorders

Table 3.1 Number of workdays lost

Grade of physical disorder	1~3	4	5	6	7
Number of workdays lost	7500	5500	4000	3000	2200

8	9	10	11	12	13	14
1500	1000	600	400	200	100	50

(c) Workdays lost without physical disorders

$$Number\ of\ workdays\ lost\ = Number\ of\ days\ off\ \times\ \frac{300}{365} \quad [24]$$

The main distinction between the definitions of JISHA and ILO is the number of lost days to be calculated. ILO foresees a calculation only for temporary incapacity for work while JISHA takes workdays lost due to permanent incapacities and death also into consideration. The approach of JISHA is more preferable since it is a better approximation to severity.

3.2.5. Petersen (1971) [26]

Frequency severity indicator: A combined frequency and severity rate. FSI equals the square root of the frequency rate times the severity rate divided by 1.000.

$$FSI = \sqrt{\frac{F \times S}{1.000}}$$

This definition will be rewritten *for the purpose of this study* with the definitions made in 3.2.3.

$$FSI = \sqrt{\frac{AFR \times ASR}{1000}} = \sqrt{\frac{1}{1000}\frac{A \times 10^6}{W}\frac{LT \times 10^6}{W}} = \frac{10^5}{W}\sqrt{\frac{A \times LT}{10}}$$

The actual total work hours (W) can be found by the multiplication of the average number of workers and the annual work hours. If we *set the annual work hours to 2000 hours* for the purpose of this study then the FSI takes the form:

$$FSI = \frac{10^5}{W}\sqrt{\frac{A \times LT}{10}} = \frac{10^5}{2000 \times E}\sqrt{\frac{A \times LT}{10}} = \frac{50}{E}\sqrt{\frac{A \times LT}{10}} \quad (\text{if } w = 2000 \times E)$$

Since this will be used only for comparison purposes it doesn't matter what the constants of severity and frequency rates are.

Some conclusions can be drawn from the above presented measures.

- The definitions used by different institutions don't overlap.
- There is no general agreement even on the names of the measures.
- Although it was stated in chapter 4 that the terms "occupational injury" and "occupational accident" are distinct concepts, it is seen that both terms are used in the formulas of different sources.
- The idea behind the constants in the formulas is generally not to get very small numbers. Thus it may be changed according to the size of the compared population.
- The definitions of measures are very important in comparisons.
- New measures can be developed when suitable data is available by keeping in mind that relative values are of importance.

CHAPTER 4

OCCUPATIONAL DISEASES IN CONSTRUCTION INDUSTRY AND EXPLANATIONS OF THE USE OF STATISTICS

Various statistics are published by official sources. It is not guaranteed that the statistics are realistic, even when these are from official sources. Thus the statistics should be examined whether they are realistic. In addition, the definitions of the measurements in these statistics should be clearly known. The first part of this chapter examines the problematic area, the occupational diseases. The second part introduces the measurements and illustrates some differences between the statistics of different years.

4.1 Brief discussion on statistics of occupational diseases

Occupational disease is "a disease contracted as a result of an exposure to risk **factors arising from work activity**." according to the definition in the ILO code of practice, "Recording and notification of occupational accidents and diseases."

However, it is more difficult than in the case of accidents to prove that a disease arises from the work activity, because the disease can be the result of a harmful exposure that can take place at work but also outside the work. In addition, many other obstacles exist in the detection of an occupational disease:

- Many occupational diseases are clinically indistinguishable from general chronic diseases resulting from other factors.

- The sometimes long latency periods of individual diseases impede their timely recognition.

- The lack of medical expertise, i.e. insufficient training in occupational medicine, is often an obstacle to the correct classification of a disease as occupational.

- If there is no effective health supervision of workers, including systematic periodical examinations by competent company or other doctors, many occupational diseases will escape detection.

- The hundreds of chemical substances newly available each year, often without having previously been tested for health effects, make diagnosis difficult. [27]

The obstacles encountered in the detection of occupational diseases result in unrealistic numbers and rates of occupational diseases, especially in Turkey. This is examined below.

The distribution of the number of employees and occupational diseases according to the industries are derived from the statistical yearbooks of the years 2002-2005. Then the percentages and incidence rates of these occupational diseases are calculated for each industry. Table 4.2 describes the number of cases and the percentages of the occupational diseases by industry. Table 4.3 shows the incidence rates of the occupational diseases in descending order for the years 2002-2005. Industries are specified with their industry codes in these tables. However, in the year 2005, full names of the industries are also given in an additional column in addition to the industry codes.

As it is seen in Table 4.2, 519 occupational diseases were recorded in 2005 in all industries together. However, 358 (68,98 %) of these diseases were recorded in coal mining. In 2004, 34,84 % and in 2003, 68,41 % of all occupational diseases were recorded in the same industry. Only 3, 10 and 8 cases were detected in the construction industry in 2005, 2004 and 2003, respectively, meaning that the diseases in the construction industry don't exceed 3 % of the total number of diseases in all industries. Incidence rates (number of occupational diseases per 100.000 workers) are also similar. Incidence rates in coal mining are quite high (about 800), while the rates in construction industry don't exceed 1,4. It is also seen that only four industries have higher incidence rates than 10.

Table 4.4 describes the number of cases and the incidence rates of occupational diseases in EU by gender, age, economic activity, occupation and causative agent. This table will be used to compare the figures in Turkish industries with European figures. The classification of economic activities listed in this table doesn't match with the industries listed in the statistical yearbooks. However, it does not prevent us from making basic comparisons and drawing some important results. The incidence rates of mining and construction industries are given as 1726,8 and 60,2 respectively. It can be seen that all incidence rates except those of 3 economic activities are not lower than 10. The economic activities which have lower values than 10 are financial intermediation, education and private households with employed persons. It is clear that it is not expected that these economic activities will have lots of problems with occupational diseases.

From the results above, we can argue that the incidence rates in Turkey are much smaller than the incidence rates in Europe. The incidence rate of European mining industry is more than 2 times higher than the incidence rate of the Turkish mining industry. The incidence rate of European construction industry is also more than 45 (or 200, depending on the year taken for Turkey value) times bigger than the Turkish construction industry. The comparison of the incidence rates of occupational diseases illustrates that Turkish industries operate much more

healthily than the European industries. However the fact that that the EU-12 countries have generally a sound recording and notification system and lower incidence rates of occupational accidents than Turkey implies that these relative conditions of Europe and Turkey should also exist in the case of occupational diseases. The contradictory result can only be explained with the difficulties confronted in the diagnosis, detection and notification of occupational diseases in Turkey.

Another point that deserves attention is the evolution of incidence rates over the last four years in different industries. Table 4.1 describes the evolution of incidence rates of some selected industries over the years. As it is seen the rates vary enormously over a short period like 4 years. But these fluctuations are not meaningful since it is not possible that industries experience such rapid developments or regressions in occupational health within a couple of years. This also can only be explained with the arguments stated in the paragraph before - the difficulties confronted in the diagnosis, detection and notification of occupational diseases in Turkey.

Table 4.1 Incidence rates of occupational diseases in selected industries

Industry	2005	2004	2003	2002
Basic metal industries	11,88	1,39	0,00	16,81
Construction	0,32	1,33	1,17	0,98
Coal mining	886,36	342,93	791,00	735,76
Crude petroleum and natural gas	0,00	0,00	0,00	39,75

As a result, it can be concluded that the number of collected statistics of occupational diseases of SII does not represent the real situation. The numbers and rates of occupational diseases that could not be detected vary with the industry and also with the year.

Thus, it is not seen to be appropriate to use the statistics of occupational diseases as a comparative measure in the comparison of health performance of industries. It is seen in the literature that various researchers attempted to compare the health and safety performance of different industries by comparing the numbers and incidence rates of death or permanent incapacities resulting from occupational accidents **and** occupational diseases. However, as stated before the correctness ratio of the number of the occupational diseases and the results thereof change with the industry and year. Thus such comparisons should be made only with occupational accident data, if separately available. It should be kept in mind that any evaluation based on these statistics will have mostly misleading results.

4.1.1 List of occupational diseases

Because of the difficulty in proving a disease to be occupational in origin, most countries have produced lists of prescribed occupational diseases. These are generally limited to those diseases where a strong cause-effect relationship has been proven. However, with the number of categories ranging from 50 to 90, national lists vary in terms of those diseases recognised as occupational. Recommended lists developed by the International Labour Office and the European Communities seem to have led only to a limited degree of harmonization. National lists are also constantly changing due to medical discoveries and changing attitudes to health. [27]

Such a list is also provided by SII.

Table 4.2 Number and percentage of occupational diseases

2005				2004			2003			2002		
C.	Industry	#	%	C.	#	%	C.	#	%	C.	#	%
T	**Total**	**519**	**100,00**	**T**	**384**	**100,00**	**T**	**440**	**100,00**	**T**	**601**	**100,00**
11	Coal mining	358	68,98	11	132	34,38	11	301	68,41	11	313	52,08
37	Manufacturing and repairing of electrical machineries and apparatus	57	10,98	38	108	28,13	37	61	13,86	38	139	23,13
35	Manufacturing of metal products industry (except machinery and transport equipr	21	4,05	37	75	19,53	38	25	5,68	37	40	6,66
38	Manufacturing of transport equipments and supplies	21	4,05	35	14	3,65	35	10	2,27	35	31	5,16
36	Manufacturing and repairing of machine (except electrical machinery)	14	2,70	**40**	**10**	**2,60**	24	9	2,05	31	14	2,33
34	Basic metal industries	9	1,73	61	8	2,08	**40**	**8**	**1,82**	34	10	1,66
24	Manufacturing of foot wear other wearing apparels and made up textile goods	6	1,16	85	5	1,30	36	5	1,14	24	8	1,33
61	Wholesale and retail trade	6	1,16	29	4	1,04	31	4	0,91	**40**	**7**	**1,16**
71	Transport	4	0,77	24	3	0,78	85	3	0,68	12	5	0,83
23	Textile industry	3	0,58	31	3	0,78	20	2	0,45	36	5	0,83
28	Printing, publishing and allied industries	3	0,58	71	3	0,78	28	2	0,45	71	5	0,83
40	**Construction**	**3**	**0,58**	26	2	0,52	61	2	0,45	19	3	0,50
29	Manufacturing of leather and manufacturing of goods from leather (except shoes	2	0,39	28	2	0,52	71	2	0,45	20	3	0,50
31	Manufacturing of chemicals and chemical products	2	0,39	39	2	0,52	25	1	0,23	32	3	0,50
33	Products obtaining from stone, clay, sand etc.	2	0,39	1	1	0,26	26	1	0,23	33	3	0,50
1	Agriculture and livestock	1	0,19	20	1	0,26	32	1	0,23	51	2	0,33
26	Furniture industry	1	0,19	23	1	0,26	39	1	0,23	61	2	0,33
30	Rubber industries	1	0,19	25	1	0,26	83	1	0,23	83	2	0,33
32	Manufacturing of petroleum and coal derivates	1	0,19	33	1	0,26	U	1	0,23	13	1	0,17
39	Miscellaneous manufacturing industries (not elsewhere classified)	1	0,19	34	1	0,26	1	0	0,00	23	1	0,17
51	Heating with electric, gas and steam	1	0,19	36	1	0,26	2	0	0,00	26	1	0,17
52	Water and sanitary instalments	1	0,19	51	1	0,26	4	0	0,00	28	1	0,17
83	Legal, commercial and technical services	1	0,19	52	1	0,26	12	0	0,00	39	1	0,17
2	Forestry and logging	0	0,00	72	1	0,26	13	0	0,00	81	1	0,17
4	Fishing	0	0,00	81	1	0,26	14	0	0,00	1	0	0,00
12	Mines except of coal	0	0,00	82	1	0,26	19	0	0,00	2	0	0,00
13	Crude petroleum and natural gas	0	0,00	83	1	0,26	21	0	0,00	4	0	0,00
14	Stone quarrying clay and sand	0	0,00	2	0	0,00	22	0	0,00	14	0	0,00
19	Pits other non-metallic material products	0	0,00	4	0	0,00	23	0	0,00	21	0	0,00

Table 4.3 Incidence rates of occupational diseases

2005				2004		2003		2002	
C.	**Industry**	**C.**	**R.**	**C.**	**R.**	**C.**	**R.**	**C.**	**R.**
11	Coal mining	11	886,4	11	342,9	11	791,0	11	735,8
37	Manufacturing and repairing of electrical machi	37	59,5	37	84,5	37	79,4	38	79,6
38	Manufacturing of transport equipments and sup	32	12,6	38	46,8	38	12,9	37	57,5
32	Manufacturing of petroleum and coal derivates	34	11,9	29	19,6	32	12,6	12	56,8
12	Mines except of coal	29	10,1	35	6,5	**T**	**7,8**	13	39,7
13	Crude petroleum and natural gas	35	8,7	**T**	**6,2**	31	5,7	32	37,2
35	Manufacturing of metal products industry (exce	38	8,6	31	4,0	35	5,3	19	30,4
T	**Total**	**T**	**7,5**	28	3,7	28	4,1	31	20,6
31	Manufacturing of chemicals and chemical prod	36	7,3	72	2,9	36	3,3	35	18,7
29	Manufacturing of leather and manufacturing of	28	5,0	26	2,8	25	2,6	34	16,8
34	Basic metal industries	30	3,6	1	2,3	24	2,2	**T**	**11,5**
19	Pits other non-metallic material products	31	2,6	25	2,3	26	1,8	36	3,8
28	Printing, publishing and allied industries	1	2,1	81	2,0	**40**	**1,2**	81	2,7
36	Manufacturing and repairing of machine (excep	24	1,5	39	2,0	39	1,1	33	2,7
26	Furniture industry	33	1,3	34	1,4	20	0,8	24	2,3
24	Manufacturing of foot wear other wearing appa	26	1,2	**40**	**1,3**	85	0,6	51	2,3
39	Miscellaneous manufacturing industries (not el	51	1,0	51	1,1	71	0,6	28	2,2
25	Manufacture of wood and cork (except manufa	39	0,9	61	1,0	61	0,3	26	2,1
1	Agriculture and livestock	52	0,9	85	0,9	83	0,3	71	1,6
33	Products obtaining from stone, clay, sand etc.	71	0,9	52	0,9	1	0,0	39	1,3
51	Heating with electric, gas and steam	23	0,8	71	0,8	2	0,0	20	1,2
81	Government services	61	0,7	24	0,8	4	0,0	**40**	**1,0**
30	Rubber industries	**40**	**0,3**	33	0,7	12	0,0	83	0,6
71	Transport	83	0,2	36	0,6	13	0,0	61	0,3
40	**Construction**	2	0,0	20	0,4	14	0,0	23	0,3
72	Storage and warehousing	4	0,0	82	0,4	19	0,0	1	0,0
61	Wholesale and retail trade	12	0,0	23	0,3	21	0,0	2	0,0
20	Food manufacturing industries (except beverag	13	0,0	83	0,2	22	0,0	4	0,0
52	Water and sanitary instalments	14	0,0	2	0,0	23	0,0	14	0,0
85	Personnel services	19	0,0	4	0,0	27	0,0	21	0,0
23	Textile industry	20	0,0	12	0,0	29	0,0	22	0,0
83	Legal, commercial and technical services	21	0,0	13	0,0	30	0,0	25	0,0
82	Public services	22	0,0	14	0,0	33	0,0	27	0,0
2	Forestry and logging	25	0,0	19	0,0	34	0,0	29	0,0
4	Fishing	27	0,0	21	0,0	51	0,0	30	0,0
14	Stone quarrying clay and sand	62	0,0	22	0,0	52	0,0	52	0,0
21	Beverage industry	63	0,0	27	0,0	62	0,0	62	0,0
22	Tobacco industry	64	0,0	30	0,0	63	0,0	63	0,0
27	Manufacture of paper and paper products	72	0,0	32	0,0	64	0,0	64	0,0
62	Banks and other financial institutions	73	0,0	62	0,0	72	0,0	72	0,0
63	Insurance	81	0,0	63	0,0	73	0,0	73	0,0
64	Real estate works (services)	82	0,0	64	0,0	81	0,0	82	0,0
73	Communication services	84	0,0	73	0,0	82	0,0	84	0,0
84	Cinema, theatre and similar services	85	0,0	84	0,0	84	0,0	85	0,0

Table 4.4 Number and incidence rates of occupational diseases by sex, age, economic activity, occupation and causative agent [28]

	EU-12			EU-15
	Persons in Employment (1000)	Number	Incidence rate	Extrapolated number
All	86 342	31 945	37,0	52 884
Men	49 649	23 743	47,8	39 306
Women	36 694	8 061	22,0	13 345
15-17 years	1 447	120	8,3	199
18-24 years	9 730	2 212	22,7	3 662
25-34 years	23 812	5 323	22,4	8 812
35-44 years	23 771	7 387	31,1	12 229
45-54 years	18 759	7 354	39,2	12 174
55-64 years	7 969	5 511	69,2	9 123
over 64 years	:	3 506	:	5 804
Economic activity				
Agriculture,hunting and forestry	2 973	1 035	34,8	1 713
Fishing	123	25	20,4	41
Mining and quarrying	293	5 066	1 726,8	8 387
Manufacturing	17 311	12 242	70,7	20 266
Electricity, gas and water supply	657	216	32,9	358
Construction	6 543	3 937	60,2	6 518
Wholesale and retail trade, repair...	12 672	1 932	15,2	3 198
Hotels and restaurants	3 587	610	17,0	1 010
Transport, storage and communication	5 606	564	10,1	934
Financial intermediation	3 158	94	3,0	156
Real estate, renting and business	7 779	1 441	18,5	2 386
Public administration and defence	6 532	693	10,6	1 147
Education	6 084	179	2,9	296
Health and social work	8 450	1 087	12,9	1 800
Other community, social and personal	3 591	692	19,3	1 146
Private households with employed persons	513	7	1,4	12
Occupation				
Legislators, senior officials and managers	5 946	163	2,7	270
Professionals	10 891	639	5,9	1 058
Technicians and associate professionals	12 108	684	5,6	1 132
Clerks	12 034	657	5,5	1 088
Service ,shop and market sales workers	13 468	1 752	13,0	2 900
Skilled agricultural, fishery workers	2 095	737	35,2	1 220
Craft and related trades workers	11 813	12 555	106,3	20 784
Plant, machine operators, assemblers	7 724	7 567	98,0	12 527
Elementary occupations	9 416	6 998	74,3	11 585
Causative agent group				
Inorganic chemicals	:	421	:	697
Organic chemicals	:	320	:	530
Other or unspecified chemicals	:	514	:	851
Physical factors	:	7 206	:	11 929
Bacteria	:	194	:	321
Viruses	:	166	:	275
Fungi	:	81	:	134
Plants	:	385	:	637
Animals	:	232	:	384
Other or unspecified biological agents	:	69	:	114
Biomechanical factors	:	12 485	:	20 669
Psychosocial factors	:	763	:	1 263
Industrial factors and products	:	7 074	:	11 711
Other factors	:	1 295	:	2 144
Unknown	:	740	:	1 225

Source: EODS Eurostat

4.2 Explanation of the compiled statistics

Some introductory information on SII and on the statistics it collects and disseminates was given in Chapter 2. Below is a brief explanation of the terms and other issues used in the statistics of SII that has to be dealt with throughout the text.

4.2.1 General Information

The coverage of the statistics is limited to the coverage of the Social Insurance Law, numbered 506. Persons and workplaces covered are defined in this law. Insured persons are defined in the second article and uninsured persons are defined in the third article of the law. The definition of workplace is made in the fifth article of the same law.

"Article 2-
(Amended: 11/5/1976-1992/ Art 1.)
Workers who have been employed by one or more employers based on a contract of services, are meant as "**insured person**" in this Law.
…"

"Article 5-
For the purpose of this Act, a "**workplace**" is a place where any insured person as defined in Article 2 is performing his work.

In the performance of the work, annexes such as recreation rooms, nurseries, dining rooms, dormitories, rest rooms, infirmaries, physical and training facilities, yards, offices and vehicles shall also be considered as workplaces." [12]

Statistical yearbooks contain many distributions according to the industries. There are 43 industries classified in these yearbooks. Each industry is represented with

its industry code in addition to its name. Construction industry has the code "40". The complete list of industries is presented in the Appendix. This list of industries covered by SII is in accordance with "International Standard Industrial Classification of all Economic Activities (ISIC-1958)" except some points. It is noteworthy that this old classification of industries (economic activities) is still being used even though it was revised two times in 1968 and in 1990 by the United Nations. [29]

The tables in the statistical yearbooks contain rows representing the values of "Unknown" cases and the total values representing "All Industries".

4.2.2 Statistical units (Units of measurement)

The statistical yearbooks contain the distributions of measurements according to many variables such as gender, industries, provinces, age groups etc. The most frequently used units of measurement are presented below:

1. **The number of occupational accidents and occupational diseases:**
   In the bilingual statistical yearbooks of SII the term "employment injury" is used which can be thought to be the same as "occupational injury". The definition of (employment) occupational **injury** made in these yearbooks is the same as the definition of occupational **accident** in the Social Insurance Law. Thus it can be figured out that these terms are used interchangeably by SII. To be in accordance with the ILO resolution, the term "occupational injury" is used in this study.

   Legal definitions of occupational accident and occupational disease according to the Social Insurance Law can be found in Chapter 3.

2. **The days of temporary incapacity for work:**
   "Total days of temporary incapacity for work" and "days of incapacity causing to in bed treatment in the hospital" are recorded by SII.

"Temporary incapacity payment" is defined instead of "temporary incapacity for work" in the statistical yearbooks:

"Temporary incapacity payment: An insured person suffering from temporary incapacity for work caused by an employment injury or occupational disease shall be paid a cash benefit for each day of temporary incapacity for work. Daily payment is half of the daily insurable earning for hospitalization and two of three of it for outpatient." [2]

"The temporary incapacity for work", "the permanent incapacity for work" and "the death cases" can be caused by an occupational injury or by an occupational disease. So the measurement of these units (cases) should be made separately for each cause. It is seen that this is done firstly in the statistical yearbooks published after the year 2001. In the statistical yearbooks published before 2002 the measurements are presented as a result of both causes.

The measurement of these 3 units should be made for each cause separately since the natures of these two causes are very different. Another reason for the necessity for separation is the problems in the statistics of occupational diseases which are explained in Chapter 4.1.

3. The permanent incapacity to work

The definition of "permanent incapacity to work" given in yearbooks is: "Permanent incapacity to work is the situation that manifests itself as the loss of the whole or part of the earning capacity of an insured person in the profession in spite of the medical treatment performed due to an employment injury or occupational disease.

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. The amount of income is determined in accordance with the Regulation about the degree of the invalidity.

The number of cases resulting in loss of earning capacity in the profession at a degree less than 10 per cent is also included in the coverage of the permanent incapacity for work cases in the Statistical Yearbook." [2]

4. **The 'Death' Cases**

   The 'death' cases are expressed as:

   "The 'death' cases comprise the deceased in result of an employment injury or occupational disease along with those who died in the course of their resultant treatment, and death of insured persons entitled to permanent incapacity payment whose degree of incapacity is 50 % or more." [2]

The term "death" in the last definition is equivalent to the term "fatal" which is more prevalently used. Besides, the measurements of the units, presented above for Turkey varies between countries.

The statistics in Europe are based on case-by-case data for accidents at work resulting in more than 3 days' absence from work, except for Norway, Czech Republic, Estonia, Latvia, Lithuania and Slovakia which apply "1 day absence from work". [30]

The notification of an accident as *fatal* ranges from national registration procedures where the accident is registered as fatal when the victim died the same day (Netherlands) or within 30 days after the accident (Germany) to cases where no time limits are laid down (Belgium, Greece, France except deaths occurring after the recognition of a permanent disability, Italy, Luxemburg, Austria, Sweden and Norway). For the other member states the time limit is within 1 year - for Spain: 1.5 years - after the date of the accident.

In practise, deaths occur in general within few days after the day of the accident and only the limitation to the "same day as the accident" involves a significant underestimation. [30]

4.2.3 Limitations to the use of yearbooks

1. As mentioned above, occupational accidents and occupational diseases have different natures. Chapter 4.1 yielded the result that the statistics of occupational diseases are very poor from all points of view. Thus comparisons should be made only with the data that comes from occupational accidents or from occupational diseases. The statistics of the years *before 2002 will not be used* since the yearbooks published before 2002 present the number of fatalities and incapacities without making distinction whether caused by occupational accidents or occupational diseases.
2. It's indicated in Table 4 of statistical yearbooks published after the year 1999, that the number of compulsory insured persons given in the yearbooks of the years before 2000 includes also the number of apprentices. So the exact numbers of insured persons and the distributions of these according to some variables etc. of the years before 2000 are unknown. The statistical yearbook of 2000 includes only the corrected total numbers of insured persons for the years 1997-1999. Anyway the distributions of the exact number of insured persons according to the industries etc. are unknown for any year before 2000.

The exact number of insured persons will be necessary for the calculation of incidence rates. Thus a constant factor will be determined to convert the number of insured persons including the number of apprentices to the number of insured persons for the years before 2000. For this purpose the numbers of insured persons and apprentices is examined in the yearbooks in which they are given separately. As it is seen in the table a factor of approximately 0.95 can be used to convert the sum of the number of apprentices and the number

of insured persons to the number of insured persons. But this factor is an approximation only for the total number of insured persons. It's clear that this factor will change in every industry.

It can be inferred from the statement in Table 6 of the yearbooks that the schools are the employers of the apprentices. It is assumed that the number of apprentices in the construction industry is negligible. Therefore no conversion factor for the number of insured persons in construction industry is foreseen.

Table 4.5 Number of insured persons and apprentices

Years	Number of insured persons	Number of apprentices	Ratio
	(1)	(2)	$\frac{(1)}{(1)+(2)}$
1997	4830056	236689	0,953
1998	5299533	259049	0,953
1999	5005403	229816	0,956
2000	5254125	253301	0,954
2001	4886881	191187	0,962
2002	5223283	215259	0,960
2003	5615238	231915	0,960
2004	6181251	219000	0,966
2005	6918605	241032	0,966

Consequently the total number of insured persons covered by the yearbooks (before 1997) can be corrected by multiplying the given number of insured persons with 0,95. Correction will not be necessary in this study since it was mentioned above that the statistics before the year 2002 will not be used. But it is an important finding for future research. Furthermore this factor indicates that the incidence and severity rate calculations made with the uncorrected values are actually underestimations.

CHAPTER 5

COMPARISON OF SAFETY PERFORMANCE OF CONSTRUCTION INDUSTRY WITH OTHER INDUSTRIES IN TURKEY

Construction industry is frequently delineated as one of the most hazardous industries. Accident statistics are used in this chapter to determine the safety performance of the construction industry among other industries in Turkey. The source of the data for the following chapters is the Social Insurance Institute, if not otherwise stated.

5.1 Measurements and method

For this purpose the distributions of the following measurements according to the industries are compiled from the statistical yearbooks of the years 2002-2005.

1. The number of workplaces
   denoted with "**wp**"
2. The number of workers (insured persons)
   denoted with "**w**"
3. The number of occupational injuries
   denoted with "**i**"
4. The number of cases resulting in permanent incapacity to work (as a result of occupational injuries)
   denoted with "**p**"

5. The number of fatal cases (as a result of occupational injuries)
   denoted with "**f**"
6. The total days of temporary incapacity for work (as a result of occupational injuries)
   denoted with "**t**"
7. The days of incapacity causing to in bed treatment in the hospital (as a result of occupational injuries)
   denoted with "**b**"

- A table for each of the years and another table for the average of these years are drawn. Table 5.1 drawn for the average values of these years is shown.
- With the information in these tables, percentages for all measurements and possible comparative measures such as incidence rates, severity rates etc. are calculated.
- Then the percentages (and absolute numbers) and calculated rates for the four years and the average values of these years are summarized in tables each drawn for a measurement or for a comparative measure in *descending* order. Industries are indicated with their codes in these tables. The columns indicating average values include also the full names of the industries. Next to this column, the years are given in descending order to have the latest year just next to the average values.
- Based on these tables comparison of industries can be realized and the evolution in the four year period can also be seen. Comparative measures that will be used will be introduced briefly before the comparisons. The reference period for comparisons is 1 year.

Table 5.1 Average values of the compiled values

C.	Industry	wp	w	i	p	f	t	b
1	Agriculture and livestock	6004	42845	432	11,8	7,3	12265	476
2	Forestry and logging	808	23546	97	3,0	5,3	3931	223
4	Fishing	394	2661	14	0,5	0,8	886	18
11	Coal mining	435	39869	5932	68,5	51,8	119481	2839
12	Mines except of coal	400	9087	265	8,3	7,5	7240	394
13	Crude petroleum and natural gas	47	2636	47	3,0	0,0	1484	88
14	Stone quarrying clay and sand	2281	25540	450	19,5	22,3	15498	1040
19	Pits other non-metallic material products	437	10643	126	3,3	0,8	4007	121
20	Food manufacturing industries (except beverages)	26754	257614	2791	60,3	29,8	71234	2512
21	Beverage industry	369	10351	160	2,3	0,8	3888	154
22	Tobacco industry	157	18191	214	2,0	0,3	4595	73
23	Textile industry	12243	360810	6797	85,8	20,5	155962	2740
24	Manufacturing of foot wear other wearing apparels and made up textile good	26485	384563	1718	13,8	8,8	35451	671
25	Manufacture of wood and cork (except manufacture of furniture)	9168	41806	1393	48,0	8,3	42113	1173
26	Furniture industry	11786	64260	1513	41,5	7,5	38979	601
27	Manufacture of paper and paper products	1354	27337	652	12,5	4,0	17741	281
28	Printing, publishing and allied industries	7006	52013	323	5,5	0,8	9669	164
29	Manufacturing of leather and manufacturing of goods from leather (except sl	1876	19941	161	12,5	2,8	6017	137
30	Rubber industries	1581	24932	776	12,3	0,8	16392	316
31	Manufacturing of chemicals and chemical products	3261	71823	1128	17,5	7,0	24425	445
32	Manufacturing of petroleum and coal derivates	227	7970	78	2,5	1,0	2976	156
33	Products obtaining from stone, clay, sand etc.	8397	131941	4813	52,0	30,3	96095	2585
34	Basic metal industries	1880	68076	4783	40,3	13,5	90535	11726
35	Manufacturing of metal products industry (except machinery and transport e	20061	202802	10028	136,0	25,5	207927	3245
36	Manufacturing and repairing of machine (except electrical machinery)	17840	163548	4758	62,0	14,5	98792	1500
37	Manufacturing and repairing of electrical machineries and apparatus	7114	82724	1286	15,8	5,0	25002	448
38	Manufacturing of transport equipments and supplies	17652	210377	5180	50,0	14,5	103146	2020
39	Miscellaneous manufacturing industries (not elsewhere classified)	11858	95086	1680	36,3	6,8	43883	586
40	**Construction**	**102929**	**771291**	**7692**	**365,0**	**286,5**	**284172**	**13791**
51	Heating with electric, gas and steam	41689	91151	544	14,0	17,0	16480	710
52	Water and sanitary instalments	4813	114777	889	20,8	13,5	27948	1111

1- The incidence rate of occupational injuries

$$R_1 = \frac{i}{w} \times 100.000$$

2- The incidence rate of cases resulting in permanent incapacity to work (as a result of occupational injuries)

$$R_2 = \frac{p}{w} \times 100.000$$

3- The incidence rate of fatal occupational injuries (as a result of occupational injuries)

$$R_3 = \frac{f}{w} \times 100.000$$

4- The severity rate of occupational injuries (as a result of occupational injuries)

The fundamental formula for the severity rate is:

$$S = \frac{Number\ of\ days\ lost\ as\ a\ result\ of\ an\ occupational\ injury}{Total\ work\ hours\ of\ workers\ in\ the\ reference\ group} \times 1.000.000$$

The denominator will be estimated by the multiplication of the average number of workers and the annual work hours. Annual work hours will be fixed at 2.000 (40 hours per week, 50 weeks per year) since we have no industry specific data.

Severity rates will be calculated in two ways. The first one will consider only temporary incapacities. The second one will consider permanent incapacities and fatal occupational injuries in addition to the temporary incapacities.

In addition to these two severity rates another rate is calculated by using the “days of incapacity causing to in bed treatment in the hospital”

a) When the “total days of temporary incapacity for work (as a result of occupational injuries)” is taken into account:

$$S_1 = \frac{t}{2.000 \times w} \quad \times \quad 1.000.000$$

b) When the “total days of temporary incapacity for work (as a result of occupational injuries)”, the “days lost as a result of permanent incapacity to work (as a result of occupational injuries)” and the “days lost as a result of fatal occupational injuries” is taken into account:

Assumptions have to be made to find the days lost due to permanent incapacities and the fatal occupational injuries:

The lost time as a result of a fatal occupational injury is assumed to be 7.500 days (as in Japan).

The time lost as result of a permanent incapacity for work with an incapacity degree of 100 % will be assumed as 7.500 days. The time lost as a result of a permanent incapacity for work with lower incapacity degrees than 100 % is assumed to vary proportionally to the degree of permanent incapacity.

It is obvious that the distribution of the numbers of permanent incapacities according to the incapacity degrees differs in each industry. However, such an industry specific distribution is not available in the statistical yearbooks. Instead, a distribution representing all industries is provided only.

Thus an incapacity degree **"i.d."** will be calculated to represent "All Industries" and this value will also be assumed to represent each industry. For this purpose the weighted average of the incapacity degrees will be calculated based on the distributions in the yearbooks.

$$i.d. = \frac{\sum (incapacity\ degree \times number\ of\ incapacities)}{\sum number\ of\ incapacities}$$

Lastly, the lost time for **one** permanent incapacity for work is calculated with the aforementioned proportionality assumption. The calculations made for each year are presented in Table 5.2.

$$Lost\ days = i.d. \times \frac{7.500}{100} = 75 \times i.d.$$

Table 5.2 Lost days per permanent incapacity

Incapacity degrees	2005	2004	2003	2002	Ave.
Less than 10%	0	0	0	0	0
% 10-19	686	712	591	790	694,8
% 20-29	319	322	297	371	327,3
% 30-39	265	297	299	389	312,5
% 40-49	170	167	204	231	193,0
% 50-100	199	195	205	306	226,3
Total	1639	1693	1596	2087	1753,8
i.d.	**30,1**	**29,8**	**31,7**	**32,2**	**31,0**
Lost days per permanent incapacity	**2260**	**2238**	**2379**	**2415**	**2328**

So the second formula that will be used in the severity rate calculation takes the form:

$$S_2 = \frac{t + p \times (2.260|2.238|2.379|2.415|2.328) + f \times 7.500}{2.000 \times w} \quad \times \quad 1.000.000$$

In this formula the related lost day per permanent incapacity has to be taken for the year in consideration.

c) When the "days of incapacity causing to in bed treatment in the hospital (as a result of occupational injuries)" is taken into account:

$$S_3 = \frac{b}{2.000 \times w} \quad \times \quad 1.000.000$$

5- The Average Days charged per Injury (ADI)

ADI was defined in Chapter 3 as the ratio between the severity rate and the frequency rate which was equal to the ratio of the lost time and the number of accidents. ADI will be calculated in two different ways. The first one will consider only the temporary incapacities. The second one will consider the permanent incapacities and the fatal occupational injuries in addition to the temporary incapacities.

a) When the "total days of temporary incapacity for work (as a result of occupational injuries)" is considered:

$$ADI_1 = \frac{t}{i}$$

b) When the “total days of temporary incapacity for work (as a result of occupational injuries)”, the “days lost as a result of permanent incapacities to work (as a result of occupational injuries)” and the “days lost as a result of fatal occupational injuries” is considered:

$$ADI_2 = \frac{t + p \times (2.260|2.238|2.379|2.415|2.328) + f \times 7.500}{i}$$

6- Occupational injuries per 100.000 workplaces

Sound comparisons can be made with this ratio if the numbers of persons working at the workplaces are approximately equal. Since this is not the case it is not a very reliable measure.

5.2 Comparison with absolute numbers

Comparison of industries will be made first with the aforementioned 7 measurements. To better visualize the change of measures of different industries, percentages are also presented in the tables. The values and percentages that will be used during the comparison below will refer to the values and percentages in the average columns of the related tables, if not otherwise stated.

1) The number of workplaces

Table 5.3 describes the distribution of the number and percentages of workplaces according to the industries along the four years, the average of these years is also presented. Due to space limitations the names of the industries are only indicated in the columns of the average values during this chapter. In other columns the industries are represented with their industry codes.

Figure 5.1 illustrates the distribution of workplaces in percentages for selected industries.

Almost 25 % of the workplaces in Turkey are occupied by “wholesale and retail trade” industry. Construction industry occupying about 12,5 % of all workplaces possesses the second highest number of workplaces in Turkey. Transport, textile industry, basic metal industries, coal mining industry occupies 7,3 %; 1,5 %; 0,2 %; 0,1 % of the total number of workplaces, respectively.

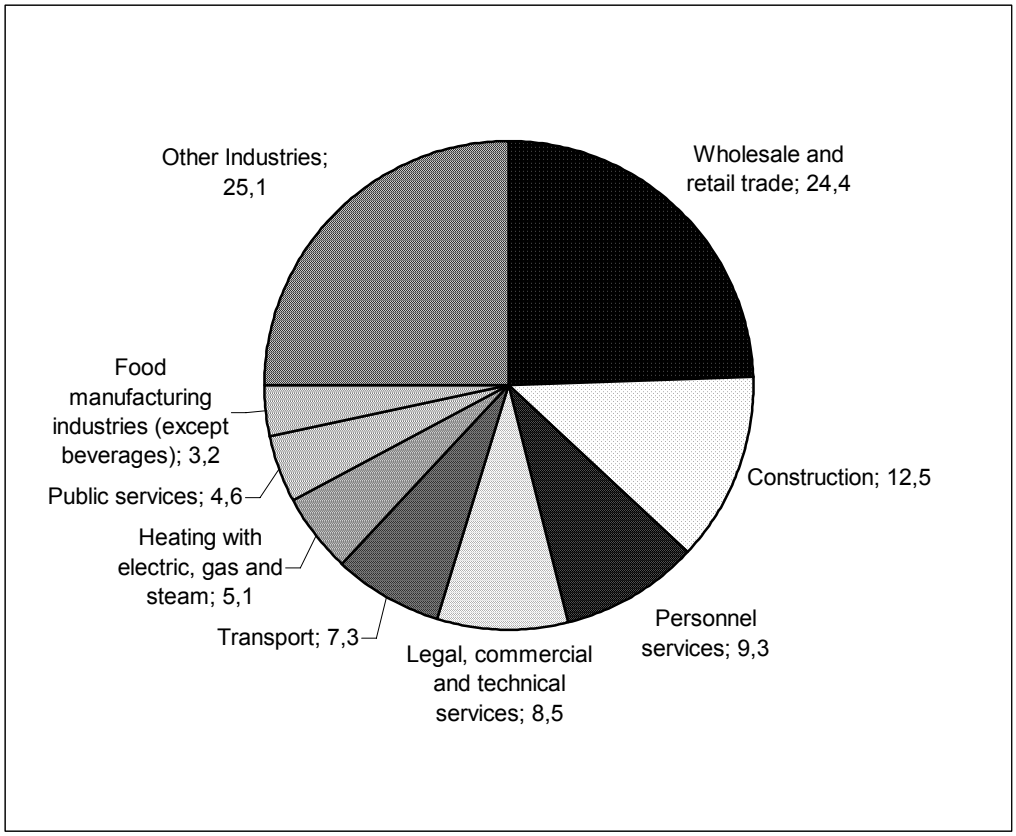

Figure 5.1 Distribution of the percentages of workplaces

Table 5.3 Distribution of the number of workplaces

C.	Industry	Ave.			2005			2004			2003			2002		
		#	%	C.	#	%	C.	#	%	C.	#	%	C.	#	%	
A	**All Industries**	**825125**	**100,0**	**A**	**944984**	**100,0**	**A**	**850928**	**100,0**	**A**	**777177**	**100,0**	**A**	**727409**	**100,0**	
61	Wholesale and retail trade	201624	24,4	61	231627	24,5	61	211289	24,8	61	190628	24,5	61	172953	23,8	
40	**Construction**	**102929**	**12,5**	**40**	**124414**	**13,2**	**40**	**100415**	**11,8**	**40**	**90310**	**11,6**	**40**	**96578**	**13,3**	
85	Personnel services	76652	9,3	85	87927	9,3	85	78763	9,3	85	72836	9,4	85	67083	9,2	
83	Legal, commercial and technical services	70097	8,5	83	78637	8,3	83	71887	8,4	83	66907	8,6	83	62957	8,7	
71	Transport	60594	7,3	71	71932	7,6	71	63949	7,5	71	55556	7,1	71	50940	7,0	
51	Heating with electric, gas and steam	41689	5,1	82	45752	4,8	51	42019	4,9	51	41343	5,3	51	40522	5,6	
82	Public services	37821	4,6	51	42872	4,5	82	40043	4,7	82	35061	4,5	82	30426	4,2	
20	Food manufacturing industries (except beverages)	26754	3,2	20	29217	3,1	24	27760	3,3	24	26610	3,4	20	24631	3,4	
24	Manufacturing of foot wear other wearing apparels a	26485	3,2	24	28733	3,0	20	27424	3,2	20	25743	3,3	24	22838	3,1	
35	Manufacturing of metal products industry (except ma	20061	2,4	35	22889	2,4	35	21080	2,5	35	18969	2,4	35	17307	2,4	
36	Manufacturing and repairing of machine (except elec	17840	2,2	36	20220	2,1	36	18586	2,2	36	17059	2,2	36	15495	2,1	
38	Manufacturing of transport equipments and supplies	17652	2,1	38	20183	2,1	38	18401	2,2	38	16813	2,2	38	15209	2,1	
23	Textile industry	12243	1,5	26	13933	1,5	23	12890	1,5	23	12149	1,6	23	10788	1,5	
39	Miscellaneous manufacturing industries (not elsewhe	11858	1,4	39	13367	1,4	26	12629	1,5	39	11308	1,5	39	10400	1,4	
26	Furniture industry	11786	1,4	23	13144	1,4	39	12358	1,5	26	11052	1,4	26	9528	1,3	
25	Manufacture of wood and cork (except manufacture	9168	1,1	25	10334	1,1	25	9568	1,1	25	8702	1,1	25	8069	1,1	
33	Products obtaining from stone, clay, sand etc.	8397	1,0	33	9374	1,0	33	8637	1,0	33	8026	1,0	33	7550	1,0	
62	Banks and other financial institutions	7312	0,9	81	8784	0,9	37	7369	0,9	62	7461	1,0	62	7375	1,0	
37	Manufacturing and repairing of electrical machineries	7114	0,9	37	8184	0,9	28	7348	0,9	37	6737	0,9	37	6166	0,8	
81	Government services	7107	0,9	28	7949	0,8	62	7194	0,8	28	6581	0,8	28	6145	0,8	
28	Printing, publishing and allied industries	7006	0,8	62	7219	0,8	81	7164	0,8	81	6416	0,8	81	6062	0,8	
1	Agriculture and livestock	6004	0,7	84	6915	0,7	1	6179	0,7	1	5749	0,7	1	5438	0,7	
84	Cinema, theatre and similar services	5847	0,7	1	6649	0,7	84	6078	0,7	84	5396	0,7	84	4998	0,7	
63	Insurance	5348	0,6	63	6398	0,7	63	5516	0,6	63	4918	0,6	52	4825	0,7	
52	Water and sanitary instalments	4813	0,6	52	4758	0,5	52	4822	0,6	52	4847	0,6	63	4560	0,6	
31	Manufacturing of chemicals and chemical products	3261	0,4	31	3580	0,4	31	3348	0,4	31	3142	0,4	31	2974	0,4	
72	Storage and warehousing	2786	0,3	72	3026	0,3	72	2902	0,3	72	2708	0,3	72	2509	0,3	
14	Stone quarrying clay and sand	2281	0,3	14	2599	0,3	14	2329	0,3	14	2146	0,3	14	2051	0,3	
34	Basic metal industries	1880	0,2	64	2549	0,3	34	1942	0,2	29	1916	0,2	29	1748	0,2	
29	Manufacturing of leather and manufacturing of goods	1876	0,2	34	2072	0,2	29	1939	0,2	34	1821	0,2	34	1684	0,2	
64	Real estate works (services)	1835	0,2	29	1901	0,2	64	1893	0,2	30	1569	0,2	30	1419	0,2	

2) The number of Workers

Table 5.4 describes the distribution of the number and percentages of the workers according to the industries. As it can be inferred from the table, construction industry generally employs more workers than other industries. In the years 2002 and 2005 construction industry employed 13,7 % and 13,5 %, respectively, of all workers in Turkey and ranked first among all industries. In 2003 and 2004 construction industry was the second largest employer after the wholesale and retail trade industry. When comparing average values transport, textile, manufacturing of metal products industry (except machinery and transport equipment) and coal mining industries rank 6^{th}, 7^{th}, 11^{th} , and 27^{th} places, respectively.

Figure 5.2 shows this distribution graphically.

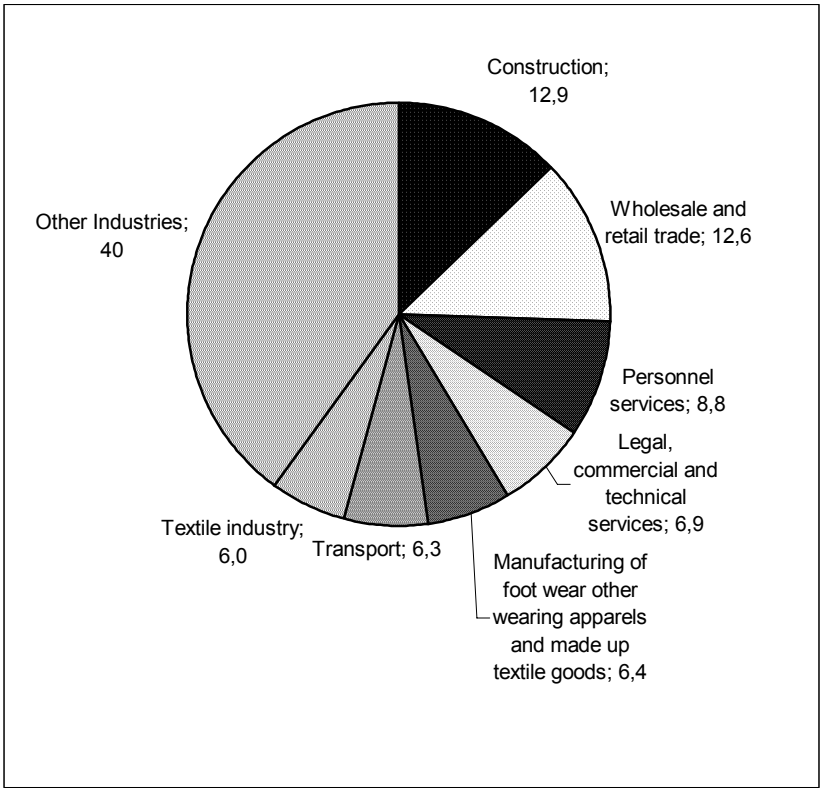

Figure 5.2 Distribution of the percentages of workers

Table 5.4 Distribution of the number of workers

		Ave.			2005			2004			2003			2002		
C.	Industry	#	%	C.	#	%	C.	#	%	C.	#	%	C.	#	%
A	**All Industries**	**5984594**	**100,0**	**A**	**6918605**	**100,0**	**A**	**6181251**	**100,0**	**A**	**5615238**	**100,0**	**A**	**5223283**	**100,0**
40	**Construction**	**771291**	**12,9**	**40**	**933498**	**13,5**	61	795818	12,9	61	703496	12,5	**40**	**713629**	**13,7**
61	Wholesale and retail trade	756759	12,6	61	896178	13,0	**40**	**752136**	**12,2**	**40**	**685902**	**12,2**	61	631544	12,1
85	Personnel services	528235	8,8	85	623387	9,0	85	549199	8,9	85	490253	8,7	85	450101	8,6
83	Legal, commercial and technical service	413176	6,9	83	483104	7,0	83	423764	6,9	24	401465	7,1	83	360329	6,9
24	Manufacturing of foot wear other wearing	384563	6,4	71	457022	6,6	24	396768	6,4	83	385508	6,9	24	342947	6,6
71	Transport	379474	6,3	24	397073	5,7	71	396393	6,4	23	363507	6,5	23	329628	6,3
23	Textile industry	360810	6,0	23	374040	5,4	23	376064	6,1	71	344226	6,1	71	320256	6,1
20	Food manufacturing industries (except b	257614	4,3	82	335567	4,9	82	262921	4,3	20	248606	4,4	20	242046	4,6
82	Public services	255289	4,3	20	278574	4,0	20	261231	4,2	82	222973	4,0	82	199696	3,8
38	Manufacturing of transport equipments a	210377	3,5	38	243096	3,5	38	230765	3,7	38	193130	3,4	38	174515	3,3
35	Manufacturing of metal products industry	202802	3,4	35	241423	3,5	35	216051	3,5	35	188056	3,3	35	165679	3,2
36	Manufacturing and repairing of machine	163548	2,7	36	192135	2,8	36	179800	2,9	36	152200	2,7	36	130058	2,5
33	Products obtaining from stone, clay, san	131941	2,2	33	154022	2,2	33	138314	2,2	33	123139	2,2	52	114615	2,2
52	Water and sanitary instalments	114777	1,9	52	113297	1,6	52	115792	1,9	52	115405	2,1	33	112287	2,1
39	Miscellaneous manufacturing industries	95086	1,6	39	109729	1,6	39	101815	1,6	39	89948	1,6	51	88378	1,7
51	Heating with electric, gas and steam	91151	1,5	51	95809	1,4	51	91140	1,5	51	89276	1,6	39	78850	1,5
37	Manufacturing and repairing of electrical	82724	1,4	37	95771	1,4	37	88748	1,4	37	76856	1,4	37	69520	1,3
31	Manufacturing of chemicals and chemica	71823	1,2	26	82095	1,2	31	74175	1,2	31	69599	1,2	31	67881	1,3
34	Basic metal industries	68076	1,1	34	75781	1,1	34	71959	1,2	34	65061	1,2	34	59504	1,1
26	Furniture industry	64260	1,1	31	75636	1,1	26	71092	1,2	62	57577	1,0	62	55349	1,1
62	Banks and other financial institutions	59496	1,0	81	70404	1,0	62	60381	1,0	26	56992	1,0	26	46861	0,9
28	Printing, publishing and allied industries	52013	0,9	62	64678	0,9	28	54527	0,9	28	48927	0,9	28	44499	0,9
81	Government services	49526	0,8	28	60100	0,9	81	50029	0,8	1	40821	0,7	11	42541	0,8
1	Agriculture and livestock	42845	0,7	25	48304	0,7	25	43901	0,7	81	40653	0,7	1	40116	0,8
25	Manufacture of wood and cork (except m	41806	0,7	84	47348	0,7	1	43263	0,7	25	39215	0,7	81	37016	0,7
84	Cinema, theatre and similar services	40103	0,7	1	47178	0,7	84	41373	0,7	11	38053	0,7	25	35804	0,7
11	Coal mining	39869	0,7	11	40390	0,6	11	38492	0,6	84	36897	0,7	84	34793	0,7
72	Storage and warehousing	33829	0,6	72	39775	0,6	72	34988	0,6	72	31679	0,6	72	28875	0,6
27	Manufacture of paper and paper product	27337	0,5	14	32322	0,5	27	27867	0,5	27	26619	0,5	27	25767	0,5

3) The number of occupational injuries

Table 5.6 describes the distribution of the number and percentages of occupational injuries according to the industries for the four years; the average of the values for these years is also presented. As it is illustrated in Table, 6.480 (% 8,8) of 73.923 occupational injuries in total occurred in the construction industry, in 2005. Construction industry had the second highest number of occupational injuries after the manufacturing of metal products industry (except machinery and transport equipment), where 10.283 accidents were recorded corresponding to 13,9 % of all accidents in this year. The relative relationship between these two industries does not change much over the years.

When comparing average values, construction industry is followed by textile and coal mining industries with percentages 8,9 and 7,7; respectively.

Some of the industries which are not mentioned above are given below in Table 5.5, due to their importance in the next sections of this chapter (Average values are given).

Table 5.5 Distribution of the number of occupational injuries in selected industries

C.	Industry	#	%	Rank
35	Manufacturing of metal products industry (except machinery and transport equipment)	10028	13,08	1
11	Coal mining	5932	7,73	4
33	Products obtaining from stone, clay, sand etc.	4813	6,28	6
34	Basic metal industries	4783	6,24	7
36	Manufacturing and repairing of machine (except electrical machinery)	4758	6,20	8
71	Transport	3856	5,03	9
25	Manufacture of wood and cork (except manufacture of furniture)	1393	1,82	16
30	Rubber industries	776	1,01	21
14	Stone quarrying clay and sand	450	0,59	24
12	Mines except of coal	265	0,35	29
22	Tobacco industry	214	0,28	30
2	Forestry and logging	97	0,13	35
84	Cinema, theatre and similar services	56	0,07	37
13	Crude petroleum and natural gas	47	0,06	38
62	Banks and other financial institutions	27	0,04	39
4	Fishing	14	0,02	41
64	Real estate works (services)	9	0,01	44

Table 5.6 Distribution of the number of occupational injuries

C.	Industry	Ave.		C.	2005		C.	2004		C.	2003		C.	2002	
A	**All Industries**	**76691**	**100,0**	**A**	**73923**	**100,0**	**A**	**83830**	**100,0**	**A**	**76668**	**100,0**	**A**	**72344**	**100,0**
35	Manufacturing of metal products industry (exc	10028	13,1	35	10283	13,9	35	11584	13,8	35	9682	12,6	35	8563	11,8
40	**Construction**	**7692**	**10,0**	**40**	**6480**	**8,8**	**40**	**8106**	**9,7**	**40**	**8198**	**10,7**	**40**	**7982**	**11,0**
23	Textile industry	6797	8,9	11	6011	8,1	23	6839	8,2	23	7382	9,6	23	7097	9,8
11	Coal mining	5932	7,7	23	5869	7,9	38	5871	7,0	11	5647	7,4	11	6587	9,1
38	Manufacturing of transport equipments and su	5180	6,8	38	5388	7,3	34	5636	6,7	38	5243	6,8	38	4217	5,8
33	Products obtaining from stone, clay, sand etc.	4813	6,3	34	4964	6,7	33	5626	6,7	33	4657	6,1	36	4146	5,7
34	Basic metal industries	4783	6,2	33	4891	6,6	11	5481	6,5	36	4598	6,0	33	4079	5,6
36	Manufacturing and repairing of machine (exce	4758	6,2	36	4875	6,6	36	5412	6,5	34	4453	5,8	34	4077	5,6
71	Transport	3856	5,0	71	3928	5,3	71	4098	4,9	71	3762	4,9	71	3636	5,0
20	Food manufacturing industries (except bevera	2791	3,6	20	2334	3,2	20	3074	3,7	20	2892	3,8	20	2865	4,0
61	Wholesale and retail trade	2250	2,9	61	2236	3,0	61	2590	3,1	61	2311	3,0	85	1985	2,7
85	Personnel services	2091	2,7	85	1973	2,7	85	2206	2,6	85	2200	2,9	61	1864	2,6
24	Manufacturing of foot wear other wearing appa	1718	2,2	39	1677	2,3	39	1939	2,3	24	1921	2,5	24	1591	2,2
39	Miscellaneous manufacturing industries (not e	1680	2,2	24	1514	2,0	26	1846	2,2	39	1640	2,1	39	1462	2,0
26	Furniture industry	1513	2,0	26	1508	2,0	24	1845	2,2	26	1451	1,9	25	1430	2,0
25	Manufacture of wood and cork (except manufa	1393	1,8	37	1325	1,8	25	1544	1,8	25	1378	1,8	26	1248	1,7
37	Manufacturing and repairing of electrical mach	1286	1,7	25	1219	1,6	37	1408	1,7	37	1208	1,6	37	1204	1,7
31	Manufacturing of chemicals and chemical prod	1128	1,5	31	1149	1,6	31	1215	1,4	31	1079	1,4	31	1068	1,5
52	Water and sanitary instalments	889	1,2	30	902	1,2	30	938	1,1	52	887	1,2	52	1026	1,4
83	Legal, commercial and technical services	844	1,1	83	756	1,0	83	934	1,1	83	871	1,1	83	816	1,1
30	Rubber industries	776	1,0	52	740	1,0	52	901	1,1	30	647	0,8	27	665	0,9
27	Manufacture of paper and paper products	652	0,9	27	569	0,8	27	736	0,9	27	639	0,8	30	616	0,9
51	Heating with electric, gas and steam	544	0,7	14	534	0,7	51	623	0,7	51	537	0,7	51	578	0,8
14	Stone quarrying clay and sand	450	0,6	51	436	0,6	14	449	0,5	1	459	0,6	1	522	0,7
1	Agriculture and livestock	432	0,6	1	334	0,5	1	413	0,5	14	398	0,5	14	419	0,6
72	Storage and warehousing	336	0,4	28	295	0,4	72	389	0,5	72	350	0,5	28	342	0,5
28	Printing, publishing and allied industries	323	0,4	72	283	0,4	82	323	0,4	82	345	0,4	72	323	0,4
82	Public services	307	0,4	82	261	0,4	28	318	0,4	28	335	0,4	82	300	0,4
12	Mines except of coal	265	0,3	12	231	0,3	12	307	0,4	12	242	0,3	12	281	0,4

4) The number of permanent incapacities to work

Table 5.7 describes the distribution of the number and percentages of the cases of permanent incapacity to work according to the industries over the four years; the average of the values for these years is also presented.
Figure 5.3 illustrates the percentages of the cases of permanent incapacities to work.

As it can be figured out from Table 5.7, nearly a quarter of the permanent incapacities to work have been recorded in the construction industry. It corresponds to a value about 150 % higher than the value for manufacturing of metal products industry (except machinery and transport equipment), which ranks second with 9 % in the average. These industries are followed by transport, textile, and coal mining industries with shares of lower than % 7.

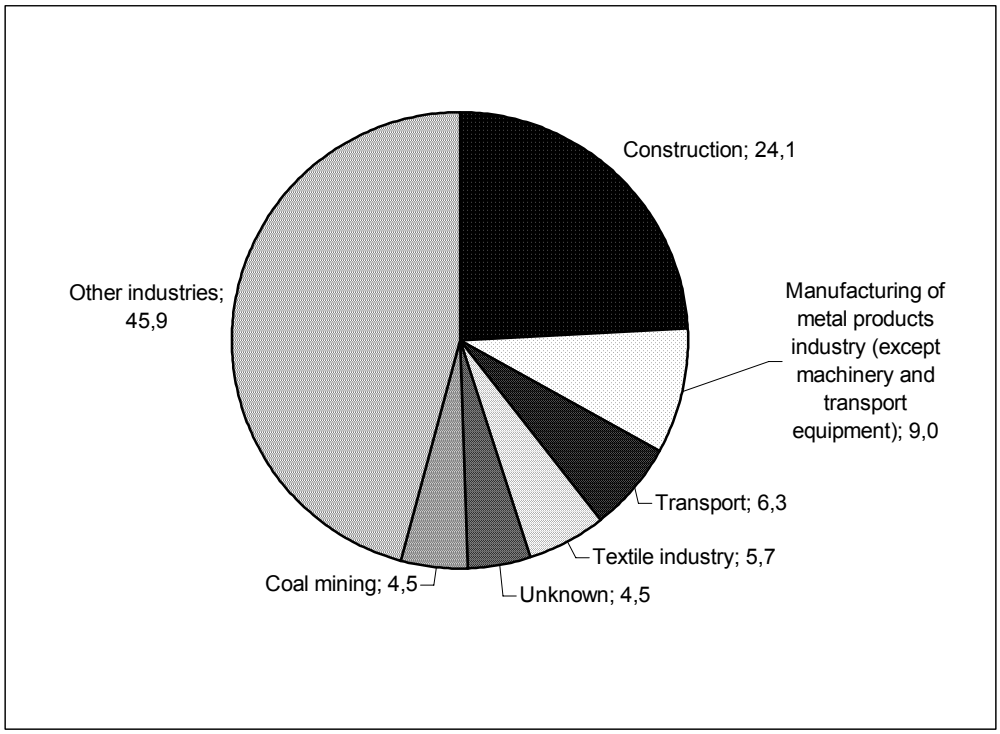

Figure 5.3 Distribution of the percentages of cases of permanent incapacities

Table 5.7 Distribution of the number of cases of permanent incapacities

		Ave.		2005			2004			2003			2002		
C.	Industry	#	%	C.	#	%	C.	#	%	C.	#	%	C.	#	%
A	**All Industries**	**1517**	**100,0**	**A**	**1374**	**100,0**	**A**	**1421**	**100,0**	**A**	**1451**	**100,0**	**A**	**1820**	**100,0**
40	**Construction**	**365**	**24,1**	**40**	**322**	**23,4**	**40**	**345**	**24,3**	**40**	**354**	**24,4**	**40**	**439**	**24,1**
35	Manufacturing of metal products industry (except ma	136	9,0	U	133	9,7	35	130	9,1	35	125	8,6	35	168	9,2
71	Transport	96	6,3	35	121	8,8	U	86	6,1	71	104	7,2	71	114	6,3
23	Textile industry	86	5,7	71	80	5,8	71	85	6,0	23	93	6,4	23	103	5,7
U	Unknown	69	4,5	23	72	5,2	23	75	5,3	61	65	4,5	11	94	5,2
11	Coal mining	69	4,5	11	50	3,6	20	67	4,7	11	64	4,4	36	87	4,8
36	Manufacturing and repairing of machine (except ele	62	4,1	36	47	3,4	11	66	4,6	36	61	4,2	20	79	4,3
20	Food manufacturing industries (except beverages)	60	4,0	38	47	3,4	36	53	3,7	33	54	3,7	61	77	4,2
61	Wholesale and retail trade	58	3,8	61	47	3,4	33	51	3,6	20	49	3,4	25	69	3,8
33	Products obtaining from stone, clay, sand etc.	52	3,4	20	46	3,3	38	50	3,5	25	49	3,4	33	58	3,2
38	Manufacturing of transport equipments and supplies	50	3,3	33	45	3,3	61	44	3,1	38	47	3,2	38	56	3,1
25	Manufacture of wood and cork (except manufacture	48	3,2	26	40	2,9	25	43	3,0	26	45	3,1	34	48	2,6
26	Furniture industry	42	2,7	34	36	2,6	26	40	2,8	39	42	2,9	39	43	2,4
34	Basic metal industries	40	2,7	25	31	2,3	34	40	2,8	34	37	2,5	26	41	2,3
39	Miscellaneous manufacturing industries (not elsewh	36	2,4	39	29	2,1	39	31	2,2	U	36	2,5	85	38	2,1
85	Personnel services	28	1,8	85	23	1,7	85	22	1,5	85	28	1,9	52	31	1,7
52	Water and sanitary instalments	21	1,4	31	21	1,5	83	21	1,5	83	21	1,4	14	28	1,5
83	Legal, commercial and technical services	21	1,4	14	20	1,5	31	18	1,3	52	19	1,3	83	26	1,4
14	Stone quarrying clay and sand	20	1,3	30	17	1,2	52	18	1,3	51	14	1,0	29	23	1,3
31	Manufacturing of chemicals and chemical products	18	1,2	27	16	1,2	14	17	1,2	1	13	0,9	24	22	1,2
37	Manufacturing and repairing of electrical machinerie	16	1,0	37	16	1,2	51	13	0,9	14	13	0,9	37	22	1,2
51	Heating with electric, gas and steam	14	0,9	52	15	1,1	1	12	0,8	24	13	0,9	31	20	1,1
24	Manufacturing of foot wear other wearing apparels a	14	0,9	51	14	1,0	37	12	0,8	37	13	0,9	U	20	1,1
27	Manufacture of paper and paper products	13	0,8	83	14	1,0	30	11	0,8	30	12	0,8	27	18	1,0
29	Manufacturing of leather and manufacturing of good	13	0,8	24	10	0,7	24	10	0,7	12	11	0,8	51	15	0,8
30	Rubber industries	12	0,8	1	9	0,7	12	9	0,6	29	11	0,8	1	13	0,7
1	Agriculture and livestock	12	0,8	29	9	0,7	27	7	0,5	31	11	0,8	12	11	0,6
12	Mines except of coal	8	0,5	82	8	0,6	29	7	0,5	27	9	0,6	30	9	0,5
82	Public services	6	0,4	28	5	0,4	82	7	0,5	19	7	0,5	72	8	0,4

5) The number of fatal occupational injuries

Table 5.8 describes the distribution of the number and percentages of fatal occupational injuries according to the industries over the four years; the average of the values for these years is also presented.
Figure 5.4 illustrates the percentages of fatal occupational injuries

The table shows that about one third of all occupational fatal injuries have been recorded in the construction industry in the past years. The number of fatalities in the construction industry is more than one to two times higher than the number of fatalities in the transport industry that has the second highest fatality number. These two industries are followed by wholesale and retail trade, coal mining and products obtaining from stone, clay, sand etc. industries with percentages lower than 7. Only 2,8 % of all fatalities were recorded in the manufacturing of metal products industry (except machinery and transport equipment), which had the highest number of accidents.

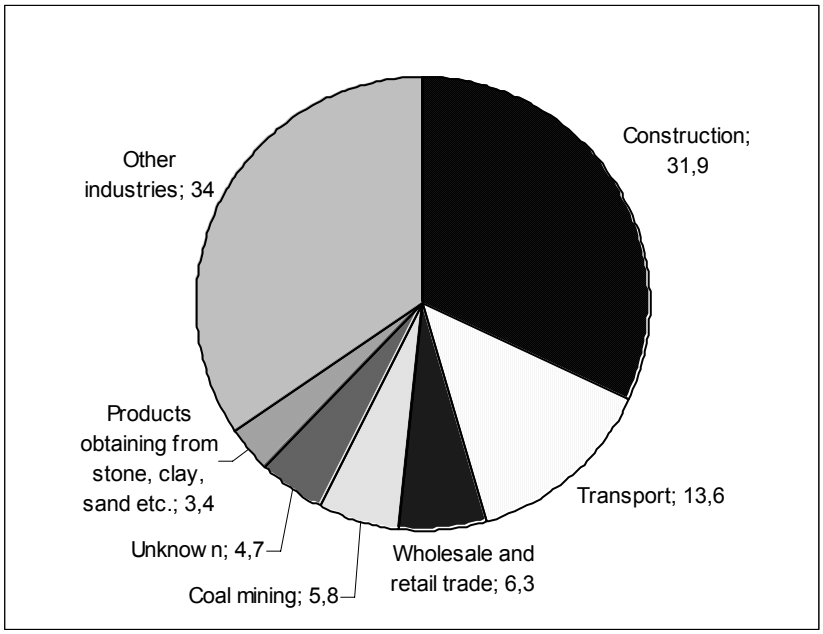

Figure 5.4 Distribution of the percentages of fatal occupational injuries

Table 5.8 Distribution of the number of fatal occupational injuries

		Ave.			2005			2004			2003			2002		
C.	Industry	#	%	C.	#	%	C.	#	%	C.	#	%	C.	#	%
A	**All Industries**	**899**	**100,0**	**A**	**1072**	**100,0**	**A**	**841**	**100,0**	**A**	**810**	**100,0**	**A**	**872**	**100,0**
40	**Construction**	**287**	**31,9**	**40**	**290**	**27,1**	**40**	**263**	**31,3**	**40**	**274**	**33,8**	**40**	**319**	**36,6**
71	Transport	123	13,6	71	163	15,2	71	109	13,0	71	88	10,9	71	130	14,9
61	Wholesale and retail trade	57	6,3	11	77	7,2	U	55	6,5	61	61	7,5	61	52	6,0
11	Coal mining	52	5,8	U	71	6,6	61	52	6,2	11	53	6,5	11	39	4,5
U	Unknown	42	4,7	61	61	5,7	11	38	4,5	20	30	3,7	20	38	4,4
33	Products obtaining from stone, clay, sand etc.	30	3,4	14	32	3,0	35	37	4,4	U	30	3,7	33	30	3,4
20	Food manufacturing industries (except beverages)	30	3,3	20	32	3,0	33	30	3,6	33	29	3,6	85	30	3,4
35	Manufacturing of metal products industry (except mach	26	2,8	33	32	3,0	83	25	3,0	35	23	2,8	51	19	2,2
85	Personnel services	24	2,6	85	30	2,8	14	19	2,3	14	21	2,6	23	18	2,1
14	Stone quarrying clay and sand	22	2,5	23	29	2,7	20	19	2,3	23	21	2,6	14	17	1,9
23	Textile industry	21	2,3	35	25	2,3	34	16	1,9	85	20	2,5	35	17	1,9
83	Legal, commercial and technical services	19	2,1	36	22	2,1	51	16	1,9	52	16	2,0	52	17	1,9
51	Heating with electric, gas and steam	17	1,9	83	22	2,1	23	14	1,7	36	15	1,9	83	15	1,7
36	Manufacturing and repairing of machine (except electri	15	1,6	38	20	1,9	85	14	1,7	38	15	1,9	U	12	1,4
38	Manufacturing of transport equipments and supplies	15	1,6	51	20	1,9	36	13	1,5	51	13	1,6	38	11	1,3
34	Basic metal industries	14	1,5	34	17	1,6	24	12	1,4	24	12	1,5	34	10	1,1
52	Water and sanitary instalments	14	1,5	1	13	1,2	38	12	1,4	83	12	1,5	25	9	1,0
24	Manufacturing of foot wear other wearing apparels and	9	1,0	26	13	1,2	12	11	1,3	34	11	1,4	31	9	1,0
25	Manufacture of wood and cork (except manufacture of	8	0,9	52	12	1,1	39	11	1,3	25	9	1,1	1	8	0,9
12	Mines except of coal	8	0,8	82	9	0,8	25	10	1,2	12	7	0,9	36	8	0,9
26	Furniture industry	8	0,8	27	8	0,7	52	9	1,1	26	6	0,7	39	8	0,9
1	Agriculture and livestock	7	0,8	29	8	0,7	31	8	1,0	1	5	0,6	81	8	0,9
31	Manufacturing of chemicals and chemical products	7	0,8	31	8	0,7	82	8	1,0	37	5	0,6	12	7	0,8
39	Miscellaneous manufacturing industries (not elsewhere	7	0,8	2	7	0,7	81	7	0,8	81	5	0,6	24	7	0,8
82	Public services	7	0,7	37	6	0,6	37	6	0,7	82	5	0,6	26	6	0,7
81	Government services	6	0,7	72	6	0,6	2	5	0,6	2	4	0,5	2	5	0,6
2	Forestry and logging	5	0,6	12	5	0,5	26	5	0,6	84	4	0,5	82	4	0,5
37	Manufacturing and repairing of electrical machineries a	5	0,6	25	5	0,5	27	5	0,6	31	3	0,4	37	3	0,3
27	Manufacture of paper and paper products	4	0,4	39	5	0,5	1	3	0,4	39	3	0,4	72	3	0,3

6) The total days of temporary incapacity for work (as a result of occupational injuries)

Table 5.9 describes the distribution of the number and percentages of the total days of temporary incapacity for work according to the industries over the four years; the average of the values for these years is also presented.

As it can be seen from the table 1.910.118 days were lost as a result of occupational injuries in the average. Almost 15 % of these lost days were due to occupational injuries in the construction industry. Construction industry is followed by the manufacturing of metal products industry (except machinery and transport equipment), textile industry, transport, and coal mining industries.

7) The days of incapacity causing to in bed treatment in the hospital (as a result of occupational injuries)

Table 5.10 describes the distribution of the number and percentages of the days of incapacity causing to in bed treatment in the hospital according to the industries over the four years; the average of the values for these years is also presented.

Again, the industry in which the number of lost days was the highest was the construction industry. Construction industry is followed by basic metal industries, transport, manufacturing of metal products industry (except machinery and transport equipment), coal mining and textile industry which, together with the construction industry constitute more than 60 % of all lost days in this distribution.

Table 5.9 Distribution of the number of the total days of temporary incapacity for work

C.	Industry	Ave.			2005			2004			2003			2002		
		#	%	C.	#	%	C.	#	%	C.	#	%	C.	#	%	
A	**All Industries**	**1910118**	**100,0**	**A**	**1742227**	**100,0**	**A**	**1977018**	**100,0**	**A**	**2101539**	**100,0**	**A**	**1819688**	**100,0**	
40	**Construction**	**284172**	**14,9**	**40**	**229010**	**13,1**	**40**	**279728**	**14,1**	**40**	**322975**	**15,4**	**40**	**304974**	**16,8**	
35	Manufacturing of metal products indus	207927	10,9	35	203220	11,7	35	227117	11,5	23	235774	11,2	35	172082	9,5	
23	Textile industry	155962	8,2	71	125058	7,2	23	141408	7,2	35	229287	10,9	23	134756	7,4	
71	Transport	126977	6,6	11	121432	7,0	71	126124	6,4	71	136079	6,5	11	133057	7,3	
11	Coal mining	119481	6,3	23	111909	6,4	38	113838	5,8	11	116051	5,5	71	120646	6,6	
38	Manufacturing of transport equipments	103146	5,4	38	104229	6,0	36	107796	5,5	38	111686	5,3	36	89101	4,9	
36	Manufacturing and repairing of machin	98792	5,2	36	99142	5,7	11	107385	5,4	36	99130	4,7	33	84814	4,7	
33	Products obtaining from stone, clay, sa	96095	5,0	33	98221	5,6	33	104429	5,3	33	96917	4,6	38	82832	4,6	
34	Basic metal industries	90535	4,7	34	95853	5,5	34	101411	5,1	34	89597	4,3	20	79056	4,3	
61	Wholesale and retail trade	79077	4,1	61	76362	4,4	61	86486	4,4	61	86168	4,1	34	75279	4,1	
20	Food manufacturing industries (except	71234	3,7	20	57345	3,3	20	73757	3,7	20	74778	3,6	61	67290	3,7	
85	Personnel services	55288	2,9	85	47280	2,7	85	55306	2,8	85	60626	2,9	85	57939	3,2	
39	Miscellaneous manufacturing industrie	43883	2,3	26	38275	2,2	39	53798	2,7	39	44703	2,1	25	42453	2,3	
25	Manufacture of wood and cork (except	42113	2,2	25	37743	2,2	26	47036	2,4	25	42546	2,0	39	39356	2,2	
26	Furniture industry	38979	2,0	39	37676	2,2	25	45709	2,3	24	39279	1,9	24	33244	1,8	
24	Manufacturing of foot wear other weari	35451	1,9	24	31827	1,8	24	37453	1,9	26	38676	1,8	26	31930	1,8	
83	Legal, commercial and technical servic	29383	1,5	37	25299	1,5	83	31355	1,6	83	33033	1,6	83	31081	1,7	
52	Water and sanitary instalments	27948	1,5	31	24252	1,4	52	29666	1,5	52	33019	1,6	52	29565	1,6	
37	Manufacturing and repairing of electric	25002	1,3	83	22061	1,3	31	28514	1,4	31	22927	1,1	37	24528	1,3	
31	Manufacturing of chemicals and chemi	24425	1,3	52	19542	1,1	37	27349	1,4	37	22831	1,1	31	22006	1,2	
27	Manufacture of paper and paper produ	17741	0,9	30	18962	1,1	30	18518	0,9	51	19463	0,9	27	19639	1,1	
51	Heating with electric, gas and steam	16480	0,9	14	18424	1,1	27	16122	0,8	27	18191	0,9	51	17537	1,0	
30	Rubber industries	16392	0,9	27	17010	1,0	51	15670	0,8	30	14910	0,7	14	14438	0,8	
14	Stone quarrying clay and sand	15498	0,8	51	13251	0,8	14	14726	0,7	14	14404	0,7	1	13237	0,7	
1	Agriculture and livestock	12265	0,6	1	10096	0,6	1	11724	0,6	1	14002	0,7	30	13176	0,7	
82	Public services	10204	0,5	82	9044	0,5	82	11243	0,6	82	11026	0,5	12	10672	0,6	
28	Printing, publishing and allied industrie	9669	0,5	28	8597	0,5	28	10871	0,5	72	10522	0,5	28	9668	0,5	
72	Storage and warehousing	9448	0,5	72	8102	0,5	72	10229	0,5	28	9541	0,5	82	9504	0,5	
12	Mines except of coal	7240	0,4	81	5445	0,3	12	6640	0,3	29	9134	0,4	72	8939	0,5	

Table 5.10 Distribution of the number of the days of incapacity causing to in bed treatment in the hospital

		Ave.		2005			2004			2003			2002		
C.	Industry	#	%	C.	#	%	C.	#	%	C.	#	%	C.	#	%
A	**All Industries**	**63638**	**100,0**	**A**	**49065**	**100,0**	**A**	**54220**	**100,0**	**A**	**105532**	**100,0**	**A**	**45733**	**100,0**
40	**Construction**	**13791**	**21,7**	**40**	**11717**	**23,9**	**40**	**14409**	**26,6**	34	42948	40,7	**40**	**12394**	**27,1**
34	Basic metal industries	11726	18,4	71	5086	10,4	71	4303	7,9	**40**	**16643**	**15,8**	71	3709	8,1
71	Transport	4797	7,5	35	3455	7,0	35	3660	6,8	71	6091	5,8	11	3462	7,6
35	Manufacturing of metal products industry (except mach	3245	5,1	61	2799	5,7	23	3079	5,7	38	4114	3,9	20	3006	6,6
11	Coal mining	2839	4,5	33	2559	5,2	61	2882	5,3	35	3523	3,3	33	2444	5,3
23	Textile industry	2740	4,3	23	2455	5,0	11	2724	5,0	61	3298	3,1	35	2342	5,1
61	Wholesale and retail trade	2721	4,3	11	2365	4,8	33	2690	5,0	23	3203	3,0	23	2221	4,9
33	Products obtaining from stone, clay, sand etc.	2585	4,1	20	1966	4,0	20	2301	4,2	11	2805	2,7	61	1903	4,2
20	Food manufacturing industries (except beverages)	2512	3,9	38	1587	3,2	85	2102	3,9	20	2775	2,6	85	1514	3,3
38	Manufacturing of transport equipments and supplies	2020	3,2	36	1458	3,0	36	1595	2,9	33	2647	2,5	83	1363	3,0
85	Personnel services	1659	2,6	85	1441	2,9	34	1583	2,9	36	1849	1,8	36	1096	2,4
36	Manufacturing and repairing of machine (except electr	1500	2,4	34	1337	2,7	38	1400	2,6	83	1616	1,5	34	1034	2,3
83	Legal, commercial and technical services	1182	1,9	25	1319	2,7	52	1266	2,3	85	1577	1,5	14	1028	2,2
25	Manufacture of wood and cork (except manufacture of	1173	1,8	14	1243	2,5	14	1072	2,0	25	1512	1,4	38	979	2,1
52	Water and sanitary instalments	1111	1,7	24	975	2,0	25	1025	1,9	52	1248	1,2	52	961	2,1
14	Stone quarrying clay and sand	1040	1,6	52	968	2,0	83	918	1,7	14	817	0,8	25	836	1,8
51	Heating with electric, gas and steam	710	1,1	83	832	1,7	51	775	1,4	39	797	0,8	51	690	1,5
24	Manufacturing of foot wear other wearing apparels and	671	1,1	26	700	1,4	39	757	1,4	51	790	0,7	26	516	1,1
26	Furniture industry	601	0,9	51	586	1,2	37	616	1,1	24	729	0,7	24	432	0,9
39	Miscellaneous manufacturing industries (not elsewher	586	0,9	31	559	1,1	26	573	1,1	37	635	0,6	1	431	0,9
1	Agriculture and livestock	476	0,7	27	406	0,8	24	546	1,0	1	632	0,6	39	424	0,9
37	Manufacturing and repairing of electrical machineries a	448	0,7	37	388	0,8	1	529	1,0	26	613	0,6	31	313	0,7
31	Manufacturing of chemicals and chemical products	445	0,7	39	364	0,7	82	433	0,8	12	538	0,5	12	292	0,6
12	Mines except of coal	394	0,6	12	355	0,7	12	392	0,7	31	532	0,5	27	235	0,5
30	Rubber industries	316	0,5	30	334	0,7	31	377	0,7	30	493	0,5	2	231	0,5
27	Manufacture of paper and paper products	281	0,4	1	313	0,6	30	285	0,5	32	412	0,4	82	215	0,5
82	Public services	274	0,4	82	214	0,4	2	281	0,5	U	310	0,3	81	202	0,4
2	Forestry and logging	223	0,4	84	179	0,4	28	267	0,5	29	281	0,3	84	201	0,4
81	Government services	178	0,3	2	175	0,4	27	249	0,5	81	279	0,3	21	196	0,4

5.3 Comparison with comparative measures

1) The incidence rate of occupational injury (will be called "incidence rate" in this part)

The incidence rate of occupational injury was defined as the number of occupational injuries per 100.000 workers in one year. The incidence rate of occupational injury can also be interpreted as a measure of the possibility that a worker incurs an accident. Thus the higher this rate is the higher will become the risk of the worker to be exposed to an accident.

Table 5.11 demonstrates the incidence rates of occupational injuries in each industry in descending order. The incidence rates calculated with average values of the industries are also presented in the same way in the table.

According to the table, the coal mining industry has the worst incidence rate in Turkey. For the year 2005 the incidence rate is calculated as 14.882 and is greater than the incidence rate of basic metal industry ranking second with a rate equal to 6.550. The incidence rate of the manufacturing of metal products industry (except machinery and transport equipment), which ranked first in the number of occupational injuries, ranks third in this distribution. This is followed by products obtaining from stone, clay, sand etc., manufacture of wood and cork (except manufacture of furniture), and rubber industries

The incidence rate calculated for the construction industry is 997 and ranks 24th place. It is even lower than the value representing all industries. That is, construction industry performs better than the total of the industry according to this distribution. In addition construction industry has also better rates than transport and textile industries.

Table 5.11 Incidence rates of occupational injuries

		Ave.	2005		2004		2003		2002	
C.	**Industry**	**R_1**	**C.**	**R_1**	**C.**	**R_1**	**C.**	**R_1**	**C.**	**R_1**
11	Coal mining	14877	11	14882	11	14239	11	14840	11	15484
34	Basic metal industries	7025	34	6550	34	7832	34	6844	34	6852
35	Manufacturing of metal products inc	4945	35	4259	35	5362	35	5148	35	5168
33	Products obtaining from stone, clay	3648	30	3253	33	4068	33	3782	25	3994
25	Manufacture of wood and cork (exc	3331	33	3176	30	3607	25	3514	33	3633
30	Rubber industries	3112	36	2537	12	3607	36	3021	12	3194
12	Mines except of coal	2919	25	2524	25	3517	12	2830	36	3188
36	Manufacturing and repairing of mac	2909	38	2216	36	3010	38	2715	30	2872
38	Manufacturing of transport equipme	2462	12	2203	27	2641	30	2636	26	2663
27	Manufacture of paper and paper pro	2386	27	1956	26	2597	26	2546	27	2581
26	Furniture industry	2355	13	1851	38	2544	27	2401	38	2416
23	Textile industry	1884	26	1837	39	1904	23	2031	13	2345
13	Crude petroleum and natural gas	1793	14	1652	23	1819	39	1823	23	2153
39	Miscellaneous manufacturing indust	1766	23	1569	13	1787	14	1736	14	2020
14	Stone quarrying clay and sand	1762	39	1528	14	1716	37	1572	21	1990
31	Manufacturing of chemicals and che	1570	31	1519	31	1638	31	1550	39	1854
37	Manufacturing and repairing of elec	1555	37	1384	21	1622	21	1453	37	1732
21	Beverage industry	1543	**A**	**1068**	37	1587	**A**	**1365**	31	1573
A	**All Industries**	**1281**	21	1063	**A**	**1356**	22	1229	19	1518
19	Pits other non-metallic material proc	1179	19	917	19	1291	**40**	**1195**	**A**	**1385**
22	Tobacco industry	1176	22	898	22	1196	13	1186	22	1375
20	Food manufacturing industries (exc	1083	71	859	20	1177	20	1163	1	1301
71	Transport	1016	20	838	72	1112	1	1124	32	1202
1	Agriculture and livestock	1008	32	718	**40**	**1078**	72	1105	20	1184
40	**Construction**	**997**	72	712	71	1034	71	1093	71	1135
72	Storage and warehousing	994	1	708	32	1018	19	1036	72	1119
32	Manufacturing of petroleum and coa	982	**40**	**694**	1	955	32	986	**40**	**1119**
29	Manufacturing of leather and manuf	807	52	653	29	843	29	957	52	895
52	Water and sanitary instalments	774	29	534	52	778	52	769	29	893
28	Printing, publishing and allied indus	620	28	491	51	684	28	685	28	769
51	Heating with electric, gas and steam	596	51	455	28	583	4	642	51	654
4	Fishing	517	4	417	4	483	51	602	4	585
24	Manufacturing of foot wear other we	447	24	381	24	465	24	478	2	511
2	Forestry and logging	412	85	316	2	428	2	449	24	464
85	Personnel services	396	2	257	85	402	85	449	85	441
81	Government services	308	81	250	61	325	81	347	81	376
61	Wholesale and retail trade	297	61	250	81	308	61	329	61	295
83	Legal, commercial and technical se	204	83	156	83	220	83	226	83	226
73	Communication services	175	64	140	64	218	73	222	73	186
64	Real estate works (services)	157	84	106	73	215	84	187	82	150
84	Cinema, theatre and similar service	140	73	98	84	135	64	165	84	141
82	Public services	120	82	78	82	123	82	155	64	95
63	Insurance	48	63	55	62	48	63	52	62	65
62	Banks and other financial institution	45	62	29	63	43	62	42	63	42

2) The incidence rate of cases resulting in permanent incapacity to work (will be called "incidence rate" in this part)

Table 5.12 demonstrates the incidence rates of permanent incapacities to work in each industry in descending order. The incidence rates calculated with average values of the industries are also presented in the same way in the table.

It can be seen from the table that coal mining industry again has the worst incidence rate with a value of 172. It is followed by manufacture of wood and cork (except manufacture of furniture), crude petroleum and natural gas, mines except of coal and stone quarrying clay and sand.

Basic metal industry, which had the second highest incidence rate of occupational injury, ranks 9th place in this table.

According to this distribution construction industry ranks 11th place, has a value of 47 and is worse compared to the value representing all industries. In addition construction industry has also worse rates than transport and textile industries. This is the reverse case of the comparison with the incidence rate of occupational injury.

Table 5.12 Incidence rates of cases resulting in permanent incapacity to work

		Ave.	2005		2004		2003		2002	
C.	**Industry**	**R_2**	**C.**	**R_2**	**C.**	**R_2**	**C.**	**R_2**	**C.**	**R_2**
11	Coal mining	172	13	145	13	219	11	168	11	221
25	Manufacture of wood and cork (except man	115	11	124	11	171	12	129	25	193
13	Crude petroleum and natural gas	114	25	64	12	106	25	125	14	135
12	Mines except of coal	91	14	62	25	98	26	79	12	125
14	Stone quarrying clay and sand	76	30	61	14	65	35	66	29	124
35	Manufacturing of metal products industry (e	67	4	60	35	60	19	64	35	101
26	Furniture industry	65	27	55	26	56	34	57	26	87
29	Manufacturing of leather and manufacturing	63	35	50	34	56	14	57	34	81
34	Basic metal industries	59	26	49	**40**	**46**	29	53	27	70
30	Rubber industries	49	34	48	30	42	**40**	**52**	36	67
40	**Construction**	**47**	29	45	32	38	30	49	**40**	**62**
27	Manufacture of paper and paper products	46	32	38	33	37	39	47	39	55
33	Products obtaining from stone, clay, sand e	39	**40**	**34**	29	34	33	44	33	52
39	Miscellaneous manufacturing industries (no	38	33	29	39	30	36	40	21	45
36	Manufacturing and repairing of machine (ex	38	31	28	36	29	13	40	30	42
32	Manufacturing of petroleum and coal deriva	31	19	27	1	28	32	38	13	40
19	Pits other non-metallic material products	31	39	26	20	26	27	34	71	36
1	Agriculture and livestock	27	36	24	27	25	1	32	**A**	**35**
A	**All Industries**	**25**	22	21	31	24	71	30	20	33
71	Transport	25	**A**	**20**	**A**	**23**	**A**	**26**	1	32
31	Manufacturing of chemicals and chemical p	24	38	19	38	22	23	26	38	32
38	Manufacturing of transport equipments and	24	23	19	21	21	38	24	37	32
23	Textile industry	24	1	19	71	21	20	20	23	31
20	Food manufacturing industries (except beve	23	12	19	23	20	37	17	31	29
21	Beverage industry	22	71	18	2	17	52	16	72	28
37	Manufacturing and repairing of electrical ma	19	37	17	52	16	31	16	52	27
4	Fishing	19	20	17	51	14	72	16	73	27
52	Water and sanitary instalments	18	51	15	37	14	51	16	2	25
72	Storage and warehousing	16	52	13	72	11	81	15	19	20
51	Heating with electric, gas and steam	15	72	13	28	11	28	10	51	17
2	Forestry and logging	13	21	10	19	10	61	9	22	15
22	Tobacco industry	11	28	8	63	8	21	9	28	13
28	Printing, publishing and allied industries	11	81	6	61	6	85	6	32	12
81	Government services	8	61	5	83	5	83	5	61	12
61	Wholesale and retail trade	8	2	4	85	4	84	5	81	11
73	Communication services	6	84	4	81	4	22	5	63	9
85	Personnel services	5	85	4	82	3	2	4	85	8
83	Legal, commercial and technical services	5	83	3	24	3	24	3	83	7
63	Insurance	4	24	3	62	2	82	2	24	6
84	Cinema, theatre and similar services	4	82	2	4	0	62	2	84	6
24	Manufacturing of foot wear other wearing ap	4	62	0	22	0	4	0	62	4
82	Public services	2	63	0	64	0	63	0	82	2
62	Banks and other financial institutions	2	64	0	73	0	64	0	4	0
64	Real estate works (services)	0	73	0	84	0	73	0	64	0

3) The incidence rate of fatal occupational injury (will be called "incidence rate" in this part)

Table 5.13 describes the incidence rates of fatal occupational injuries in each industry in descending order. The incidence rates calculated with average values of the industries are also presented in the same way in the table. Figure 5.5 shows the values of some selected industries. It can be drawn from this table that coal mining industry again has the worst incidence rate with a value of 130. Stone quarrying clay and sand industry ranks 2nd place and is followed by the mines except of coal industry. Construction industry ranks 4th place with a rate 37 and has a worse rate in comparison to the rate representing all industries. Transport industry, basic metal industries, manufacturing of metal products industry (except machinery and transport equipment) ranks 5th, 9th and 15th places, respectively. If the position of the construction industry in the last three tables or the relative positions of the industries are observed, it can be seen that construction industry climbs up in the table when the measurement indicates a severer result for occupational injury.

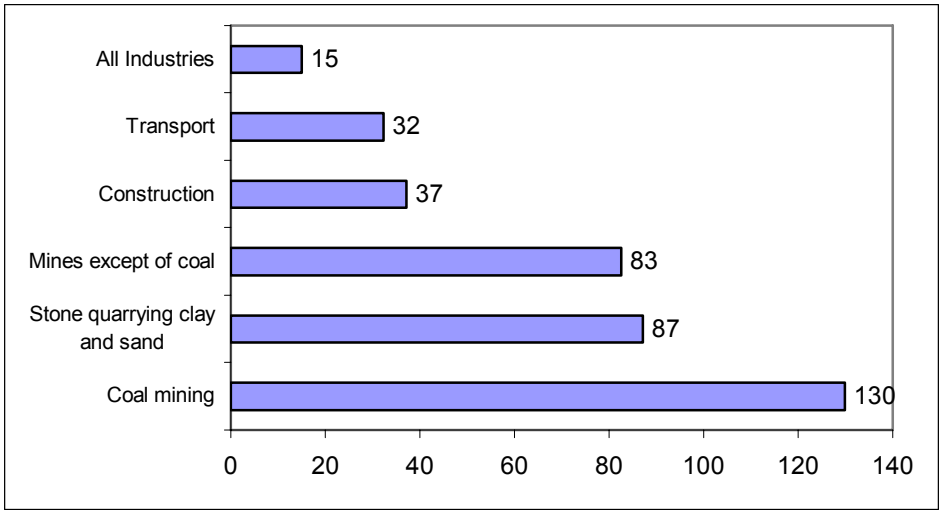

Figure 5.5 Incidence rates of fatal occupational injuries

Table 5.13 Incidence rates of fatal occupational injuries

		Ave.		2005		2004		2003		2002
C.	**Industry**	**R_3**	**C.**	**R_3**	**C.**	**R_3**	**C.**	**R_3**	**C.**	**R_3**
11	Coal mining	130	11	191	12	129	11	139	11	92
14	Stone quarrying clay and sand	87	14	99	11	99	14	92	14	82
12	Mines except of coal	83	4	60	14	73	12	82	12	80
40	**Construction**	**37**	12	48	**40**	**35**	**40**	**40**	4	49
71	Transport	32	29	40	71	27	71	26	**40**	**45**
4	Fishing	28	32	38	25	23	33	24	71	41
33	Products obtaining from stone, clay, sa	23	71	36	34	22	25	23	33	27
2	Forestry and logging	22	**40**	**31**	33	22	64	21	25	25
34	Basic metal industries	20	2	30	2	21	34	17	81	22
25	Manufacture of wood and cork (except	20	1	28	27	18	2	17	51	21
51	Heating with electric, gas and steam	19	27	27	51	18	51	15	2	21
1	Agriculture and livestock	17	34	22	35	17	**A**	**14**	1	20
A	**All Industries**	**15**	51	21	81	14	73	14	34	17
27	Manufacture of paper and paper produ	15	33	21	**A**	**14**	52	14	**A**	**17**
29	Manufacturing of leather and manufact	14	19	18	39	11	81	12	20	16
35	Manufacturing of metal products indus	13	26	16	31	11	1	12	52	15
32	Manufacturing of petroleum and coal d	13	**A**	**15**	21	11	35	12	73	13
81	Government services	12	72	15	72	9	20	12	31	13
52	Water and sanitary instalments	12	64	13	52	8	84	11	26	13
26	Furniture industry	12	20	11	20	7	26	11	32	12
20	Food manufacturing industries (except	12	36	11	36	7	36	10	72	10
72	Storage and warehousing	11	52	11	26	7	72	9	35	10
31	Manufacturing of chemicals and chemi	10	31	11	1	7	61	9	39	10
36	Manufacturing and repairing of machin	9	35	10	37	7	38	8	19	10
64	Real estate works (services)	9	25	10	61	7	27	8	30	9
61	Wholesale and retail trade	7	21	10	83	6	37	7	21	9
21	Beverage industry	7	38	8	38	5	23	6	61	8
39	Miscellaneous manufacturing industrie	7	23	8	29	5	29	5	85	7
19	Pits other non-metallic material produc	7	61	7	23	4	31	4	38	6
38	Manufacturing of transport equipments	7	37	6	62	3	85	4	36	6
73	Communication services	6	81	6	82	3	30	4	84	6
37	Manufacturing and repairing of electric	6	22	5	24	3	39	3	23	5
23	Textile industry	6	85	5	85	3	83	3	29	5
84	Cinema, theatre and similar services	5	62	5	84	2	24	3	37	4
83	Legal, commercial and technical servic	4	39	5	28	2	82	2	83	4
85	Personnel services	4	83	5	4	0	62	2	27	4
30	Rubber industries	3	63	3	13	0	4	0	28	2
62	Banks and other financial institutions	3	82	3	19	0	13	0	24	2
82	Public services	3	84	2	22	0	19	0	82	2
24	Manufacturing of foot wear other weari	2	28	2	30	0	21	0	62	2
28	Printing, publishing and allied industrie	1	24	1	32	0	22	0	13	0
22	Tobacco industry	1	13	0	63	0	28	0	22	0
63	Insurance	1	30	0	64	0	32	0	63	0
13	Crude petroleum and natural gas	0	73	0	73	0	63	0	64	0

4) The severity rate of occupational injuries (as a result of occupational injuries)

a) S_1 is used:

In this measure the "total days of temporary incapacity for work (as a result of occupational injuries)" is taken into account.

Table 5.14 describes the severity rate of occupational injuries in each industry in descending order. The severity rates calculated with average values of the industries are also presented in the same way in the table.

Coal mining, basic metal industries, manufacturing of metal products industry (except machinery and transport equipment) rank the first 3 positions and have the severity rates of 1.498, 665 and 513.

Construction industry has a severity rate of 184 and ranks 19^{th} place. Compared to the rate representing all industries, 160; it is a little worse. This comparison with severity rates yielded similar results to the comparison with the incidence rates of occupational injuries. The first three of both tables are occupied by the same industries with the same ranking. Moreover construction industry in both tables rank similar places.

b) S_2 is used

In this measure the "total days of temporary incapacity for work (as a result of occupational injuries)", the "days lost as a result of permanent incapacity to work (as a result of occupational injuries)" and the "days lost as a result of fatal occupational injuries" are taken into account.

Table 5.15 describes the severity rate of occupational injuries (S_2) in each industry in descending order. The severity rates calculated with average values of the industries are also presented in the same way in the table.

Figure 5.6 shows the severity rates for selected industries

Coal mining, mines except of coal and stone quarrying clay and stone quarrying clay and sand industries rank the first three places with rates of 8.366, 4.550 and 4.459, respectively.

Construction industry ranks 5th place and has a severity rate of 2.128 followed by basic metal industries and manufacturing of metal products industry (except machinery and transport equipment) industries with rates of 2.097 and 1.765, respectively.

While construction industry ranked 19th place in the previous comparison it ranks 5th place in this comparison. The difference between these two measures is the permanent incapacities and fatalities that are taken into account in the latter comparison. Therefore it can be argued that construction industry ranks the worse positions if the comparative measure indicates a severer result for occupational injury as it was also deduced by the comparisons with incidence rates.

c) S_3 is used

In this measure the "The days of incapacity causing to in bed treatment in the hospital (as a result of occupational injuries)" is taken into account. The result found with this measure will be compared with S_1 which is also a measure of temporary incapacity.

Table 5.16 describes the severity rate of occupational injuries (S_3) in each industry in descending order. The severity rates calculated with average values of the industries are also presented in the same way in the table.

The first four places in this distribution is occupied by basic metal industries, coal mining, mines except of coal and stone quarrying clay and sand industries which have rates 86,1; 35,6; 21,7; 20,4; respectively.

Construction industry ranks 9th place with a rate of 8,9 in this table. Compared to the comparison with S_1, it is a worse place. This result reinforces the argument in the previous comparison.

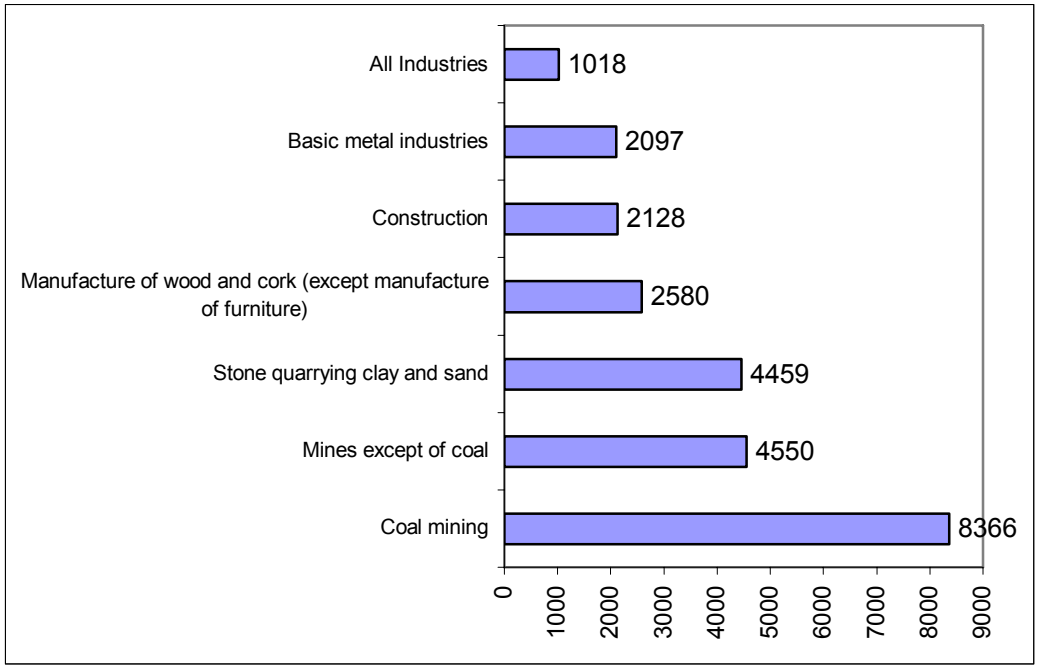

Figure 5.6 Severity rates of occupational injuries – S_2

Table 5.14 Severity rates of occupational injuries – S_1

		Ave.	2005		2004		2003		2002	
C.	**Industry**	**S_1**	**C.**	**S_1**	**C.**	**S_1**	**C.**	**S_1**	**C.**	**S_1**
11	Coal mining	1498	11	1503	11	1395	11	1525	11	1564
34	Basic metal industries	665	34	632	34	705	34	689	34	633
35	Manufacturing of metal products industry (e	513	35	421	35	526	35	610	12	607
25	Manufacture of wood and cork (except mar	504	25	391	25	521	25	542	25	593
12	Mines except of coal	398	30	342	12	390	12	425	35	519
33	Products obtaining from stone, clay, sand e	364	33	319	33	378	33	394	27	381
30	Rubber industries	329	27	292	30	356	27	342	33	378
27	Manufacture of paper and paper products	324	14	285	26	331	26	339	14	348
14	Stone quarrying clay and sand	303	13	267	36	300	36	326	13	348
26	Furniture industry	303	36	258	27	289	23	324	36	343
36	Manufacturing and repairing of machine (ex	302	26	233	14	281	14	314	26	341
13	Crude petroleum and natural gas	282	38	214	39	264	13	304	30	307
38	Manufacturing of transport equipments and	245	12	209	38	247	30	304	19	271
39	Miscellaneous manufacturing industries (no	231	39	172	13	215	38	289	39	250
23	Textile industry	216	31	160	21	203	4	283	21	243
19	Pits other non-metallic material products	188	23	150	32	194	39	248	38	237
21	Beverage industry	188	71	137	31	192	**40**	**235**	32	214
32	Manufacturing of petroleum and coal deriva	187	37	132	23	188	32	225	**40**	**214**
40	**Construction**	**184**	19	130	**40**	**186**	29	218	23	204
31	Manufacturing of chemicals and chemical p	170	**A**	126	19	186	71	198	71	188
71	Transport	167	21	124	**A**	160	**A**	187	22	176
4	Fishing	167	**40**	**123**	71	159	21	177	37	176
A	**All Industries**	160	4	114	37	154	19	176	**A**	174
37	Manufacturing and repairing of electrical m	151	32	113	72	146	1	172	29	169
29	Manufacturing of leather and manufacturing	151	1	107	20	141	72	166	4	167
1	Agriculture and livestock	143	20	103	1	135	31	165	1	165
72	Storage and warehousing	140	72	102	4	133	22	157	20	163
20	Food manufacturing industries (except bev	138	52	86	29	130	20	150	31	162
22	Tobacco industry	126	29	84	52	128	37	149	72	155
52	Water and sanitary instalments	122	22	75	28	100	52	143	52	129
28	Printing, publishing and allied industries	93	28	72	22	87	51	109	28	109
51	Heating with electric, gas and steam	90	51	69	51	86	28	98	2	103
2	Forestry and logging	83	73	59	2	86	2	92	51	99
85	Personnel services	52	2	53	61	54	85	62	81	76
61	Wholesale and retail trade	52	61	43	85	50	61	61	85	64
81	Government services	51	24	40	24	47	81	57	61	53
73	Communication services	47	81	39	81	45	73	55	24	48
24	Manufacturing of foot wear other wearing a	46	85	38	73	39	24	49	83	43
83	Legal, commercial and technical services	36	84	27	83	37	84	43	84	43
84	Cinema, theatre and similar services	35	64	26	84	32	83	43	73	35
64	Real estate works (services)	23	83	23	64	24	82	25	82	24
82	Public services	20	82	13	82	21	64	16	64	23
63	Insurance	9	63	6	62	5	62	8	63	18
62	Banks and other financial institutions	8	62	4	63	4	63	7	62	17

Table 5.15 Severity rates of occupational injuries – S_2

		Ave.	2005		2004		2003		2002	
C.	**Industry**	**S_2**	**C.**	**S_2**	**C.**	**S_2**	**C.**	**S_2**	**C.**	**S_2**
11	Coal mining	8366	11	10051	11	7016	11	8748	11	7670
12	Mines except of coal	4550	14	4697	12	6419	12	5025	12	5100
14	Stone quarrying clay and sand	4459	4	3019	14	3732	14	4423	14	5051
25	Manufacture of wood and cork (except m	2580	12	2212	13	2663	25	2889	25	3863
40	**Construction**	**2128**	29	2106	25	2471	**40**	**2347**	**40**	**2633**
34	Basic metal industries	2097	34	2010	34	2160	34	1999	34	2237
35	Manufacturing of metal products industry	1765	32	1956	**40**	**2010**	35	1859	71	2140
33	Products obtaining from stone, clay, sanc	1683	27	1945	35	1841	33	1798	35	2129
71	Transport	1672	13	1907	33	1603	26	1673	33	2003
13	Crude petroleum and natural gas	1606	**40**	**1677**	71	1430	71	1516	4	1997
26	Furniture industry	1493	71	1672	27	1243	36	1172	26	1877
4	Fishing	1442	25	1504	26	1224	30	1038	29	1865
27	Manufacture of paper and paper products	1405	33	1428	2	1080	**A**	1035	36	1381
29	Manufacturing of leather and manufacturi	1398	26	1378	39	1010	27	1026	27	1370
1	Agriculture and livestock	1097	35	1376	**A**	927	29	1024	1	1304
36	Manufacturing and repairing of machine (	1076	1	1356	51	904	1	1010	39	1289
2	Forestry and logging	1068	2	1226	36	901	19	933	**A**	1221
32	Manufacturing of petroleum and coal deri	1022	19	1099	31	868	39	929	2	1202
A	**All Industries**	1018	30	1035	21	846	38	870	30	1163
30	Rubber industries	1013	51	1017	30	829	52	859	20	1146
51	Heating with electric, gas and steam	969	36	964	1	706	23	845	21	1116
39	Miscellaneous manufacturing industries (	941	**A**	931	20	701	51	842	51	1110
20	Food manufacturing industries (except be	844	31	871	29	698	20	837	81	1016
31	Manufacturing of chemicals and chemica	819	72	810	38	684	64	790	31	1015
19	Pits other non-metallic material products	808	38	741	32	616	13	775	52	1012
38	Manufacturing of transport equipments a	780	20	720	81	614	2	771	19	895
52	Water and sanitary instalments	773	23	658	72	596	72	709	72	879
72	Storage and warehousing	745	39	641	52	594	81	694	38	861
21	Beverage industry	712	52	633	37	559	32	676	73	855
23	Textile industry	706	21	618	23	551	37	594	32	828
37	Manufacturing and repairing of electrical	599	37	556	61	361	73	575	13	828
81	Government services	599	22	514	83	314	31	514	23	786
61	Wholesale and retail trade	422	64	502	19	293	84	514	37	720
73	Communication services	361	61	357	28	292	61	496	61	509
64	Real estate works (services)	351	81	316	85	191	21	285	85	416
22	Tobacco industry	306	85	260	24	189	85	283	22	358
85	Personnel services	280	28	228	82	165	4	283	28	356
28	Printing, publishing and allied industries	270	83	226	62	148	83	224	84	328
84	Cinema, theatre and similar services	266	62	177	4	133	22	221	83	286
83	Legal, commercial and technical services	261	84	154	84	122	28	219	24	202
24	Manufacturing of foot wear other wearing	173	82	141	63	91	24	200	63	130
82	Public services	143	63	134	22	87	82	135	62	129
62	Banks and other financial institutions	138	24	106	73	39	62	94	82	123
63	Insurance	93	73	59	64	24	63	7	64	23

Table 5.16 Severity rates of occupational injuries – S_3

		Ave.	2005		2004		2003		2002	
C.	**Industry**	**S_3**	**C.**	**S_3**	**C.**	**S_3**	**C.**	**S_3**	**C.**	**S_3**
34	Basic metal industries	86,1	11	29,3	11	35,4	34	330,1	11	40,7
11	Coal mining	35,6	13	23,9	12	23,0	11	36,9	14	24,8
12	Mines except of coal	21,7	14	19,2	14	20,5	12	31,5	13	20,5
14	Stone quarrying clay and sand	20,4	12	16,9	25	11,7	32	26,1	12	16,6
13	Crude petroleum and natural gas	16,6	25	13,7	34	11,0	25	19,3	25	11,7
25	Manufacture of wood and cork (except ma	14,0	34	8,8	21	10,1	14	17,8	33	10,9
33	Products obtaining from stone, clay, sand	9,8	33	8,3	33	9,7	13	15,4	21	8,7
32	Manufacturing of petroleum and coal deri	9,8	35	7,2	**40**	**9,6**	**40**	**12,1**	34	8,7
40	**Construction**	**8,9**	27	7,0	35	8,5	4	11,6	**40**	**8,7**
35	Manufacturing of metal products industry	8,0	**40**	**6,3**	19	7,3	33	10,7	35	7,1
21	Beverage industry	7,5	30	6,0	13	6,7	38	10,7	19	6,5
30	Rubber industries	6,3	71	5,6	1	6,1	30	10,0	20	6,2
71	Transport	6,3	32	4,3	32	6,1	**A**	9,4	71	5,8
19	Pits other non-metallic material products	5,7	52	4,3	2	6,0	35	9,4	26	5,5
1	Agriculture and livestock	5,6	26	4,3	30	5,5	71	8,8	1	5,4
A	**All Industries**	5,3	19	3,8	52	5,5	1	7,7	2	4,9
27	Manufacture of paper and paper products	5,1	36	3,8	71	5,4	21	7,3	27	4,6
20	Food manufacturing industries (except be	4,9	2	3,7	27	4,5	29	6,7	**A**	4,4
52	Water and sanitary instalments	4,8	31	3,7	36	4,4	36	6,1	36	4,2
38	Manufacturing of transport equipments ar	4,8	21	3,6	20	4,4	20	5,6	52	4,2
2	Forestry and logging	4,7	**A**	3,5	**A**	4,4	52	5,4	51	3,9
26	Furniture industry	4,7	20	3,5	51	4,3	26	5,4	30	3,6
36	Manufacturing and repairing of machine (	4,6	1	3,3	23	4,1	19	5,4	23	3,4
51	Heating with electric, gas and steam	3,9	23	3,3	26	4,0	39	4,4	32	2,9
23	Textile industry	3,8	38	3,3	39	3,7	51	4,4	84	2,9
29	Manufacturing of leather and manufacturi	3,4	51	3,1	37	3,5	27	4,4	38	2,8
4	Fishing	3,3	29	2,3	72	3,3	23	4,4	81	2,7
31	Manufacturing of chemicals and chemical	3,1	37	2,0	38	3,0	2	4,3	39	2,7
39	Miscellaneous manufacturing industries (	3,1	72	2,0	31	2,5	37	4,1	29	2,7
37	Manufacturing and repairing of electrical r	2,7	4	1,9	28	2,4	31	3,8	31	2,3
72	Storage and warehousing	2,5	84	1,9	85	1,9	81	3,4	73	2,1
22	Tobacco industry	2,0	39	1,7	61	1,8	22	3,4	22	1,9
61	Wholesale and retail trade	1,8	61	1,6	29	1,8	72	3,2	83	1,9
81	Government services	1,8	22	1,5	73	1,6	28	2,6	85	1,7
84	Cinema, theatre and similar services	1,7	24	1,2	81	1,2	61	2,3	61	1,5
28	Printing, publishing and allied industries	1,6	85	1,2	83	1,1	83	2,1	72	1,3
85	Personnel services	1,6	83	0,9	22	1,1	73	2,0	62	1,1
83	Legal, commercial and technical services	1,4	81	0,8	84	0,8	85	1,6	37	1,1
73	Communication services	1,4	28	0,7	82	0,8	84	1,5	63	0,6
24	Manufacturing of foot wear other wearing	0,9	82	0,3	24	0,7	24	0,9	24	0,6
82	Public services	0,5	64	0,3	4	0,5	82	0,5	28	0,5
62	Banks and other financial institutions	0,3	73	0,2	63	0,0	62	0,2	82	0,5
63	Insurance	0,2	63	0,1	62	0,0	64	0,0	4	0,0
64	Real estate works (services)	0,1	62	0,0	64	0,0	63	0,0	64	0,0

5) The Average Days charged per Injury (ADI)

Since ADI is the ratio of lost time and number of occupational injuries, ADI varies much with the number of occupational injuries. Thus the industries with small numbers of occupational injuries should be kept in mind, since their possibility of reflecting the real condition is smaller than the other industries with large number of injuries, as it is the case in fishing with 14 and real estate works (services) with 9 injuries. Industries with low number of injuries are given below in ascending order. (Table 5.17)

a) Comparison with ADI_1

In this measure the "total days of temporary incapacity for work (as a result of occupational injuries)" is considered.

Table 5.18 describes the Average Days charged per Injury (ADI_1) in each industry in descending order. The ADI calculated with the average values of the industries are also presented in the same way in the table.

It can be seen from the table that construction industry ranks 7^{th} place in this distribution. Manufacturing of metal products industry (except machinery and transport equipment), coal mining, products obtaining from stone, clay, sand etc. and basic metal industries, which generally ranked the first places, rank 37^{th}, 39^{th}, 40^{th} and 43^{rd} places, respectively.

But if the industries with less than 100 occupational injuries are neglected, the first place will be occupied by manufacturing of leather and manufacturing of goods from leather (except shoes) industry with a rate of 37,4 and construction industry will follow this industry with a rate 36,9.

b) Comparison with ADI_2

In this measure the "total days of temporary incapacity for work (as a result of occupational injuries)", the "days lost as a result of permanent incapacity to work (as a result of occupational injuries)" and the "days lost as a result of fatal occupational injuries" are taken into account.

Table 5.19 describes the Average Days charged per Injury (ADI_2) in each industry in descending order. The ADI calculated with average values of the industries are also presented in the same way in the table.

Again as in ADI_1, if the industries with occupational injuries less than 100 are neglected, the first two places will be occupied by "stone quarrying clay and sand" and construction industries. Similar to the comparison with ADI_1 it can be seen that industries which ranked generally first places, occupy lower places at this ranking. Comparisons made with ADI are also only the comparisons where construction industry ranks before the mines except of coal and coal mining industries.

Table 5.17 Industries with low number of occupational injuries

C.	Industry	#	%
64	Real estate works (services)	9	0,0
63	Insurance	12	0,0
4	Fishing	14	0,0
73	Communication services	14	0,0
U	Unknown	20	0,0
62	Banks and other financial institutions	27	0,0
13	Crude petroleum and natural gas	47	0,1
84	Cinema, theatre and similar services	56	0,1
32	Manufacturing of petroleum and coal derivates	78	0,1
2	Forestry and logging	97	0,1
19	Pits other non-metallic material products	126	0,2
81	Government services	153	0,2
21	Beverage industry	160	0,2
29	Manufacturing of leather and manufacturing of goods from leather (except shoes)	161	0,2
22	Tobacco industry	214	0,3
12	Mines except of coal	265	0,3
82	Public services	307	0,4
28	Printing, publishing and allied industries	323	0,4
72	Storage and warehousing	336	0,4
1	Agriculture and livestock	432	0,6
14	Stone quarrying clay and sand	450	0,6
51	Heating with electric, gas and steam	544	0,7
27	Manufacture of paper and paper products	652	0,9
30	Rubber industries	776	1,0
83	Legal, commercial and technical services	844	1,1

Table 5.18 Average Days charged per Injury (ADI_1)

		Ave.	2005		2004		2003		2002	
C.	**Industry**	**ADI_1**	**C.**	**ADI_1**	**C.**	**ADI_1**	**C.**	**ADI_1**	**C.**	**ADI_1**
4	Fishing	64	73	120	4	55	4	88	63	85
73	Communication services	54	4	55	84	47	13	51	84	61
84	Cinema, theatre and similar services	51	84	51	2	40	73	49	4	57
2	Forestry and logging	41	2	41	32	38	84	46	62	53
32	Manufacturing of petroleum and coal deriva	38	64	37	73	36	29	46	64	48
29	Manufacturing of leather and manufacturing	37	**40**	**35**	82	35	32	46	2	40
40	**Construction**	**37**	82	35	**40**	**35**	2	41	81	40
62	Banks and other financial institutions	36	14	35	28	34	**40**	**39**	**40**	**38**
63	Insurance	36	61	34	83	34	83	38	83	38
61	Wholesale and retail trade	35	71	32	61	33	62	37	12	38
83	Legal, commercial and technical services	35	32	32	52	33	61	37	29	38
14	Stone quarrying clay and sand	34	29	31	14	33	52	37	73	37
82	Public services	33	25	31	29	31	51	36	61	36
81	Government services	33	81	31	71	31	14	36	19	36
71	Transport	33	51	30	25	30	71	36	32	36
19	Pits other non-metallic material products	32	1	30	81	29	19	34	14	34
52	Water and sanitary instalments	31	27	30	19	29	81	33	71	33
13	Crude petroleum and natural gas	31	83	29	1	28	82	32	82	32
51	Heating with electric, gas and steam	30	28	29	39	28	23	32	51	30
25	Manufacture of wood and cork (except manu	30	13	29	72	26	25	31	25	30
28	Printing, publishing and allied industries	30	72	29	26	25	1	31	13	30
64	Real estate works (services)	29	19	28	51	25	72	30	27	30
1	Agriculture and livestock	28	52	26	85	25	12	30	85	29
72	Storage and warehousing	28	26	25	21	25	28	28	52	29
12	Mines except of coal	27	20	25	13	24	27	28	28	28
27	Manufacture of paper and paper products	27	62	24	20	24	63	28	72	28
85	Personnel services	26	85	24	**A**	24	85	28	20	28
39	Miscellaneous manufacturing industries (no	26	63	24	31	23	**A**	27	39	27
26	Furniture industry	26	**A**	24	64	22	39	27	22	26
20	Food manufacturing industries (except beve	26	21	23	27	22	26	27	26	26
A	**All Industries**	25	39	22	12	22	20	26	1	25
21	Beverage industry	24	31	21	23	21	22	26	**A**	25
23	Textile industry	23	30	21	24	20	21	24	21	24
31	Manufacturing of chemicals and chemical p	22	24	21	36	20	35	24	36	21
22	Tobacco industry	21	36	20	63	20	30	23	30	21
30	Rubber industries	21	11	20	62	20	36	22	24	21
36	Manufacturing and repairing of machine (ex	21	33	20	30	20	38	21	33	21
35	Manufacturing of metal products industry (e	21	35	20	35	20	31	21	31	21
24	Manufacturing of foot wear other wearing ap	21	38	19	11	20	33	21	37	20
11	Coal mining	20	34	19	37	19	11	21	11	20
33	Products obtaining from stone, clay, sand e	20	37	19	38	19	24	20	35	20
38	Manufacturing of transport equipments and	20	23	19	33	19	34	20	38	20
37	Manufacturing and repairing of electrical ma	19	12	19	34	18	64	19	23	19
34	Basic metal industries	19	22	17	22	15	37	19	34	18

Table 5.19 Average Days charged per Injury (ADI_2)

		Ave.	2005		2004		2003		2002	
C.	**Industry**	**ADI_2**	**C.**	**ADI_2**	**C.**	**ADI_2**	**C.**	**ADI_2**	**C.**	**ADI_2**
62	Banks and other financial institutions	608	4	1449	62	614	64	957	73	918
4	Fishing	558	62	1208	2	505	84	550	4	682
2	Forestry and logging	518	2	954	14	435	73	518	63	622
14	Stone quarrying clay and sand	506	29	789	63	427	14	510	81	541
64	Real estate works (services)	446	64	719	81	399	62	449	14	500
40	**Construction**	**427**	14	569	**40**	**373**	81	400	**40**	**471**
73	Communication services	411	32	545	12	356	**40**	**393**	2	470
81	Government services	389	63	492	13	298	12	355	84	466
63	Insurance	386	**40**	**483**	83	285	2	343	29	418
84	Cinema, theatre and similar services	381	51	447	71	277	61	302	62	396
29	Manufacturing of leather and manufacturing	346	71	389	82	269	51	280	71	377
71	Transport	329	1	383	51	264	71	277	61	345
51	Heating with electric, gas and steam	325	82	363	61	222	52	223	51	340
12	Mines except of coal	312	84	292	84	181	29	214	12	319
61	Wholesale and retail trade	284	83	289	29	166	83	199	83	253
83	Legal, commercial and technical services	256	61	286	52	153	19	180	52	226
82	Public services	237	81	253	1	148	1	180	1	200
1	Agriculture and livestock	218	19	240	25	141	82	175	20	194
32	Manufacturing of petroleum and coal deriva	208	72	228	**A**	137	25	164	25	193
52	Water and sanitary instalments	200	13	206	32	121	**A**	152	85	189
13	Crude petroleum and natural gas	179	12	201	20	119	20	144	**A**	176
A	**All Industries**	159	27	199	72	107	32	137	82	164
20	Food manufacturing industries (except beve	156	52	194	39	106	26	131	72	157
25	Manufacture of wood and cork (except man	155	**A**	174	31	106	13	131	26	141
72	Storage and warehousing	150	20	172	21	104	72	128	39	139
85	Personnel services	142	85	164	28	100	85	126	32	138
19	Pits other non-metallic material products	137	26	150	11	99	11	118	31	129
26	Furniture industry	127	11	135	85	95	39	102	19	118
27	Manufacture of paper and paper products	118	73	120	26	94	33	95	21	112
11	Coal mining	112	25	119	27	94	4	88	33	110
39	Miscellaneous manufacturing industries (no	107	21	116	24	81	27	85	27	106
31	Manufacturing of chemicals and chemical p	104	31	115	33	79	24	83	11	99
21	Beverage industry	92	22	115	37	70	23	83	28	93
33	Products obtaining from stone, clay, sand e	92	28	93	35	69	30	79	24	87
28	Printing, publishing and allied industries	87	33	90	23	61	36	78	36	87
24	Manufacturing of foot wear other wearing a	77	39	84	36	60	37	76	37	83
37	Manufacturing and repairing of electrical ma	77	23	84	34	55	35	72	35	82
23	Textile industry	75	37	80	4	55	31	66	30	81
36	Manufacturing and repairing of machine (ex	74	36	76	38	54	38	64	23	73
35	Manufacturing of metal products industry (e	71	38	67	30	46	28	64	38	71
30	Rubber industries	65	35	65	19	45	34	58	13	71
38	Manufacturing of transport equipments and	63	30	64	73	36	21	39	34	65
34	Basic metal industries	60	34	61	64	22	22	36	22	52
22	Tobacco industry	52	24	56	22	15	63	28	64	48

6) The occupational injuries per 100.000 workplaces

Table 5.20 describes the distribution of "occupational injuries per 100.000 workplaces" in each industry in descending order. The ratios calculated with average values of the industries are also presented in the same way in the table.

Coal mining, basic metal, and tobacco industries rank the first, second and third positions, respectively. This distribution yielded similar results as the one made with the number of occupational injuries when the first two industries and construction industry is considered. Construction industry ranks 27th place.

Table 5.20 Occupational injuries per 100.000 workplaces

		Ave.	2005		2004		2003		2002	
C.	**Industry**	**R_W**	**C.**	**R_W**	**C.**	**R_W**	**C.**	**R_W**	**C.**	**R_W**
11	Coal mining	1364347	11	1301082	11	1245682	11	1357452	11	1564608
34	Basic metal indu	254422	34	239575	34	290216	34	244536	34	242102
22	Tobacco industr	136741	22	119858	22	121711	22	143396	22	157471
13	Crude petroleum	101070	13	100000	13	108889	12	67036	13	137209
12	Mines except of	66313	30	53028	12	74515	13	62500	12	83881
33	Products obtaini	57323	33	52176	33	65138	23	60762	23	65786
23	Textile industry	55517	12	46951	30	57440	33	58024	21	65015
35	Manufacturing o	49987	35	44926	35	54953	35	51041	27	56452
30	Rubber industrie	49083	23	44652	23	53057	27	48891	33	54026
27	Manufacture of p	48172	27	37832	27	51577	21	45326	35	49477
21	Beverage indust	43322	31	32095	21	39842	30	41236	32	46411
31	Manufacturing o	34583	38	26696	32	36323	32	36967	30	43411
32	Manufacturing o	34509	21	26250	31	36290	31	34341	19	37594
38	Manufacturing o	29345	36	24110	38	31906	38	31184	31	35911
19	Pits other non-m	28735	32	21591	19	30337	19	27078	38	27727
36	Manufacturing a	26669	19	21369	36	29119	36	26954	36	26757
14	Stone quarrying	19726	14	20546	14	19279	14	18546	52	21264
52	Water and sanit	18460	37	16190	37	19107	52	18300	14	20429
37	Manufacturing a	18081	52	15553	52	18685	37	17931	37	19526
25	Manufacture of v	15191	39	12546	25	16137	25	15835	25	17722
39	Miscellaneous m	14163	25	11796	39	15690	39	14503	2	15921
26	Furniture industr	12840	26	10823	26	14617	2	13476	39	14058
72	Storage and war	12068	72	9352	72	13405	26	13129	26	13098
2	Forestry and log	12005	20	7988	2	12376	72	12925	72	12874
20	Food manufactu	10433	**A**	**7823**	20	11209	20	11234	20	11632
A	**All Industries**	**9295**	2	6897	**A**	**9852**	29	10438	**A**	**9945**
29	Manufacturing o	8582	29	5576	29	8871	**A**	**9865**	1	9599
40	**Construction**	**7473**	71	5461	**40**	**8072**	**40**	**9078**	29	9497
1	Agriculture and h	7196	24	5269	1	6684	1	7984	**40**	**8265**
24	Manufacturing o	6486	**40**	**5208**	24	6646	24	7219	71	7138
71	Transport	6364	1	5023	71	6408	71	6772	24	6966
28	Printing, publish	4603	28	3711	28	4328	28	5090	28	5566
4	Fishing	3490	4	2954	4	3423	4	4335	4	3458
85	Personnel servic	2728	85	2244	85	2801	85	3020	85	2959
81	Government ser	2146	81	2004	81	2150	81	2198	81	2293
73	Communication	1721	51	1017	73	1918	73	2195	73	2229
51	Heating with ele	1304	61	965	51	1483	83	1302	51	1426
83	Legal, commerc	1204	83	961	83	1299	51	1299	83	1296
61	Wholesale and r	1116	73	896	61	1226	84	1279	61	1078
84	Cinema, theatre	958	84	723	84	921	61	1212	82	986
82	Public services	812	82	570	82	807	82	984	84	980
64	Real estate work	491	64	432	64	687	64	515	62	488
62	Banks and other	369	62	263	62	403	62	322	64	298
63	Insurance	224	63	250	63	199	63	244	63	197

5.4 Summary of comparisons

Consequently it is seen that the construction industry ranks the first places in the comparisons undertaken with absolute numbers. The number of cases of permanent incapacity to work, the number of fatal occupational injuries, the number of total days of temporary incapacity to work and the number of workers were highest in the construction industry.

Construction industry had the second highest values in the comparison of numbers of work places and occupational injuries.

But these results should be interpreted carefully since it was stated in Chapter 3 that comparisons based on absolute numbers are misleading.

It is found that construction industry has a very low incidence rate of occupational injury. Construction industry ranked 24^{th} place among 43 industries. That means that the risk of exposure of the construction workers to accidents is lower than the risk of workers employed in several other industries. But this positive picture changes when a measure indicating a severer result is chosen for comparison, such as the incidence rate of fatal occupational injuries or the severity rate which takes the permanent incapacities and fatalities also into account. This can be best observed by looking at the increasing ranks of construction industry in comparisons made with the incidence rates R_1, R_2 and R_3. The ranks in these comparisons were found as 24, 11 and 4, respectively. The same observation can also be made when one considers the rankings of the severity rates S_1 and S_2. Thus it is clear that the construction industry is more important when the severity of the occupational injuries is considered.

As seen in the rankings given above, even in the measures indicating the most severe results, construction industry is found to perform better than some other

industries. Coal mining and mines except of coal and stone quarrying clay and sand industries have always worse safety performance than construction industry as the incidence rates **and** severity rates illustrated. Coal mining and mines except of coal industries had only better positions when the comparisons were made with ADIs. Stone quarrying clay and sand industry had only once a better position when the comparison was made with ADI_1.

It should be borne in mind that the correctness of these results is affected by,

- the correctness of the data itself; that is, failure in the recording, analysing and publishing can happen.
- the unregistered employment. It can vary among industries.
- the compliance of the employer to their obligation to notify occupational accidents and diseases. The compliance of employers to their obligations can also differ among industries.
- the coverage of statistics. Self employed people are not within the coverage of the statistics used in this study. The number of self employed people in the construction industry is more than some other industries.

CHAPTER 6

COMPARISON OF THE PROVINCES OF TURKEY ACCORDING TO THEIR SAFETY PERFORMANCES IN CONSTRUCTION

This chapter investigates the relative position of provinces of Turkey in terms of occupational safety in construction industry.

6.1 Measurements and method

The comparison of the provinces is conducted with the same method that was also used in the comparison of industries.

The distribution of the following measures according to the provinces for the years 2003-2005 are derived from the sources of SII.

8. The number of workers
   denoted with "**w**"
9. The number of occupational injuries
   denoted with "**i**"
10. The number of cases resulting in permanent incapacity to work (as a result of occupational injuries)
    denoted with "**p**"
11. The number of fatal cases (as a result of occupational injuries)
    denoted with "**f**"

12. The total days of temporary incapacity for work (as a result of occupational injuries)
    denoted with "**t**"

- A table for each of the years and another table for the average values of these years are drawn. Table 6.2 demonstrates the average values of these years.
- With the information in Table 6.2, percentages for all measurements are calculated.
- Comparative measures such as incidence rates, severity rates etc. are also calculated.
- Based on the results of these calculations comparison of provinces are realized. In order to better visualize the relative values of provinces the measures and measurements are organized in descending order in the tables used during comparison.
- In addition, in the tables that are used in comparison; provinces with less than 1.000 workers are written in bold while provinces with less than 10 accidents per year are written in italic fonts. The small numbers of these measures can engender to instability in the values.

Comparative measures that will be used are given below. Since the formulas are given in previous chapters, only the changes in the formulas are indicated.

1- The incidence rate of occupational injuries (R_1)

2- The incidence rate of cases resulting in permanent incapacity to work (as a result of occupational injuries) (R_2)

3- The incidence rate of fatal occupational injuries (as a result of occupational injuries) (R_3)

4- The severity rate of occupational injuries (as a result of occupational injuries)

a) “total days of temporary incapacity for work (as a result of occupational injuries)” is taken into account: (S_1)

b) When the “total days of temporary incapacity for work (as a result of occupational injuries)”, the “days lost as a result of permanent incapacity to work (as a result of occupational injuries)” and the “days lost as a result of fatal occupational injuries” is taken into account: (S_2)

The lost day per permanent incapacity has to be recalculated since this value was calculated with the average of the four years and for all industries in the last chapter. For the purpose of this chapter it has to be calculated for the average of three years and specific to construction industry. Therefore the construction specific values are used which were derived for the purpose of this study from SII sources. Formulas below are used as in the previous chapter to calculate the lost days per permanent incapacity.

$$i.d. = \frac{\sum (incapacity\ degree \times number\ of\ incapacities)}{\sum number\ of\ incapacities}$$

$$Lost\ days = i.d. \times \frac{7.500}{100} = 75 \times i.d.$$

Table 6.1 Incapacity degrees for construction industry

Incapacity degrees	2005	2004	2003	Ave.
Less than 10 %	0	0	0	0,0
% 10-19	89	99	116	101,3
% 20-29	61	63	51	58,3
% 30-39	89	78	60	75,7
% 40-49	51	46	44	47,0
% 50-100	66	63	53	60,7
Total	356	349	324	343,0
i.d.	36,7	35,7	33,7	**35,4**
Lost days per permanent incapacity	2755	2674	2531	**2657**

As it is seen in the table lost days per permanent incapacity has to be taken as 2.657. Thus the formula takes the form:

$$S_2 = \frac{t + p \times 2657 + f \times 7.500}{2.000 \times w} \quad \times \quad 1.000.000$$

5- Frequency severity indicator. (FSI)

If the equation of FSI from Chapter 3.2.5 is rewritten with the variables in this chapter:

$$FSI = \frac{50}{w}\sqrt{\frac{i \times LT}{10}}$$

Lost time (LT) will be calculated in the same two ways as in the calculation of severity rates.

a) When the “total days of temporary incapacity for work (as a result of occupational injuries)” is taken into account: (FSI_1)

$$FSI_1 = \frac{50}{w}\sqrt{\frac{i \times t}{10}}$$

b) When the “total days of temporary incapacity for work (as a result of occupational injuries)”, the “days lost as a result of permanent incapacity to work (as a result of occupational injuries)” and the “days lost as a result of fatal occupational injuries” is taken into account: (FSI_2)

$$FSI_2 = \frac{50}{w}\sqrt{\frac{i \times (t + p \times 2657 + f \times 7.500)}{10}}$$

Table 6.2 Distributions according to the provinces

Code	Province	w	i	p	f	t
1	Adana	17027	166,3	9,7	9,0	5545
2	Adıyaman	3373	11,7	0,7	1,0	661
3	Afyon	7759	28,3	2,0	1,3	1282
4	*Ağrı*	*1791*	*3,0*	*1,0*	*1,7*	*164*
5	Amasya	3259	27,7	1,7	0,7	775
6	Ankara	80764	497,3	26,3	32,0	20559
7	Antalya	36511	219,3	15,7	18,0	9324
8	Artvin	4296	72,0	1,7	2,3	2060
9	Aydın	12336	148,3	6,0	4,7	4416
10	Balıkesir	12238	142,3	4,0	6,0	4809
11	Bilecik	3213	57,7	0,7	1,0	1426
12	Bingöl	3503	11,7	2,0	2,0	735
13	*Bitlis*	*2333*	*1,0*	*0,3*	*1,0*	*43*
14	Bolu	4040	91,7	5,3	3,3	3314
15	Burdur	2982	14,3	0,3	0,7	553
16	Bursa	26682	477,3	15,0	12,3	14968
17	Çanakkale	7193	95,7	3,7	2,0	2685
18	Çankırı	1973	9,7	0,7	1,0	276
19	Çorum	5155	29,3	2,7	1,0	815
20	Denizli	11924	83,3	6,0	3,3	3945
21	Diyarbakır	10722	42,7	8,0	4,7	2499
22	Edirne	3863	14,3	2,0	0,7	447
23	Elazığ	6877	24,3	0,7	2,0	1006
24	Erzincan	4982	41,3	0,7	1,7	1181
25	Erzurum	9836	39,3	2,0	3,3	1564
26	Eskişehir	8641	114,0	2,0	4,0	3758
27	Gaziantep	11376	67,3	5,3	3,0	3865
28	Giresun	4905	20,7	1,0	2,0	929
29	Gümüşhane	2407	17,0	0,7	2,3	459
30	*Hakkari*	*1694*	*2,0*	*0,7*	*0,7*	*56*
31	İskenderun	8819	113,7	3,7	4,3	2754
32	Isparta	5196	17,3	1,7	0,7	876
33	İçel	12744	175,7	10,3	7,0	8299
34	İstanbul	140215	716,0	44,3	30,7	33999
35	İzmir	42316	916,3	27,7	12,0	30837
36	Kars	3440	7,7	1,7	0,3	259
37	Kastamonu	4877	22,3	0,7	2,0	1159
38	Kayseri	14256	220,3	5,3	4,7	4333
39	Kırklareli	4181	72,7	2,0	2,0	1453
40	Kırşehir	2576	7,3	1,3	1,0	509
41	Kocaeli	23183	684,7	23,0	9,0	18162

Table 6.2 Distributions according to the provinces (continued)

Code	Province	w	i	p	f	t
42	Konya	20321	88,7	5,3	8,3	5302
43	Kütahya	6644	96,7	1,0	2,3	1574
44	Malatya	7697	41,7	2,3	2,3	1897
45	Manisa	11853	185,0	3,7	2,0	4253
46	K.Maraş	10530	170,3	5,3	5,0	3973
47	*Mardin*	*2062*	*2,7*	*1,0*	*0,7*	*136*
48	Muğla	15601	156,0	8,7	5,7	6417
49	*Muş*	*2221*	*0,7*	*1,7*	*0,3*	*19*
50	Nevşehir	3290	11,7	2,3	1,0	624
51	Niğde	3793	20,0	1,7	0,3	1023
52	Ordu	6836	59,0	4,3	1,7	2436
53	Rize	4275	19,3	0,7	1,7	1344
54	Sakarya	9651	120,7	4,0	4,0	4611
55	Samsun	12012	97,0	4,3	4,3	3490
56	*Siirt*	*2148*	*0,3*	*1,7*	*1,3*	*2*
57	Sinop	2778	20,7	1,3	1,0	1160
58	Sivas	8971	57,3	5,7	2,3	2466
59	Tekirdağ	8399	222,3	3,3	2,0	3790
60	Tokat	3847	20,0	1,7	1,3	465
61	Trabzon	11247	71,7	3,7	4,0	3252
62	Tunceli	1604	8,3	1,7	0,3	805
63	Şanlıurfa	8693	25,3	6,3	3,7	1938
64	Uşak	3535	56,3	1,3	1,7	1594
65	Van	6126	8,7	1,0	3,0	228
66	Yozgat	3958	10,7	1,3	2,3	681
67	Zonguldak	7373	179,7	4,7	1,7	5275
68	Aksaray	3516	7,7	1,3	1,0	495
69	***Bayburt***	***876***	***3,0***	***0,0***	***0,3***	***42***
70	Karaman	3669	19,0	2,0	1,0	504
71	Kırıkkale	3071	22,0	1,7	1,7	1158
72	Batman	2296	8,0	1,3	1,3	807
73	*Şırnak*	*1557*	*1,7*	*1,3*	*0,0*	*30*
74	Bartın	1923	25,3	1,0	0,3	603
75	***Ardahan***	***577***	***0,0***	***0,0***	***0,0***	***0***
76	***Iğdır***	***742***	***1,3***	***0,7***	***0,7***	***27***
77	Yalova	2378	28,3	1,0	1,3	1630
78	Karabük	2394	36,0	0,0	0,7	1306
79	***Kilis***	***907***	***1,7***	***0,0***	***0,0***	***96***
80	Osmaniye	2603	6,3	0,0	0,0	116
81	Düzce	3076	37,0	0,0	0,0	1444
T	Total	790512	7473,0	340,3	275,0	263775

6.2 Comparison with absolute numbers

1) The number of workers

Table 6.3 presents the distribution of workers according to the provinces. It can be seen from the table that the province in which the employment in construction is highest is İstanbul with a percentage of 17,74. It is followed by Ankara, İzmir and Antalya with percentages 10,22; 5,35 and 4,62; respectively. The last 54 provinces in the table have numbers of workers which correspond to a smaller percentage than 1 % of the total workers in construction industry.

2) The number of occupational injuries

Table 6.4 shows the distribution of occupational injuries according to the provinces. The province in which the number of occupational injuries is highest is İzmir with a percentage of 12,26. The second highest number of occupational injuries is observed in İstanbul. It is followed by Kocaeli and Ankara with percentages 9,16 and 6,66; respectively.

56 provinces had occupational injuries less than 73 which correspond to a percentage of smaller than 1 %.

3) The number of permanent incapacities to work

Table 6.5 shows the distribution of the number of permanent incapacities to work according to the provinces.
It can be seen from this table that the highest number of permanent incapacities has been recorded in İstanbul. 44 accidents were recorded corresponding to a percentage of 13,03 %. It is followed by İzmir Ankara, and Kocaeli with percentages 8,13; 7,74 and 6,76; respectively. In 49 provinces less than 42

permanent incapacities were recorded in each of the last 49 provinces in the Table.

4) The number of fatal occupational injuries

Table 6.6 describes the distribution of the number of fatal occupational injuries according to the provinces. As it is seen in this table 11,61 % of the fatalities were recorded in Ankara which is followed by İstanbul and Antalya.

5) The number of temporary incapacities to work (days)

Table 6.7 describes the distribution of the number of temporary incapacities (days) according to the provinces.

As seen in this table; 12,89 % of the permanent incapacities were observed in İstanbul. İstanbul is followed by İzmir, Ankara and Kocaeli with percentages 11,69; 7,79 and 6,89; respectively.

Table 6.3 Number of workers

C.	Province	#	%
T	Total	790512	100
34	İstanbul	140215	17,74
6	Ankara	80764	10,22
35	İzmir	42316	5,35
7	Antalya	36511	4,62
16	Bursa	26682	3,38
41	Kocaeli	23183	2,93
42	Konya	20321	2,57
1	Adana	17027	2,15
48	Muğla	15601	1,97
38	Kayseri	14256	1,80
33	İçel	12744	1,61
9	Aydın	12336	1,56
10	Balıkesir	12238	1,55
55	Samsun	12012	1,52
20	Denizli	11924	1,51
45	Manisa	11853	1,50
27	Gaziantep	11376	1,44
61	Trabzon	11247	1,42
21	Diyarbakır	10722	1,36
46	K.Maraş	10530	1,33
25	Erzurum	9836	1,24
54	Sakarya	9651	1,22
58	Sivas	8971	1,13
31	İskenderun	8819	1,12
63	Şanlıurfa	8693	1,10
26	Eskişehir	8641	1,09
59	Tekirdağ	8399	1,06
3	Afyon	7759	0,98
44	Malatya	7697	0,97
67	Zonguldak	7373	0,93
17	Çanakkale	7193	0,91
23	Elazığ	6877	0,87
52	Ordu	6836	0,86
43	Kütahya	6644	0,84
65	Van	6126	0,77
32	Isparta	5196	0,66
19	Çorum	5155	0,65
24	Erzincan	4982	0,63
28	Giresun	4905	0,62
37	Kastamonu	4877	0,62
8	Artvin	4296	0,54
53	Rize	4275	0,54

C.	Province	#	%
39	Kırklareli	4181	0,53
14	Bolu	4040	0,51
66	Yozgat	3958	0,50
22	Edirne	3863	0,49
60	Tokat	3847	0,49
51	Niğde	3793	0,48
70	Karaman	3669	0,46
64	Uşak	3535	0,45
68	Aksaray	3516	0,44
12	Bingöl	3503	0,44
36	Kars	3440	0,44
2	Adıyaman	3373	0,43
50	Nevşehir	3290	0,42
5	Amasya	3259	0,41
11	Bilecik	3213	0,41
81	Düzce	3076	0,39
71	Kırıkkale	3071	0,39
15	Burdur	2982	0,38
57	Sinop	2778	0,35
80	Osmaniye	2603	0,33
40	Kırşehir	2576	0,33
29	Gümüşhane	2407	0,30
78	Karabük	2394	0,30
77	Yalova	2378	0,30
13	*Bitlis*	*2333*	*0,30*
72	Batman	2296	0,29
49	*Muş*	*2221*	*0,28*
56	*Siirt*	*2148*	*0,27*
47	*Mardin*	*2062*	*0,26*
18	Çankırı	1973	0,25
74	Bartın	1923	0,24
4	*Ağrı*	*1791*	*0,23*
30	*Hakkari*	*1694*	*0,21*
62	Tunceli	1604	0,20
73	*Şırnak*	*1557*	*0,20*
79	***Kilis***	***907***	***0,11***
69	***Bayburt***	***876***	***0,11***
76	***Iğdır***	***742***	***0,09***
75	***Ardahan***	***577***	***0,07***

Table 6.4 Number of occupational injuries

C.	Province	#	%
T	Total	7473,0	100
35	İzmir	916,3	12,26
34	İstanbul	716,0	9,58
41	Kocaeli	684,7	9,16
6	Ankara	497,3	6,66
16	Bursa	477,3	6,39
59	Tekirdağ	222,3	2,98
38	Kayseri	220,3	2,95
7	Antalya	219,3	2,94
45	Manisa	185,0	2,48
67	Zonguldak	179,7	2,40
33	İçel	175,7	2,35
46	K.Maraş	170,3	2,28
1	Adana	166,3	2,23
48	Muğla	156,0	2,09
9	Aydın	148,3	1,98
10	Balıkesir	142,3	1,90
54	Sakarya	120,7	1,61
26	Eskişehir	114,0	1,53
31	İskenderun	113,7	1,52
55	Samsun	97,0	1,30
43	Kütahya	96,7	1,29
17	Çanakkale	95,7	1,28
14	Bolu	91,7	1,23
42	Konya	88,7	1,19
20	Denizli	83,3	1,12
39	Kırklareli	72,7	0,97
8	Artvin	72,0	0,96
61	Trabzon	71,7	0,96
27	Gaziantep	67,3	0,90
52	Ordu	59,0	0,79
11	Bilecik	57,7	0,77
58	Sivas	57,3	0,77
64	Uşak	56,3	0,75
21	Diyarbakır	42,7	0,57
44	Malatya	41,7	0,56
24	Erzincan	41,3	0,55
25	Erzurum	39,3	0,53
81	Düzce	37,0	0,50
78	Karabük	36,0	0,48
19	Çorum	29,3	0,39
3	Afyon	28,3	0,38
77	Yalova	28,3	0,38

C.	Province	#	%
5	Amasya	27,7	0,37
63	Şanlıurfa	25,3	0,34
74	Bartın	25,3	0,34
23	Elazığ	24,3	0,33
37	Kastamonu	22,3	0,30
71	Kırıkkale	22,0	0,29
28	Giresun	20,7	0,28
57	Sinop	20,7	0,28
60	Tokat	20,0	0,27
51	Niğde	20,0	0,27
53	Rize	19,3	0,26
70	Karaman	19,0	0,25
32	Isparta	17,3	0,23
29	Gümüşhane	17,0	0,23
22	Edirne	14,3	0,19
15	Burdur	14,3	0,19
12	Bingöl	11,7	0,16
2	Adıyaman	11,7	0,16
50	Nevşehir	11,7	0,16
66	Yozgat	10,7	0,14
18	Çankırı	9,7	0,13
65	Van	8,7	0,12
62	Tunceli	8,3	0,11
72	Batman	8,0	0,11
68	Aksaray	7,7	0,10
36	Kars	7,7	0,10
40	Kırşehir	7,3	0,10
80	Osmaniye	6,3	0,08
4	*Ağrı*	*3,0*	*0,04*
69	***Bayburt***	***3,0***	***0,04***
47	*Mardin*	*2,7*	*0,04*
30	*Hakkari*	*2,0*	*0,03*
73	*Şırnak*	*1,7*	*0,02*
79	***Kilis***	***1,7***	***0,02***
76	***Iğdır***	***1,3***	***0,02***
13	*Bitlis*	*1,0*	*0,01*
49	*Muş*	*0,7*	*0,01*
56	*Siirt*	*0,3*	*0,00*
75	***Ardahan***	***0,0***	***0,00***

Table 6.5 Number of permanent incapacities to work

C.	Province	#	%
T	Total	340,3	100
34	İstanbul	44,3	13,03
35	İzmir	27,7	8,13
6	Ankara	26,3	7,74
41	Kocaeli	23,0	6,76
7	Antalya	15,7	4,60
16	Bursa	15,0	4,41
33	İçel	10,3	3,04
1	Adana	9,7	2,84
48	Muğla	8,7	2,55
21	Diyarbakır	8,0	2,35
63	Şanlıurfa	6,3	1,86
9	Aydın	6,0	1,76
20	Denizli	6,0	1,76
58	Sivas	5,7	1,67
38	Kayseri	5,3	1,57
46	K.Maraş	5,3	1,57
14	Bolu	5,3	1,57
42	Konya	5,3	1,57
27	Gaziantep	5,3	1,57
67	Zonguldak	4,7	1,37
55	Samsun	4,3	1,27
52	Ordu	4,3	1,27
10	Balıkesir	4,0	1,18
54	Sakarya	4,0	1,18
45	Manisa	3,7	1,08
31	İskenderun	3,7	1,08
17	Çanakkale	3,7	1,08
61	Trabzon	3,7	1,08
59	Tekirdağ	3,3	0,98
19	Çorum	2,7	0,78
44	Malatya	2,3	0,69
50	Nevşehir	2,3	0,69
26	Eskişehir	2,0	0,59
39	Kırklareli	2,0	0,59
25	Erzurum	2,0	0,59
3	Afyon	2,0	0,59
70	Karaman	2,0	0,59
22	Edirne	2,0	0,59
12	Bingöl	2,0	0,59
8	Artvin	1,7	0,49
5	Amasya	1,7	0,49
71	Kırıkkale	1,7	0,49

C.	Province	#	%
60	Tokat	1,7	0,49
51	Niğde	1,7	0,49
32	Isparta	1,7	0,49
62	Tunceli	1,7	0,49
36	Kars	1,7	0,49
49	*Muş*	*1,7*	*0,49*
56	*Siirt*	*1,7*	*0,49*
64	Uşak	1,3	0,39
57	Sinop	1,3	0,39
66	Yozgat	1,3	0,39
72	Batman	1,3	0,39
68	Aksaray	1,3	0,39
40	Kırşehir	1,3	0,39
73	*Şırnak*	*1,3*	*0,39*
43	Kütahya	1,0	0,29
77	Yalova	1,0	0,29
74	Bartın	1,0	0,29
28	Giresun	1,0	0,29
65	Van	1,0	0,29
4	*Ağrı*	*1,0*	*0,29*
47	*Mardin*	*1,0*	*0,29*
11	Bilecik	0,7	0,20
24	Erzincan	0,7	0,20
23	Elazığ	0,7	0,20
37	Kastamonu	0,7	0,20
53	Rize	0,7	0,20
29	Gümüşhane	0,7	0,20
2	Adıyaman	0,7	0,20
18	Çankırı	0,7	0,20
30	*Hakkari*	*0,7*	*0,20*
76	***Iğdır***	***0,7***	***0,20***
15	Burdur	0,3	0,10
13	*Bitlis*	*0,3*	*0,10*
81	Düzce	0,0	0,00
78	Karabük	0,0	0,00
80	Osmaniye	0,0	0,00
69	***Bayburt***	***0,0***	***0,00***
79	***Kilis***	***0,0***	***0,00***
75	***Ardahan***	***0,0***	***0,00***

Table 6.6 Number of fatal occupational injuries

C.	Province	#	%
T	Total	275,0	100
6	Ankara	32,0	11,64
34	İstanbul	30,7	11,15
7	Antalya	18,0	6,55
16	Bursa	12,3	4,48
35	İzmir	12,0	4,36
41	Kocaeli	9,0	3,27
1	Adana	9,0	3,27
42	Konya	8,3	3,03
33	İçel	7,0	2,55
10	Balıkesir	6,0	2,18
48	Muğla	5,7	2,06
46	K.Maraş	5,0	1,82
21	Diyarbakır	4,7	1,70
9	Aydın	4,7	1,70
38	Kayseri	4,7	1,70
55	Samsun	4,3	1,58
31	İskenderun	4,3	1,58
54	Sakarya	4,0	1,45
61	Trabzon	4,0	1,45
26	Eskişehir	4,0	1,45
63	Şanlıurfa	3,7	1,33
20	Denizli	3,3	1,21
14	Bolu	3,3	1,21
25	Erzurum	3,3	1,21
27	Gaziantep	3,0	1,09
65	Van	3,0	1,09
58	Sivas	2,3	0,85
44	Malatya	2,3	0,85
8	Artvin	2,3	0,85
66	Yozgat	2,3	0,85
43	Kütahya	2,3	0,85
29	Gümüşhane	2,3	0,85
45	Manisa	2,0	0,73
17	Çanakkale	2,0	0,73
59	Tekirdağ	2,0	0,73
39	Kırklareli	2,0	0,73
12	Bingöl	2,0	0,73
28	Giresun	2,0	0,73
23	Elazığ	2,0	0,73
37	Kastamonu	2,0	0,73
67	Zonguldak	1,7	0,61
52	Ordu	1,7	0,61

C.	Province	#	%
71	Kırıkkale	1,7	0,61
64	Uşak	1,7	0,61
4	*Ağrı*	*1,7*	*0,61*
24	Erzincan	1,7	0,61
53	Rize	1,7	0,61
3	Afyon	1,3	0,48
60	Tokat	1,3	0,48
56	*Siirt*	*1,3*	*0,48*
72	Batman	1,3	0,48
77	Yalova	1,3	0,48
19	Çorum	1,0	0,36
50	Nevşehir	1,0	0,36
70	Karaman	1,0	0,36
57	Sinop	1,0	0,36
68	Aksaray	1,0	0,36
40	Kırşehir	1,0	0,36
11	Bilecik	1,0	0,36
2	Adıyaman	1,0	0,36
18	Çankırı	1,0	0,36
13	*Bitlis*	*1,0*	*0,36*
22	Edirne	0,7	0,24
5	Amasya	0,7	0,24
32	Isparta	0,7	0,24
47	*Mardin*	*0,7*	*0,24*
30	*Hakkari*	*0,7*	*0,24*
76	***Iğdır***	***0,7***	***0,24***
15	Burdur	0,7	0,24
78	Karabük	0,7	0,24
51	Niğde	0,3	0,12
62	Tunceli	0,3	0,12
36	Kars	0,3	0,12
49	*Muş*	*0,3*	*0,12*
74	Bartın	0,3	0,12
69	***Bayburt***	***0,3***	***0,12***
73	*Şırnak*	*0,0*	*0,00*
81	Düzce	0,0	0,00
80	Osmaniye	0,0	0,00
79	***Kilis***	***0,0***	***0,00***
75	***Ardahan***	***0,0***	***0,00***

Table 6.7 Number of temporary incapacities to work (days)

C.	Province	#	%
T	Total	263775	100
34	İstanbul	33999	12,89
35	İzmir	30837	11,69
6	Ankara	20559	7,79
41	Kocaeli	18162	6,89
16	Bursa	14968	5,67
7	Antalya	9324	3,53
33	İçel	8299	3,15
48	Muğla	6417	2,43
1	Adana	5545	2,10
42	Konya	5302	2,01
67	Zonguldak	5275	2,00
10	Balıkesir	4809	1,82
54	Sakarya	4611	1,75
9	Aydın	4416	1,67
38	Kayseri	4333	1,64
45	Manisa	4253	1,61
46	K.Maraş	3973	1,51
20	Denizli	3945	1,50
27	Gaziantep	3865	1,47
59	Tekirdağ	3790	1,44
26	Eskişehir	3758	1,42
55	Samsun	3490	1,32
14	Bolu	3314	1,26
61	Trabzon	3252	1,23
31	İskenderun	2754	1,04
17	Çanakkale	2685	1,02
21	Diyarbakır	2499	0,95
58	Sivas	2466	0,94
52	Ordu	2436	0,92
8	Artvin	2060	0,78
63	Şanlıurfa	1938	0,73
44	Malatya	1897	0,72
77	Yalova	1630	0,62
64	Uşak	1594	0,60
43	Kütahya	1574	0,60
25	Erzurum	1564	0,59
39	Kırklareli	1453	0,55
81	Düzce	1444	0,55
11	Bilecik	1426	0,54
53	Rize	1344	0,51
78	Karabük	1306	0,50
3	Afyon	1282	0,49

C.	Province	#	%
24	Erzincan	1181	0,45
57	Sinop	1160	0,44
37	Kastamonu	1159	0,44
71	Kırıkkale	1158	0,44
51	Niğde	1023	0,39
23	Elazığ	1006	0,38
28	Giresun	929	0,35
32	Isparta	876	0,33
19	Çorum	815	0,31
72	Batman	807	0,31
62	Tunceli	805	0,31
5	Amasya	775	0,29
12	Bingöl	735	0,28
66	Yozgat	681	0,26
2	Adıyaman	661	0,25
50	Nevşehir	624	0,24
74	Bartın	603	0,23
15	Burdur	553	0,21
40	Kırşehir	509	0,19
70	Karaman	504	0,19
68	Aksaray	495	0,19
60	Tokat	465	0,18
29	Gümüşhane	459	0,17
22	Edirne	447	0,17
18	Çankırı	276	0,10
36	Kars	259	0,10
65	Van	228	0,09
4	*Ağrı*	*164*	*0,06*
47	*Mardin*	*136*	*0,05*
80	Osmaniye	116	0,04
79	***Kilis***	***96***	***0,04***
30	*Hakkari*	*56*	*0,02*
13	*Bitlis*	*43*	*0,02*
69	***Bayburt***	***42***	***0,02***
73	*Şırnak*	*30*	*0,01*
76	***Iğdır***	***27***	***0,01***
49	*Muş*	*19*	*0,01*
56	*Siirt*	*2*	*0,00*
75	***Ardahan***	***0***	***0,00***

6.3 Comparison with comparative measures

1) The incidence rate of occupational injuries (R_1)

Table 6.8 describes the incidence rates of occupational injury in each province in descending order. Figure 6.1 show graphically the incidence rates of occupational injuries in selected provinces.

According to this table, Kocaeli has the worst incidence rate in Turkey with a value of 2.953. It is followed by Tekirdağ, Zonguldak and Bolu with rates of 2.647, 2.437 and 2.269, respectively. İzmir, Ankara and İstanbul rank 5th, 38th, 47th places; respectively in this table. As it can be figured out from the comparison of these ranks with the ranks in absolute values, provinces which rank at the first places in absolute numbers do not compulsorily rank in the first places in relative measures.

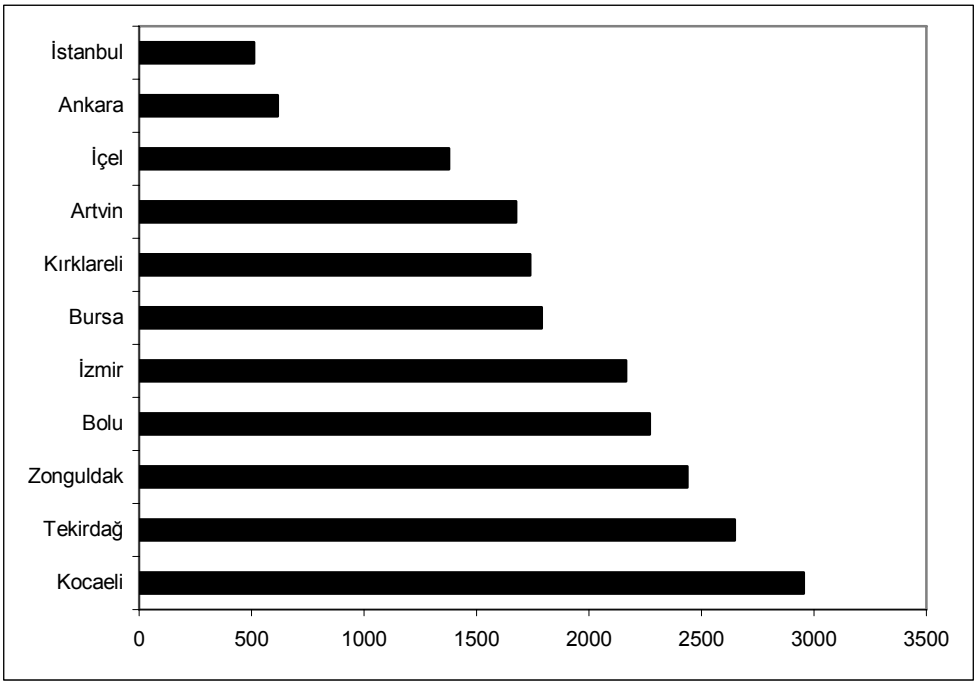

Figure 6.1 Incidence rate - R_1

Table 6.8 Incidence rate - R_1

Province	R_1
Kocaeli	2953
Tekirdağ	2647
Zonguldak	2437
Bolu	2269
İzmir	2165
Bilecik	1795
Bursa	1789
Kırklareli	1738
Artvin	1676
K.Maraş	1618
Uşak	1594
Manisa	1561
Kayseri	1546
Karabük	1504
Kütahya	1455
İçel	1378
Çanakkale	1330
Eskişehir	1319
Bartın	1317
İskenderun	1289
Sakarya	1250
Düzce	1203
Aydın	1202
Yalova	1191
Balıkesir	1163
Muğla	1000
Adana	977
Total	945
Ordu	863
Amasya	849
Erzincan	830
Samsun	808
Sinop	744
Kırıkkale	716
Gümüşhane	706
Denizli	699
Sivas	639
Trabzon	637
Ankara	616
Antalya	601
Gaziantep	592
Çorum	569
Malatya	541

Province	R_1
Niğde	527
Tokat	520
Tunceli	519
Karaman	518
İstanbul	511
Çankırı	490
Burdur	481
Kastamonu	458
Rize	452
Konya	436
Giresun	421
Erzurum	400
Diyarbakır	398
Edirne	371
Afyon	365
Nevşehir	355
Elazığ	354
Batman	348
Adıyaman	346
Bayburt	***343***
Isparta	334
Bingöl	333
Şanlıurfa	291
Kırşehir	285
Yozgat	269
Osmaniye	243
Kars	223
Aksaray	218
Kilis	***184***
Iğdır	***180***
Ağrı	*167*
Van	141
Mardin	*129*
Hakkari	*118*
Şırnak	*107*
Bitlis	*43*
Muş	*30*
Siirt	*16*
Ardahan	***0***

2) The incidence rate of cases resulting in permanent incapacity to work (as a result of occupational injuries) (R_2)

Table 6.9 describes the incidence rates of cases resulting in permanent incapacity to work in each province in descending order.

Bolu ranks first place with a value of 132 in this table. It is followed by Tunceli, Kocaeli and Iğdır. Iğdır is followed by Şırnak but this province and Iğdır do not have many employees in construction industry implying that the statistics could be not sound. İzmir, Ankara and İstanbul rank 12th, 54th and 57th places; respectively.

3) The incidence rate of fatal occupational injuries (as a result of occupational injuries) (R_3)

Table 6.10 describes the incidence rates of fatal occupational injuries in each province in descending order.
As seen in the table, the first places are occupied by Gümüşhane, Ağrı, Iğdır, Bolu and Siirt. But attention should be paid to Ağrı, Iğdır and Siirt which have few workers or less than 10 reported occupational injuries per year. Ankara, Kocaeli, İzmir and İstanbul rank 31st, 34th, 54th and 65th places, respectively in this table.

Table 6.9 Incidence rate - R_2

Province	R_2
Bolu	132
Tunceli	104
Kocaeli	99
Iğdır	***90***
Şırnak	*86*
İçel	81
Siirt	*78*
Muş	*75*
Diyarbakır	75
Şanlıurfa	73
Nevşehir	71
İzmir	65
Ordu	63
Zonguldak	63
Sivas	63
Batman	58
Bingöl	57
Adana	57
Bursa	56
Ağrı	*56*
Muğla	56
Karaman	55
Kırıkkale	54
Bartın	52
Edirne	52
Kırşehir	52
Çorum	52
Amasya	51
Çanakkale	51
K.Maraş	51
Denizli	50
Aydın	49
Mardin	*48*
Kars	48
Sinop	48
Kırklareli	48
Gaziantep	47
Niğde	44
Tokat	43
Total	43
Antalya	43
Yalova	42
İskenderun	42

Province	R_2
Sakarya	41
Tekirdağ	40
Hakkari	*39*
Artvin	39
Aksaray	38
Uşak	38
Kayseri	37
Samsun	36
Çankırı	34
Yozgat	34
Balıkesir	33
Ankara	33
Trabzon	33
Isparta	32
İstanbul	32
Manisa	31
Malatya	30
Gümüşhane	28
Konya	26
Afyon	26
Eskişehir	23
Bilecik	21
Giresun	20
Erzurum	20
Adıyaman	20
Van	16
Rize	16
Kütahya	15
Bitlis	*14*
Kastamonu	14
Erzincan	13
Burdur	11
Elazığ	10
Karabük	0
Düzce	0
Bayburt	***0***
Osmaniye	0
Kilis	***0***
Ardahan	***0***

Table 6.10 Incidence rate - R_3

Province	R_3
Gümüşhane	97
Ağrı	*93*
Iğdır	***90***
Bolu	83
Siirt	*62*
Yozgat	59
Batman	58
Bingöl	57
Yalova	56
İçel	55
Artvin	54
Kırıkkale	54
Adana	53
Çankırı	51
Antalya	49
İskenderun	49
Balıkesir	49
Van	49
Kırklareli	48
K.Maraş	47
Uşak	47
Eskişehir	46
Bursa	46
Diyarbakır	44
Bitlis	*43*
Şanlıurfa	42
Sakarya	41
Konya	41
Kastamonu	41
Giresun	41
Ankara	40
Hakkari	*39*
Rize	39
Kocaeli	39
Kırşehir	39
Bayburt	***38***
Aydın	38
Muğla	36
Samsun	36
Sinop	36
Trabzon	36
Kütahya	35
Total	35

Province	R_3
Tokat	35
Erzurum	34
Erzincan	33
Kayseri	33
Mardin	*32*
Bilecik	31
Nevşehir	30
Malatya	30
Adıyaman	30
Elazığ	29
Aksaray	28
İzmir	28
Denizli	28
Karabük	28
Çanakkale	28
Karaman	27
Gaziantep	26
Sivas	26
Ordu	24
Tekirdağ	24
Zonguldak	23
Burdur	22
İstanbul	22
Tunceli	21
Amasya	20
Çorum	19
Bartın	17
Edirne	17
Afyon	17
Manisa	17
Muş	*15*
Isparta	13
Kars	10
Niğde	9
Şırnak	*0*
Düzce	0
Osmaniye	0
Kilis	***0***
Ardahan	***0***

4) The severity rate of occupational injuries (as a result of occupational injuries)

a) S_1 is used.

Table 6.11 describes the severity rates of occupational injuries (S_1) in each province in descending order. As it can be observed from the table, Bolu has the highest severity rate with a value of 410 and is followed by Kocaeli with a value of 392. İzmir and Zonguldak rank 3rd and 4th places in this Table.

In addition, provinces Ankara and İstanbul rank 41st and 43rd places with values 127 and 121, respectively.

Figure 6.2 illustrates the severity rates of selected provinces.

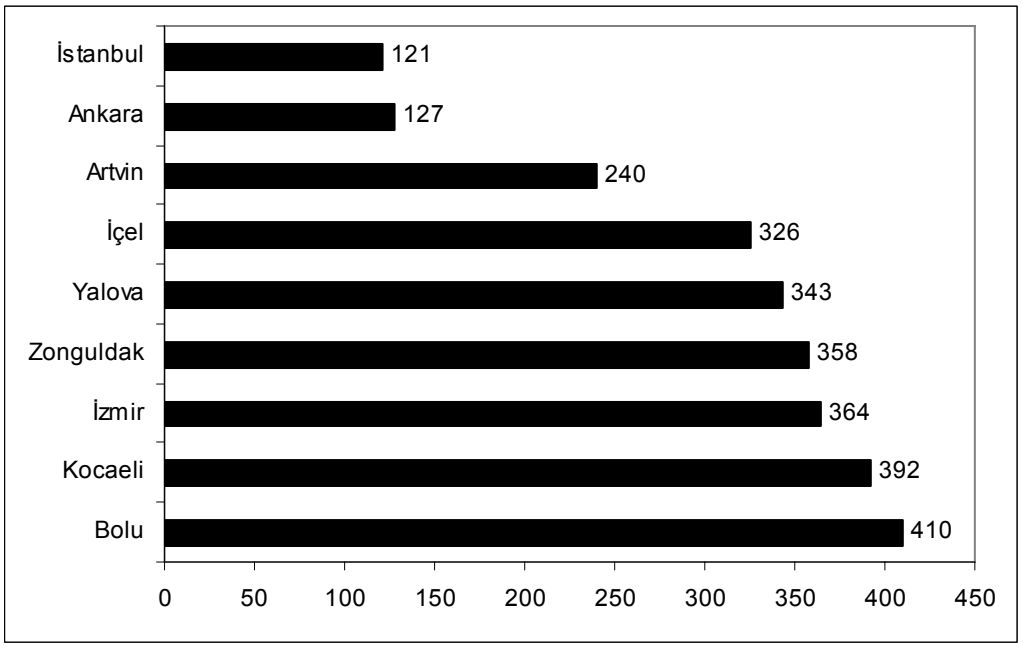

Figure 6.2 Severity rate - S_1

Table 6.11 Severity rate - S_1

Province	S_1
Bolu	410
Kocaeli	392
İzmir	364
Zonguldak	358
Yalova	343
İçel	326
Bursa	280
Karabük	273
Tunceli	251
Artvin	240
Sakarya	239
Düzce	235
Tekirdağ	226
Uşak	225
Bilecik	222
Eskişehir	217
Sinop	209
Muğla	206
Balıkesir	196
K.Maraş	189
Kırıkkale	188
Çanakkale	187
Manisa	179
Aydın	179
Ordu	178
Batman	176
Kırklareli	174
Gaziantep	170
Total	167
Denizli	165
Adana	163
Rize	157
Bartın	157
İskenderun	156
Kayseri	152
Samsun	145
Trabzon	145
Sivas	137
Niğde	135
Konya	130
Antalya	128
Ankara	127
Malatya	123

Province	S_1
İstanbul	121
Amasya	119
Kastamonu	119
Erzincan	119
Kütahya	118
Diyarbakır	117
Şanlıurfa	111
Bingöl	105
Kırşehir	99
Adıyaman	98
Gümüşhane	95
Nevşehir	95
Giresun	95
Burdur	93
Yozgat	86
Isparta	84
Afyon	83
Erzurum	80
Çorum	79
Elazığ	73
Aksaray	70
Çankırı	70
Karaman	69
Tokat	60
Edirne	58
Kilis	***53***
Ağrı	*46*
Kars	38
Mardin	*33*
Bayburt	***24***
Osmaniye	22
Van	19
Iğdır	***18***
Hakkari	*17*
Şırnak	*10*
Bitlis	*9*
Muş	*4*
Siirt	*1*
Ardahan	***0***

b) S_2 is used.

Table 6.12 describes the severity rates (S_2) of occupational injuries in each province in descending order. It can be seen that this rate is highest in Bolu. Iğdır and Ağrı have the second and third highest values but as aforementioned, these provinces have less number of workers or accidents which causes problems of consistency between years. Gümüşhane and İçel rank 4th and 5th places, respectively. In addition İzmir, Ankara and İstanbul occupy the 28th, 36th and 68th places.

Figure 6.3 illustrates the severity rates of selected provinces.

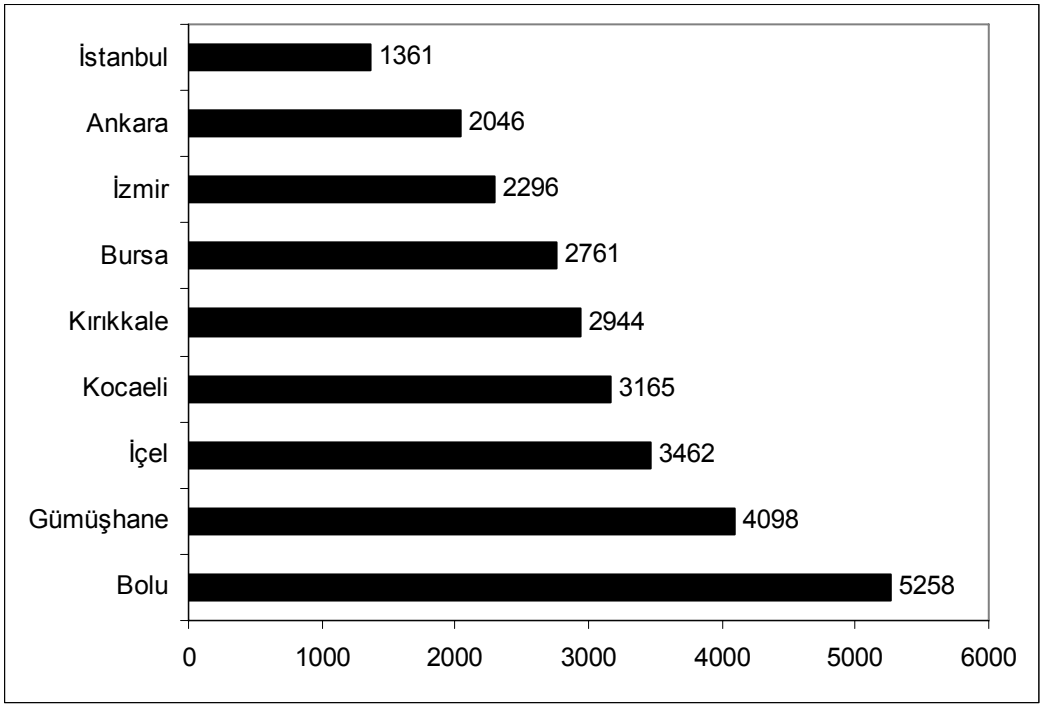

Figure 6.3 Severity rate - S_2

Table 6.12 Severity rate - S_2

Province	S_2
Bolu	5258
Iğdır	***4583***
Ağrı	*4277*
Gümüşhane	4098
İçel	3462
Siirt	*3359*
Kocaeli	3165
Batman	3125
Bingöl	3005
Yalova	3004
Kırıkkale	2944
Adana	2899
Artvin	2792
Bursa	2761
Yozgat	2744
Diyarbakır	2740
Şanlıurfa	2661
K.Maraş	2642
Kırklareli	2603
İskenderun	2551
Antalya	2547
Uşak	2495
Balıkesir	2469
Çankırı	2420
Tunceli	2410
Sakarya	2344
Muğla	2306
İzmir	2296
Eskişehir	2261
Aydın	2244
Kırşehir	2242
Sinop	2196
Nevşehir	2177
Van	2072
Zonguldak	2046
Ankara	2046
Total	2043
Konya	2017
Hakkari	*2015*
Samsun	1977
Sivas	1952
Tokat	1936
Ordu	1935

Province	S_2
Trabzon	1911
Çanakkale	1906
Giresun	1894
Mardin	*1890*
Denizli	1882
Kayseri	1877
Kastamonu	1838
Rize	1826
Karaman	1815
Bitlis	*1806*
Gaziantep	1782
Bilecik	1665
Malatya	1663
Tekirdağ	1646
Aksaray	1641
Kütahya	1635
Erzurum	1620
Amasya	1565
Muş	*1564*
Erzincan	1551
Bartın	1498
Çorum	1494
Adıyaman	1472
Bayburt	***1452***
Edirne	1393
İstanbul	1361
Karabük	1317
Elazığ	1292
Manisa	1223
Şırnak	*1147*
Burdur	1079
Afyon	1069
Niğde	1048
Kars	1045
Isparta	992
Düzce	235
Kilis	***53***
Osmaniye	22
Ardahan	***0***

5) Frequency severity indicator. (FSI)

a) FSI_1 is used

Table 6.13 describes the values of frequency severity indicator (FSI_1) in each province in descending order.

As it is seen in the table, the highest value of FSI_1 is found for the province Kocaeli which is 2,41. It is followed by Bolu, Zonguldak and İzmir with values of 2,16; 2,09 and 1,99; respectively. Ankara and İstanbul occupy the 39^{th} and 45^{th} places in this table.

Figure 6.4 shows the values of FSI_1 for some selected provinces.

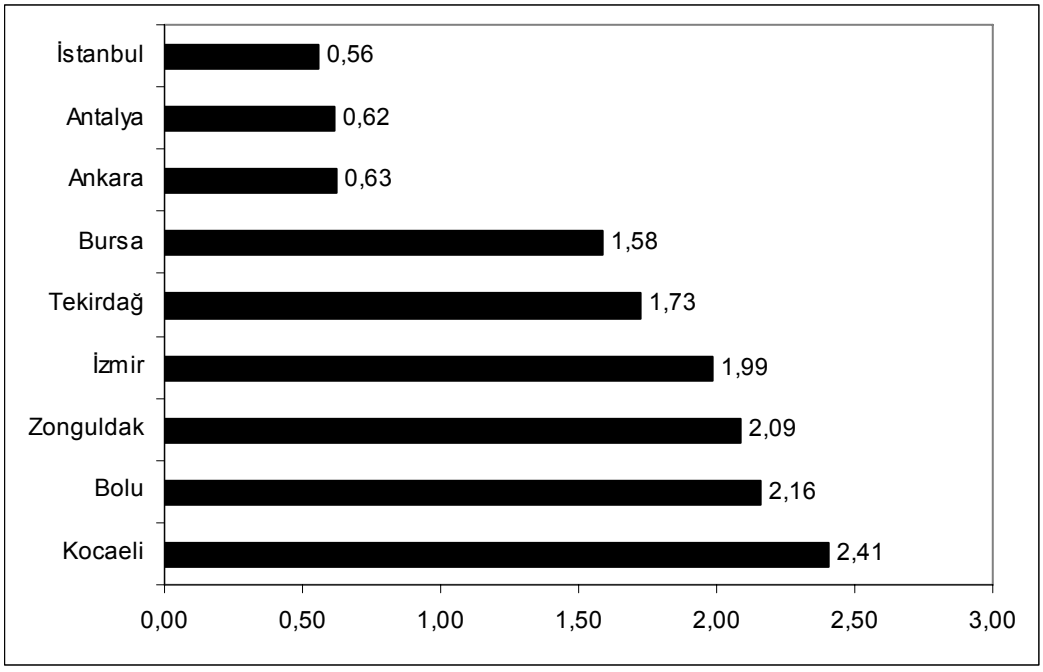

Figure 6.4 Frequency severity indicator - FSI_1

Table 6.13 Frequency severity indicator - FSI_1

Province	FSI_1
Kocaeli	2,41
Bolu	2,16
Zonguldak	2,09
İzmir	1,99
Tekirdağ	1,73
Bursa	1,58
İçel	1,50
Karabük	1,43
Yalova	1,43
Artvin	1,42
Bilecik	1,41
Uşak	1,34
K.Maraş	1,24
Kırklareli	1,23
Sakarya	1,22
Eskişehir	1,20
Düzce	1,19
Manisa	1,18
Çanakkale	1,11
Kayseri	1,08
Balıkesir	1,07
Aydın	1,04
Bartın	1,02
Muğla	1,01
İskenderun	1,00
Kütahya	0,93
Adana	0,89
Total	0,89
Sinop	0,88
Ordu	0,88
Kırıkkale	0,82
Tunceli	0,81
Samsun	0,77
Denizli	0,76
Amasya	0,71
Gaziantep	0,71
Erzincan	0,70
Trabzon	0,68
Sivas	0,66
Ankara	0,63
Antalya	0,62
Niğde	0,60
Rize	0,60

Province	FSI_1
Gümüşhane	0,58
Malatya	0,58
İstanbul	0,56
Batman	0,55
Konya	0,53
Kastamonu	0,52
Diyarbakır	0,48
Çorum	0,47
Burdur	0,47
Giresun	0,45
Karaman	0,42
Bingöl	0,42
Çankırı	0,41
Adıyaman	0,41
Nevşehir	0,41
Şanlıurfa	0,40
Erzurum	0,40
Tokat	0,40
Afyon	0,39
Kırşehir	0,38
Isparta	0,37
Elazığ	0,36
Yozgat	0,34
Edirne	0,33
Aksaray	0,28
Kilis	***0,22***
Kars	0,20
Bayburt	***0,20***
Ağrı	*0,20*
Osmaniye	0,16
Mardin	*0,15*
Iğdır	***0,13***
Van	0,11
Hakkari	*0,10*
Şırnak	*0,07*
Bitlis	*0,04*
Muş	*0,03*
Siirt	*0,01*
Ardahan	***0,00***

b) FSI_2 is used

Table 6.14 describes the values of frequency severity indicator (FSI_2) in each province in descending order.

As it is seen in the table the highest value is found in Bolu and the second highest value is found in Kocaeli. By the comparison with FSI_1, Kocaeli ranked the first place. This indicates that the accidents in Bolu have more severe results since the FSI_2 involves also the fatalities and permanent incapacities in the calculation. 3rd and 4th places are occupied by Zonguldak and İzmir as it was the case in FSI_1. Ankara and İstanbul rank 36th and 58th places, respectively.

Figure 6.5 shows the values of FSI_2 for some selected provinces.

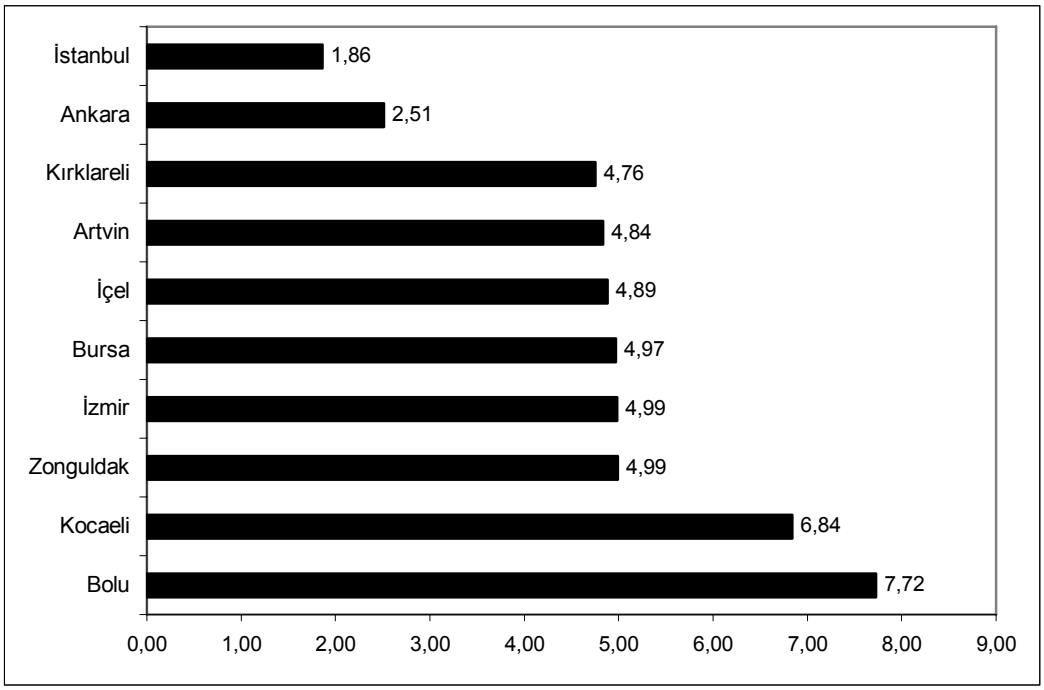

Figure 6.5 Frequency severity indicator - FSI_2

Table 6.14 Frequency severity indicator - FSI_2

Province	FSI_2
Bolu	7,72
Kocaeli	6,84
Zonguldak	4,99
İzmir	4,99
Bursa	4,97
İçel	4,89
Artvin	4,84
Kırklareli	4,76
Tekirdağ	4,67
K.Maraş	4,62
Uşak	4,46
Yalova	4,23
İskenderun	4,05
Bilecik	3,87
Eskişehir	3,86
Sakarya	3,83
Kayseri	3,81
Gümüşhane	3,80
Balıkesir	3,79
Adana	3,76
Aydın	3,67
Çanakkale	3,56
Kütahya	3,45
Muğla	3,40
Kırıkkale	3,25
Karabük	3,15
Bartın	3,14
Total	3,11
Manisa	3,09
Ordu	2,89
Sinop	2,86
Samsun	2,83
Antalya	2,77
Amasya	2,58
Denizli	2,56
Erzincan	2,54
Ankara	2,51
Tunceli	2,50
Sivas	2,50
Trabzon	2,47
Çankırı	2,43
Diyarbakır	2,33
Batman	2,33

Province	FSI_2
Gaziantep	2,30
Tokat	2,24
Bingöl	2,24
Karaman	2,17
Malatya	2,12
Konya	2,10
Çorum	2,06
Kastamonu	2,05
Rize	2,03
Iğdır	***2,03***
Giresun	2,00
Şanlıurfa	1,97
Nevşehir	1,96
Yozgat	1,92
Ağrı	*1,89*
İstanbul	1,86
Erzurum	1,80
Kırşehir	1,79
Niğde	1,66
Burdur	1,61
Edirne	1,61
Adıyaman	1,60
Bayburt	***1,58***
Elazığ	1,51
Afyon	1,40
Aksaray	1,34
Isparta	1,29
Van	1,21
Düzce	1,19
Mardin	*1,11*
Hakkari	*1,09*
Kars	1,08
Şırnak	*0,78*
Bitlis	*0,62*
Siirt	*0,51*
Muş	*0,48*
Kilis	***0,22***
Osmaniye	0,16
Ardahan	***0,00***

6.4 Assessment of the results

It can be concluded that the number of accidents per worker is highest in Kocaeli, Tekirdağ, Zonguldak, Bolu and İzmir. Ankara and İstanbul come much later in this ranking.

When the incidence rates measuring a severe result or the severity rates are used in the comparison it is seen that the province Bolu takes the first place in the rankings. That is, while the number of accidents per worker is highest in Kocaeli, the severity rates are highest in Bolu. It should be mentioned that Bolu ranks before Kocaeli in the ranking of incidence rate R_2, R_3 and in the ranking of severity rates S_1 and S_2. Thus Bolu has a worse safety performance with respect to Kocaeli.

The combination of the frequency and severity of an accident is more easily evaluated with the measure FSI. FSI_2 is a more severity based measure than FSI_1 since it incorporates the permanent incapacities and the fatalities in calculations, in addition to temporary incapacities.

Kocaeli and Bolu ranked the 1^{st} and 2^{nd} places in the ranking of FSI_1 values, respectively. This ranking reversed when FSI_2 values were used. This supports the argument that accidents in Bolu have more serious results than the ones in Kocaeli.

As it is seen, Kocaeli and Bolu have the worst safety performances in Turkey in the years considered. This can emanate from the rapid reconstruction process after the earthquakes in Kocaeli and Bolu in year 1999. Thousands of buildings collapsed during these earthquakes and others were damaged highly which had to be taken down. As a result many thousands of buildings have to be constructed in a short time in these provinces. At this point it can be said that the safety

performance of these provinces can partly be the result of the demand on rapid construction after the earthquakes when the negative effects of the acceleration of the usual production process on the consideration of the occupational health and safety measures is considered.

Next, Zonguldak ranks third place and İzmir ranks the 5th place in the ranking according to incidence rates (R_1). But İzmir has little higher values in the severity related rankings (R_2, R_3, S_1, S_2). Zonguldak has slightly higher FSI_1 and FSI_2 values. Thus it can be stated that Zonguldak has a slightly worse safety performance in comparison to İzmir.

The comparisons above result in a ranking of provinces as follows: Bolu, Kocaeli, Zonguldak and İzmir. This ranking is parallel to the ranking with FSI_2 values. And the ranking in FSI_1 values is similar to rankings in FSI_2 values with the difference that FSI_2 is more severity based. This yields also the result that FSI values are good measures since they combine frequency and severity.

When the ranking of İzmir, Ankara and İstanbul is examined it is seen that the ranking between these provinces is generally İzmir, Ankara and İstanbul. İzmir, Ankara and İstanbul rank 4th, 36th and 58th places in the FSI_2 values; respectively.

CHAPTER 7

DISTRIBUTION OF OCCUPATIONAL ACCIDENTS IN THE CONSTRUCTION INDUSTRY ACCORDING TO SOME VARIABLES

In this chapter some characteristics of the victims and occupational injuries will be determined. For this purpose the distribution of the occupational accidents according to some variables is derived from the records of the Social Insurance Institute. These distributions contain information about the occupational accidents that were recorded in the years 2003, 2004 and 2005 in the *construction industry.* All of the recorded accidents in the construction industry are included, which means that a number of 6.480, 8.106 and 8.198 data were taken into account for the years 2003, 2004 and 2005, respectively.

For comparison and other reasons the statistics in the yearbooks will also be necessary. The distributions in these yearbooks contain information about all accidents in Turkey. That is, these yearbooks contain information about 75.000 accidents for each year.

1) The working period of the worker at the last workplace

Table 7.1 describes the distribution of the number and Table 7.2 describes the percentages of occupational injuries according to the working period of the workers at their last workplace (= the working period of the worker by the last employer) for the years 2003-2005. While the columns denoted with "AI" illustrate the distributions for all industries, the columns denoted with CI illustrate the distributions for construction industry. The average values of the three years are also given separately.

This measurement can be interpreted as the experience of the worker until the accident occurred. The workers in construction change more frequently in comparison to other industries. Thus the adaptation process of workers to the new working environments is a more problematic issue in construction. In addition, it can be assumed that an experienced worker knows the accidents risks better.

Figure 7.1 shows the distribution for construction industry graphically. It can be seen from this figure that the working period in which the number of occupational injuries is highest is the working period "More than 3 Months - inc. 1 year". 26,9 % of all occupational injuries were suffered by workers with an experience between 3 months and 1 year. This is followed by the working period "more than one Month - inc. 3 Months" with a percentage of 18,4 %. Furthermore it can be seen that 3,7 % of all accidents occurred in the first working day of the workers. (First working day refers to the first day in their last workplace.) The cumulative percentage of victims which have a working period less than 1 year is 61,8 %.

It is not easy to draw conclusions from the distributions since the calculation of comparative measures is not possible due to the lack of denominator data and the different increments in the consecutive working periods. But it can be inferred that workers at their first days experience more accidents than the workers with working period 2-7 days.

Nevertheless the construction data can be compared with the data representing all industries.

Figure 7.2 illustrates the distribution of the data for construction industry and the data representing all industries in percentages. The figure shows that the percentage of construction industry is greater than the percentage of all industries if the working periods equal to or shorter than 1 year are considered. This reverses when working periods between one year and ten years is examined. One explanation for this case can be the employment difference between construction industry and other industries. Construction workers change employer more frequently than the other workers (Seasonal workers, project based employment). In addition, working conditions change continuously and rapidly on the construction sites, especially at project start.

When the “1 Day” working period is observed, construction industry has the value 3,7 % while this value is 1,4 % for all industries. In addition construction industry constitutes 24,2 % of this “1 Day” category. This can be explained again with the employment difference and with the difficulties encountered by the workers in the adaptation process to a new construction site.

Table 7.1 Distribution according to the working period (numbers)

Working period	CI			AI			CI	AI
	2003	2004	2005	2003	2004	2005	Ave.	Ave.
1 Day	284	243	296	1068	925	1405	274	1133
2 - 7 Days	266	207	218	1061	1042	1054	230	1052
8 - 30 Days	782	758	654	3672	4273	3535	731	3827
More th. 1 Month - inc. 3 Months	1480	1435	1203	8740	9494	7802	1373	8679
More th. 3 Months - inc. 1 Year	2151	2078	1809	19739	22361	19000	2013	20367
More th. 1 Year - inc. 2 Years	800	733	594	10723	12656	12134	709	11838
More th. 2 Years - inc. 5 Years	817	789	557	15170	15872	13590	721	14877
More th. 5 Years - inc. 10 Years	462	462	376	8898	9858	9483	433	9413
10+ Years	1110	1080	775	7597	7349	5920	988	6955
Total	8152	7785	6482	76668	83830	73923	7473	78140

Table 7.2 Distribution according to the working period (%)

Working period	CI			AI			CI	AI
	2003	2004	2005	2003	2004	2005	Ave.	Ave.
1 Day	3,5	3,1	4,6	1,4	1,1	1,9	3,7	1,4
2 - 7 Days	3,3	2,7	3,4	1,4	1,2	1,4	3,1	1,3
8 - 30 Days	9,6	9,7	10,1	4,8	5,1	4,8	9,8	4,9
More th. 1 Month - inc. 3 Months	18,2	18,4	18,6	11,4	11,3	10,6	18,4	11,1
More th. 3 Months - inc. 1 Year	26,4	26,7	27,9	25,7	26,7	25,7	26,9	26,1
More th. 1 Year - inc. 2 Years	9,8	9,4	9,2	14,0	15,1	16,4	9,5	15,1
More th. 2 Years - inc. 5 Years	10,0	10,1	8,6	19,8	18,9	18,4	9,6	19,0
More th. 5 Years - inc. 10 Years	5,7	5,9	5,8	11,6	11,8	12,8	5,8	12,0
10+ Years	13,6	13,9	12,0	9,9	8,8	8,0	13,2	8,9
Total	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0

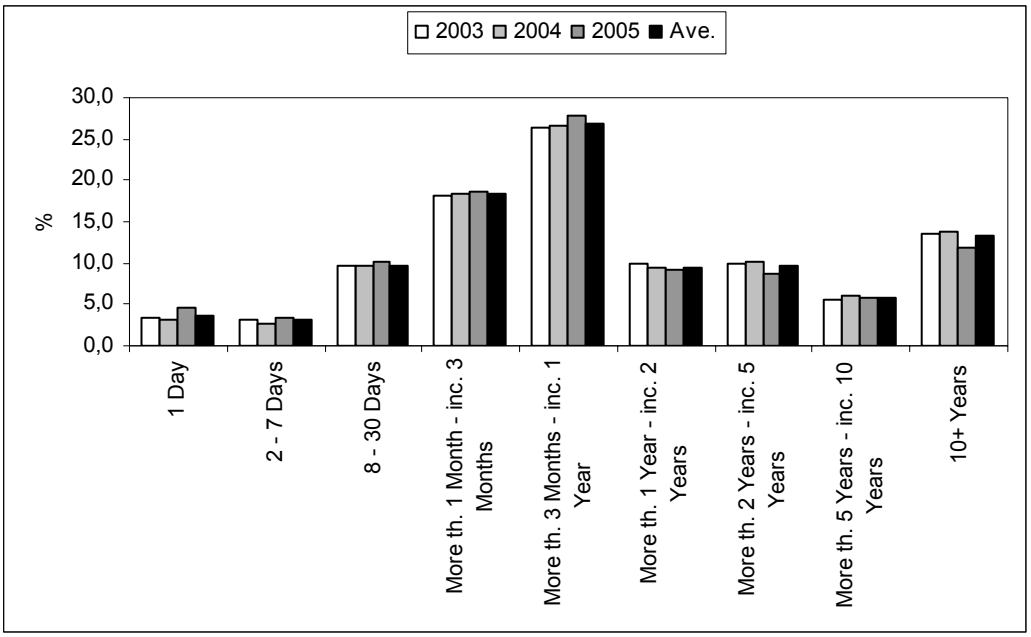

Figure 7.1 Distribution according to the working period (%)

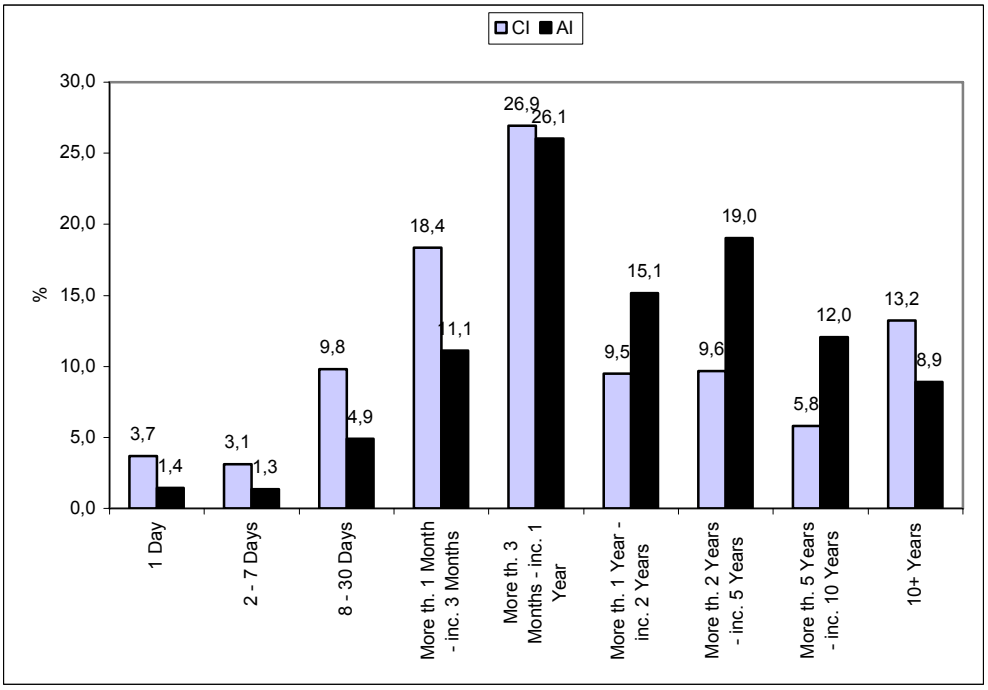

Figure 7.2 Distribution according to the working period (Ave.)

2) The duration of Temporary Incapacity for Work

Table 7.3 describes the distribution of the number and Table 7.4 describes the percentages of occupational injuries according to the duration of temporary incapacity to work for the years 2003-2005. While the columns denoted with "AI" illustrate the distributions for all industries, the columns denoted with CI illustrate the distributions for construction industry. The averages values of the three years are also given separately.

Figure 7.3 shows the distribution for construction industry. The percentages do not much vary over the years except the "0" duration as seen in the figure. The duration category in which the number of occupational accidents is highest is "7-13" and is followed by "31-90". It is difficult to interpret the results since the increments in the defined durations are not equal.

Figure 7.4 illustrates the distribution of the data for construction industry and the data representing all industries in percentages. The percentages of construction industry exceed the values of all industries when there is "0" days lost or when there are more than 21 days lost as seen from Figure 7.3.

Since the values of all industries encompass also the values of construction industry the proportion of construction in each duration category can be determined. For this purpose the average values representing the three years are used. The result is given in Table 7.5. In total 9,6 % of the accidents occurred in the construction industry. But this ratio changes very much in the distribution examined. Except the first value, this ratio increases from 6,6 to 28,8. That means the share of construction in temporary incapacities increases with increasing lost days. More than a quarter of the incapacities of 365+ days were caused by accidents in construction industry. This result supports the result of the previous chapter. The share of construction in the distribution of accidents increases when more severe results of accidents are taken into account.

Table 7.3 Distribution according to the
duration of temporary incapacity for work

Duration of Temporary Incapacity for Work	CI			AI			CI	AI
	2003	2004	2005	2003	2004	2005	Ave.	Ave.
0	1047	693	301	3354	4228	1344	680	2975
1 - 3	427	403	339	5885	6184	5577	390	5882
4 - 7	948	967	766	12162	12945	11805	894	12304
7 - 3	2068	2081	1842	25165	27560	25105	1997	25943
14 - 20	1077	1065	1020	12076	13228	12419	1054	12574
21 - 30	404	439	399	3540	3905	3730	414	3725
31 - 90	1438	1403	1239	10726	11813	10648	1360	11062
91 - 183	414	435	346	2415	2664	2221	398	2433
184 - 364	211	197	146	932	954	780	185	889
365 +	118	102	84	413	349	294	101	352
Total	8152	7785	6482	76668	83830	73923	7473	78140

Table 7.4 Distribution according to the
duration of temporary incapacity for work (%)

Duration of Temporary Incapacity for Work	CI			AI			CI	AI
	2003	2004	2005	2003	2004	2005	Ave.	Ave.
0	12,8	8,9	4,6	4,4	5,0	1,8	9,1	3,8
1 - 3	5,2	5,2	5,2	7,7	7,4	7,5	5,2	7,5
4 - 7	11,6	12,4	11,8	15,9	15,4	16,0	12,0	15,7
7 - 3	25,4	26,7	28,4	32,8	32,9	34,0	26,7	33,2
14 - 20	13,2	13,7	15,7	15,8	15,8	16,8	14,1	16,1
21 - 30	5,0	5,6	6,2	4,6	4,7	5,0	5,5	4,8
31 - 90	17,6	18,0	19,1	14,0	14,1	14,4	18,2	14,2
91 - 183	5,1	5,6	5,3	3,1	3,2	3,0	5,3	3,1
184 - 364	2,6	2,5	2,3	1,2	1,1	1,1	2,5	1,1
365 +	1,4	1,3	1,3	0,5	0,4	0,4	1,4	0,5
Total	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0

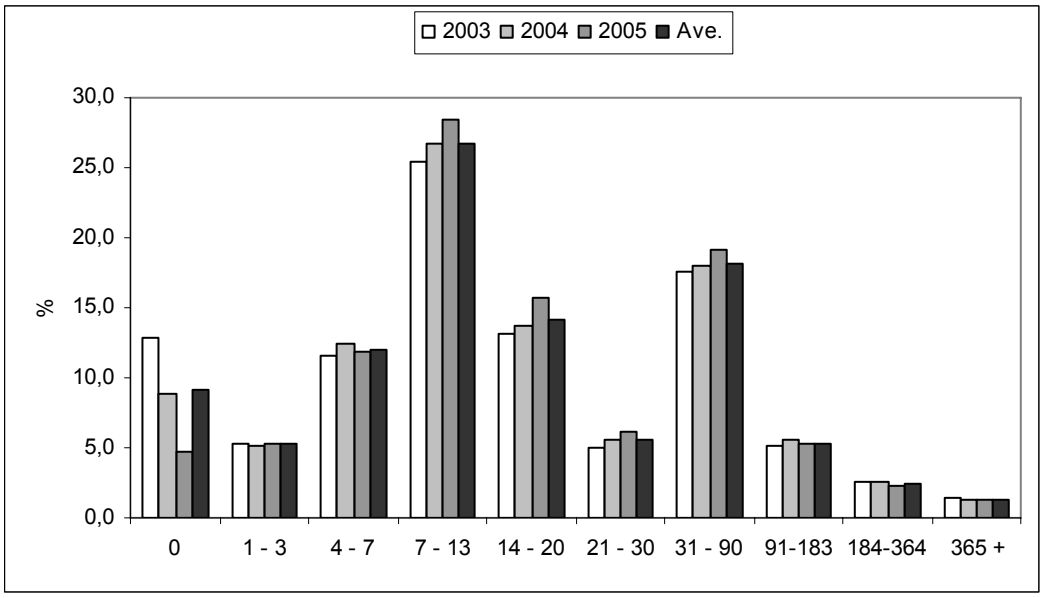

Figure 7.3 Distribution according to the duration of temporary incapacity for work

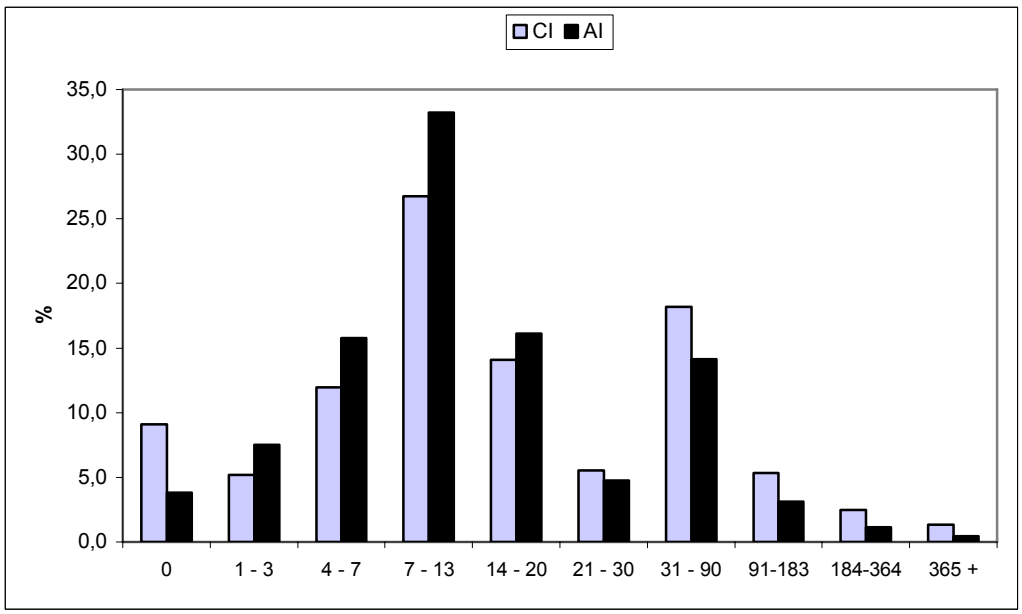

Figure 7.4 Distribution according to the duration of temporary incapacity for work (Ave.)

Table 7.5 Proportion of construction industry

Duration of Temporary Incapacity for Work	CI	AI	%
0	680	2975	22,9
1 - 3	390	5882	6,6
4 - 7	894	12304	7,3
7 - 13	1997	25943	7,7
14 - 20	1054	12574	8,4
21 - 30	414	3725	11,1
31 - 90	1360	11062	12,3
91 - 183	398	2433	16,4
184 - 364	185	889	20,8
365 +	101	352	28,8
Total	7473	78140	9,6

3) The number of workers in workplaces

Table 7.6 describes the distribution of the number and Table 7.7 describes the percentages of occupational injuries according to the number of workers in the workplaces for the years 2003-2005. While the columns denoted with "AI" illustrate the distributions for all industries, the columns denoted with CI illustrate the distributions for construction industry. The averages values of the three years are also given separately.

Number of workers in a workplace can be interpreted as an indicator for the size of firms. 10 groups are defined in the statistics each indicating different sizes.

Figure 7.5 shows the distribution for construction industry. As it is seen in the figure, the values in each group do not vary much over the years. The group in which the number of occupational accidents is highest is the first group consisting of 1 to 3 workers. The numbers of the occupational accidents generally decrease

in consecutive groups. But more than 50 % of the accidents occurred in firms employing less than 10 workers.

Figure 7.6 illustrates the distribution of the data for construction industry and the data representing all industries in percentages. It can be seen that in the first three groups the percentages of construction are higher than those of all industries.

But a sound comparison between the safety performances of the groups is not possible unless these values are related to the number of workers in these groups. Thus the distribution of the number of workers according to the groups defined in Table 7.8 is derived from the statistical yearbook of the year 2005. But the statistical yearbook gives only the distribution representing all industries. Thus the distribution in construction is found by assuming that the distribution representing all industries also applies to construction. So the distribution in construction industry is calculated with the percentages representing all industries. Consequently the incidence rate (for year 2005) is calculated for each group and presented in Table 7.8 and Figure 7.7.

As seen in this table, construction industry has an incidence rate of 6,9 in total. This rate has its maximum value in the first group with a value of 17,8; followed by the second group with a value of 7,6. The incidence rate decreases continuously with increasing firm size. Thus it can be argued that in construction, the safety performance of small firms is worse than greater firms. This is especially true for firms with less than 4 workers.

In addition, it is seen in Figure 7.7 that the incidence rate of the first group representing all industries is also very high as it was in construction. But the rest of the groups have approximately uniform (constant) rates while construction had continuously decreasing rates as we go from 2003 to 2005.

Table 7.6 Distribution according to the number of workers in the workplaces

Number of workers in the workplaces	CI			AI			CI	AI
	2003	2004	2005	2003	2004	2005	Ave.	Ave.
1-3	2981	2995	2389	23997	22045	19519	2788	21854
4-9	1442	1226	1070	6615	8781	7736	1246	7711
10-20	1058	912	780	8689	9551	8493	917	8911
21-49	844	849	763	10411	12074	10594	819	11026
50-99	723	557	471	6835	7226	6343	584	6801
100-199	386	422	459	6930	7597	6818	422	7115
200-249	91	115	87	1937	2212	2001	98	2050
250-499	341	398	300	5396	6287	5618	346	5767
500-1000	243	246	137	3614	4200	3075	209	3630
1001 +	43	65	26	2244	3857	3726	45	3276
Total	8152	7785	6482	76668	83830	73923	7473	78140

Table 7.7 Distribution according to the number of workers in the workplaces (%)

Number of workers in the workplaces	CI			AI			CI	AI
	2003	2004	2005	2003	2004	2005	Ave.	Ave.
1-3	36,57	38,47	36,86	31,30	26,30	26,40	37,31	27,97
4-9	17,69	15,75	16,51	8,63	10,47	10,46	16,67	9,87
10-20	12,98	11,71	12,03	11,33	11,39	11,49	12,27	11,40
21-49	10,35	10,91	11,77	13,58	14,40	14,33	10,95	14,11
50-99	8,87	7,15	7,27	8,92	8,62	8,58	7,81	8,70
100-199	4,74	5,42	7,08	9,04	9,06	9,22	5,65	9,11
200-249	1,12	1,48	1,34	2,53	2,64	2,71	1,31	2,62
250-499	4,18	5,11	4,63	7,04	7,50	7,60	4,63	7,38
500-1000	2,98	3,16	2,11	4,71	5,01	4,16	2,79	4,65
1001 +	0,53	0,83	0,40	2,93	4,60	5,04	0,60	4,19
Total	100	100	100	100	100	100	100	100

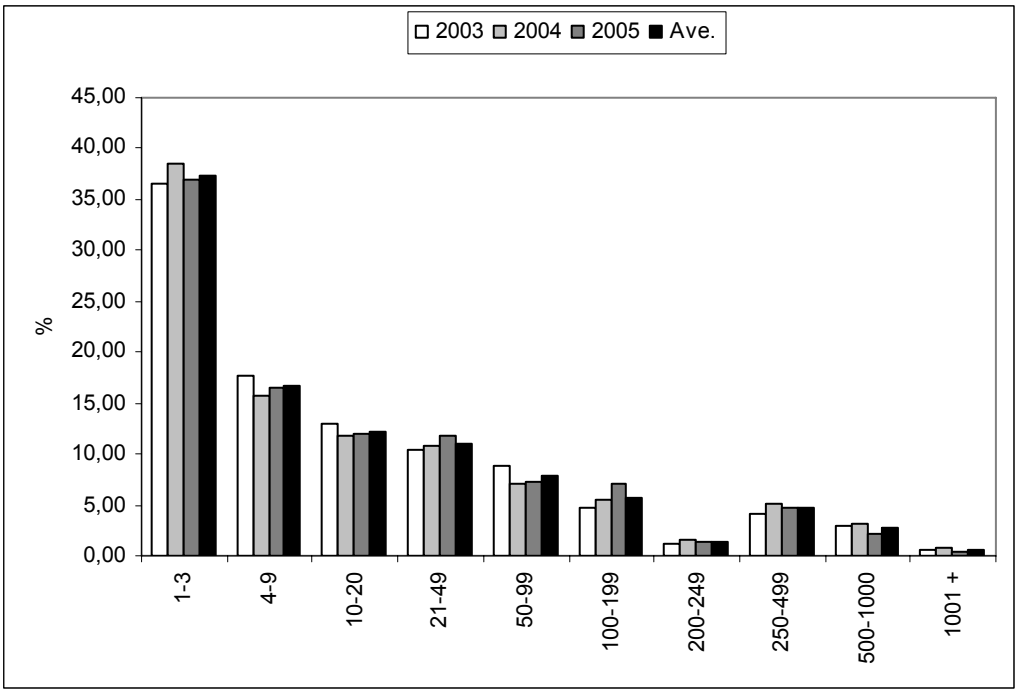

Figure 7.5 Distribution according to the number of workers in the workp.

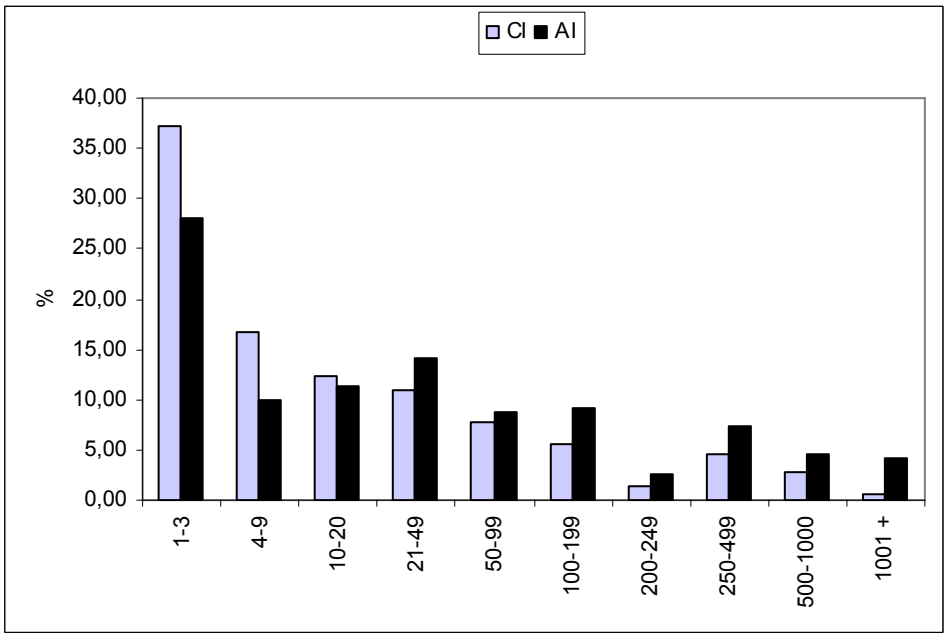

Figure 7.6 Distribution according to the number of workers in the workp. (Ave.)

Table 7.8 Distribution of the number of workers and incidence rates

Number of workers in the workplaces	# of workers			# of injuries		incidence rate	
	CI	AI	%	CI	AI	CI	AI
1-3	134515	996956	14,4	2389	19519	17,8	19,6
4-9	141197	1046480	15,1	1070	7736	7,6	7,4
10-20	118872	881021	12,7	780	8493	6,6	9,6
21-49	158955	1178093	17,0	763	10594	4,8	9,0
50-99	87596	649217	9,4	471	6343	5,4	9,8
100-199	93709	694519	10,0	459	6818	4,9	9,8
200-249	27519	203959	2,9	87	2001	3,2	9,8
250-499	76789	569121	8,2	300	5618	3,9	9,9
500-1000	51627	382634	5,5	137	3075	2,7	8,0
1001 +	42718	316605	4,6	26	3726	0,6	11,8
Total	933498	6918605	100,0	6482	73923	6,9	10,7

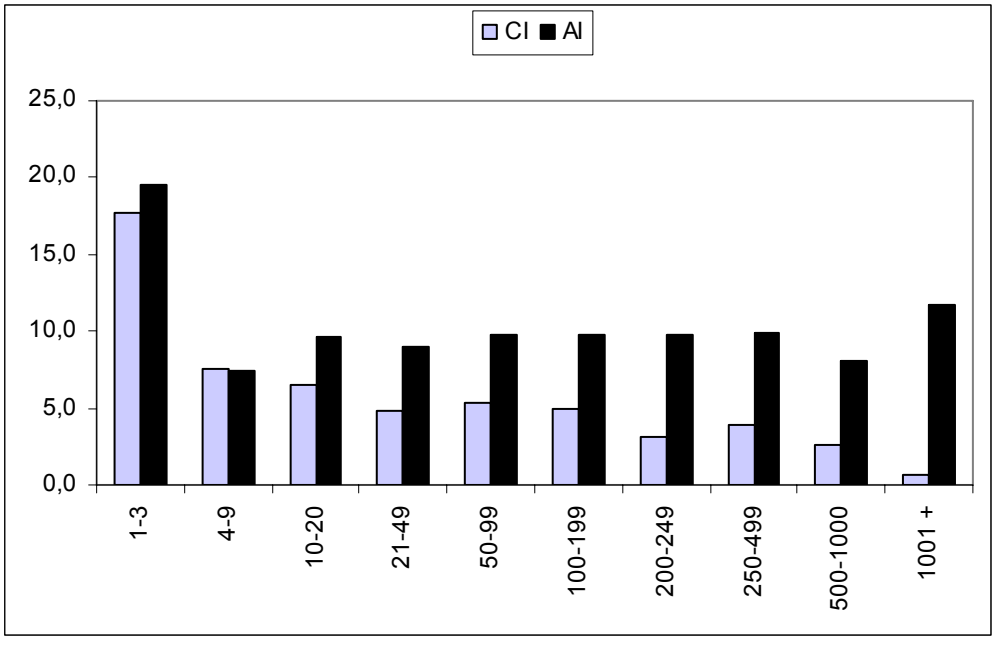

Figure 7.7 Incidence rates of the groups

4) The distribution of the number of occupational injuries according to the working hours at which they occurred.

Table 7.9 describes the distribution of the number and the percentages of occupational injuries according to the working hours at which they occurred for the year 2005. While the columns denoted with "AI" illustrate the distributions for all industries, the columns denoted with CI illustrate the distributions for construction industry.

Figure 7.8 illustrates the distribution of the data for construction industry and the data representing all industries in percentages. It can be seen that generally most of the accidents occur in the first half of the day. This is more true for construction since 66,4 % of all the accidents in construction occurred in the first half of the day while this ratio was 60,9 % for all industries.

If it is assumed that the number of workers does not vary much during the day it can be stated that the graph of the incidence rate drawn according to the hours will be similar to the graph drawn with absolute numbers of occupational accidents. The hour in which the number of accidents is highest is the first working hour. This decreases until the 6^{th} hour and then it increases again. The decrease can be explained by the adaptation of the worker to the working environment and the increase can be the result of the getting tired of the workers.

Table 7.9 Distribution according to the working hours

Working hours	#		%	
	CI	AI	CI	AI
	2005	2005	2005	2005
1st Hour	1346	13708	20,8	18,5
2 nd Hour	1081	11192	16,7	15,1
3 th Hour	1030	11003	15,9	14,9
4 th Hour	845	9112	13,0	12,3
5 th Hour	369	5975	5,7	8,1
6 th Hour	448	6144	6,9	8,3
7 th Hour	606	7939	9,3	10,7
8 th Hour	756	8849	11,7	12,0
9 th hour and Over				
Unknown	1	1	0,0	0,0
Total	6482	73923	100,0	100,0

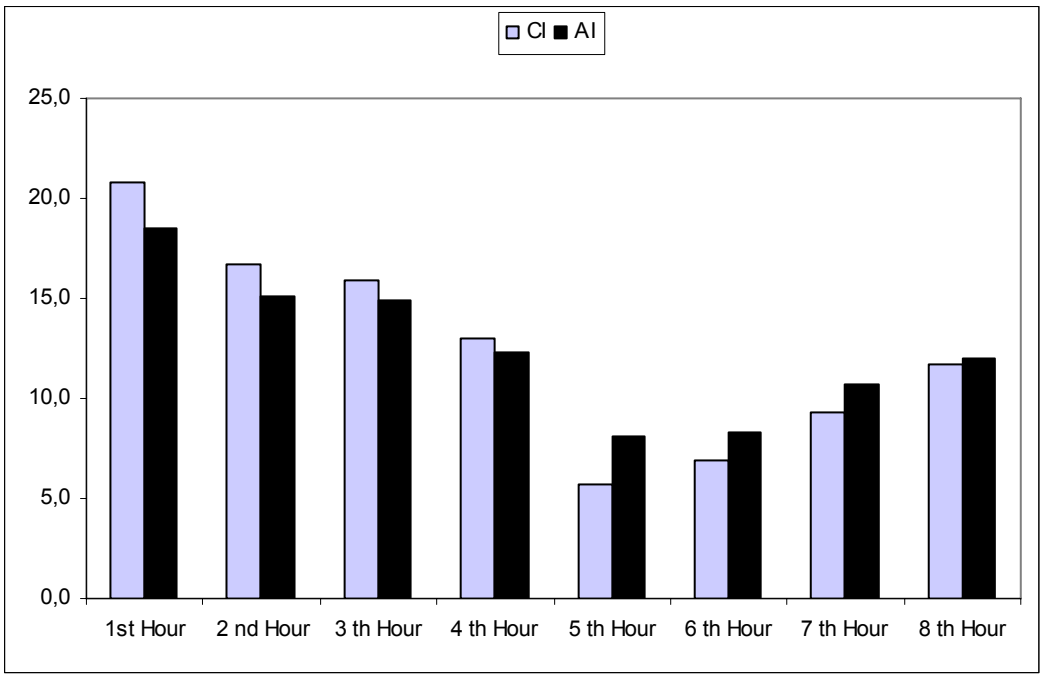

Figure 7.8 Distribution according to the working hours

5) The distribution of the number of cases of permanent incapacity to work according to the degree of permanent incapacity

Table 7.10 describes the distribution of the number of permanent incapacities according to the degree of permanent incapacity for the years 2003-2005. While the columns denoted with "AI" illustrate the distributions for all industries, the columns denoted with CI illustrate the distributions for construction industry.

Figure 7.9 illustrates the distribution of the average values for construction industry and for all industries in percentages. The number of occupational injuries is highest at incapacity degrees less than % 20. As it is seen in the figure most of the permanent incapacities in construction have high incapacity degrees in comparison to all industries.

It was stated that about all 20 % of all permanent incapacities will be recorded in construction industry. The same ratio is also calculated for the different incapacity degrees and is presented at the last column of Table 7.10. (Average values are used) As it is seen in this column the share of construction industry in number of permanent incapacities increases while the considered incapacity degree increases. This again supports the idea that the share of construction is higher in worse resulting injuries than in other injuries.

In addition the weighted incapacity degree is calculated for each year and for the average values of these years as it was described in previous chapters. Table 7.11 presents the results of this calculation. This table shows that the weighted incapacity degree is higher in construction in comparison to all industries, as expected.

Table 7.10 Distribution of the number of permanent incapacities according to the degree of permanent incapacity

Incapacity degrees	CI			AI			CI	AI	CI/AI
	2003	2004	2005	2003	2004	2005	Ave.	Ave.	%
Less than 10%	0	0	0	0	0	0	0	0	
% 10-19	89	99	116	591	712	686	101	663	15
% 20-29	61	63	51	297	322	319	58	313	19
% 30-39	89	78	60	299	297	265	76	287	26
% 40-49	51	46	44	204	167	170	47	180	26
% 50-100	66	63	53	205	195	199	61	200	30
Total	356	349	324	1596	1693	1639	343	1643	21

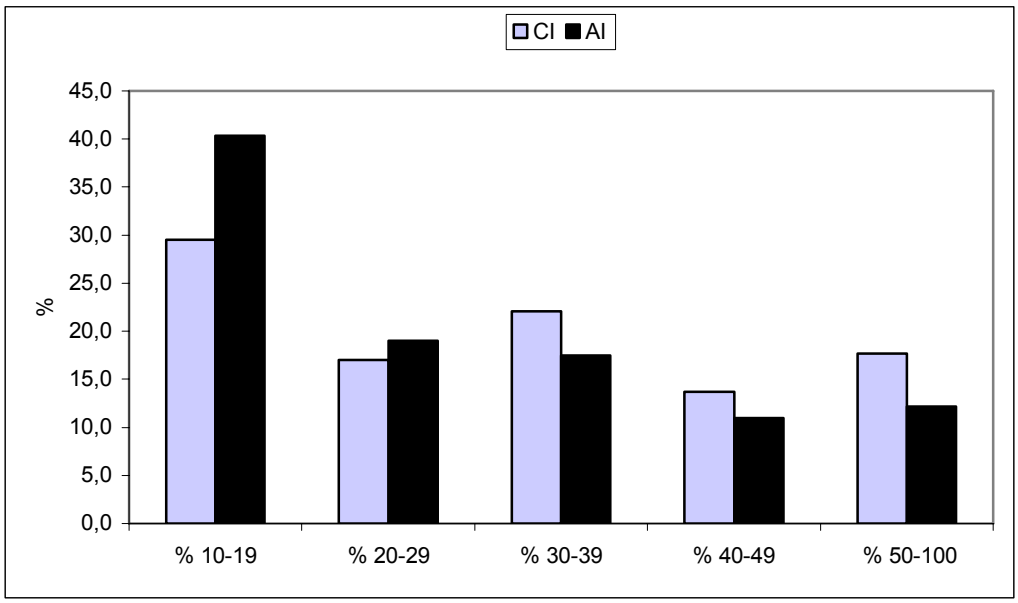

Figure 7.9 Distribution of the number of permanent incapacities according to the degree of permanent incapacity (%)

Table 7.11 Weighted incapacity degrees

	2005	2004	2003	Ave.
AI	30,14	29,84	31,71	30,54
CI	36,73	35,65	33,75	35,42

6) The distribution of the number of the cases of permanent incapacity to work according to the age groups.

Table 7.12 describes the distribution of the number of permanent incapacities in construction industry according to the age groups for the years 2003-2005 as percentages.

Figure 7.10 shows the distribution of the average values representing the three years in percentages. As it can be seen in the figure the group in which the number of accidents was highest was the group “30 - 34”. It is closely followed by the group “35-39”. But since the distribution of the workers according to the age groups are not known, it is not possible to designate these groups as the most risky ones.

Table 7.12 Distribution of the number of permanent incapacities according to the age groups

Age Groups	2003	2004	2005	Ave.
14	0,00	0,00	0,00	0,00
15-17	0,00	0,58	0,00	0,20
18-24	9,89	10,43	6,83	9,11
25-29	16,95	11,01	15,53	14,50
30-34	18,93	17,10	21,74	19,20
35-39	17,23	19,42	17,70	18,12
40-44	11,58	16,81	14,29	14,20
45-49	17,23	15,07	13,66	15,38
50-54	5,93	6,38	5,59	5,97
55-59	1,13	2,03	3,73	2,25
60-64	0,56	0,29	0,93	0,59
65 +	0,56	0,87	0,00	0,49

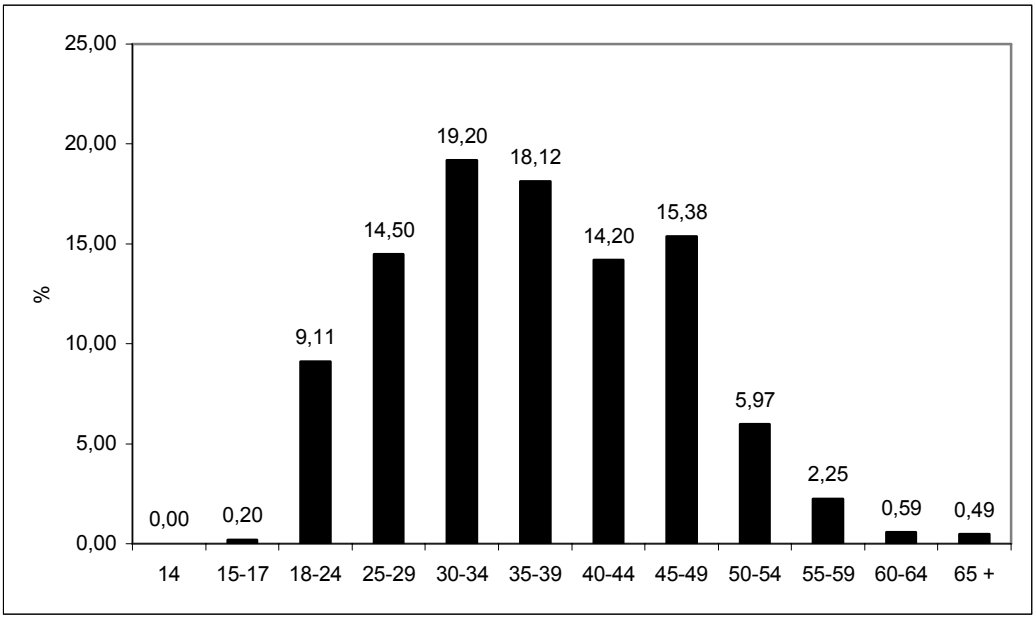

Figure 7.10 Distribution of the number of permanent incapacities according to the age groups (%)

7) The distribution of the number of the fatal occupational injuries according to the age groups.

Table 7.13 describes the distribution of the number of the fatal occupational injuries in construction industry according to the age groups for the years 2003-2005 as percentages.

Figure 7.11 shows the distribution of the average values representing the three years in percentages. As it can be seen in the figure the group in which the number of the fatal occupational injuries was highest was the group "30 - 34". It is followed by the group "35-39". But since the distribution of the workers according to the age groups are not known, it is not possible to designate these groups as the most risky ones.

Table 7.13 Distribution of the number of the fatal occupational injuries according to the age groups

Age Groups	2003	2004	2005	Ave.
14	0,00	0,00	0,00	0,00
15-17	0,36	0,00	0,00	0,12
18-24	8,39	5,70	10,07	8,12
25-29	13,87	17,49	18,06	16,48
30-34	18,25	20,15	21,18	19,88
35-39	14,60	18,25	15,63	16,12
40-44	15,69	16,73	14,58	15,64
45-49	11,31	11,79	9,03	10,67
50-54	10,95	5,32	4,17	6,79
55-59	2,92	2,28	3,47	2,91
60-64	2,19	1,14	1,74	1,70
65 +	1,46	1,14	2,08	1,58
Total	100,00	100,00	100,00	100,00

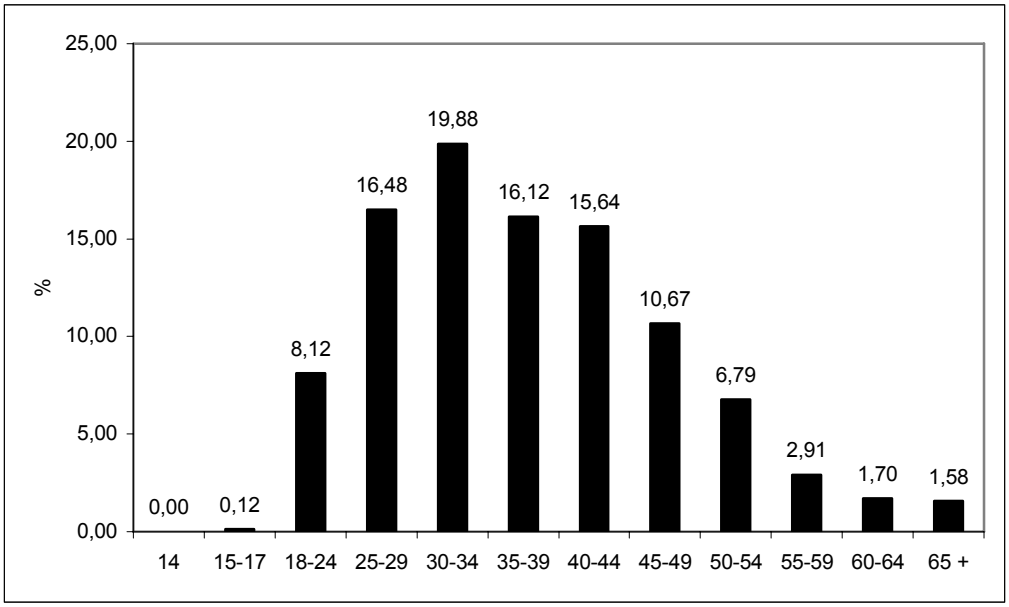

Figure 7.11 Distribution of the number of the fatal occupational injuries according to the age groups

8) The distribution of the number of occupational injuries according to the occupation of the victim

Table 7.14 describes the distribution of the number and percentages of occupational injuries according to the occupation of the victim. The average of the years 2003-2005 is presented in the table only instead the distribution of each year only separately.

As it is seen in the table 9 main occupation groups are defined by SII. Each main group consists of different number of subgroups. It's obvious that this categorization of occupations is a more general categorization. Thus much information can not be extracted about the construction specific occupations. It can be inferred from the table that more than 91% of the victims have the occupations defined in the last three categories. That means a composition of 45 % qualified worker, 13 % operators and about 32 % unqualified workers.

Table 7.14 Distribution of the number of occupational injuries according to the occupation of the victim

C.	Occupation of the victim	#	%
10	**Legislators, senior officials and managers without specification**	**305,00**	**4,08**
11	Legislators and senior officials	24,00	0,32
12	Corporate managers 1	266,33	3,56
13	General managers 2	14,67	0,20
20	**Professionals without specification**	**31,33**	**0,42**
21	Physical, mathematical and engineering science professionals	16,33	0,22
22	Life science and health professionals	1,00	0,01
23	Teaching professionals	2,33	0,03
24	Other professionals	11,67	0,16
30	**Technicians and associate professionals without specification**	**46,00**	**0,62**
31	Physical and engineering science associate professionals	32,00	0,43
32	Life science and health associate professionals	2,00	0,03
33	Teaching associate professionals	0,33	0,00
34	Other associate professionals	11,67	0,16
40	**Clerks without specification**	**99,33**	**1,33**
41	Office clerks	79,67	1,07
42	Customer service clerks	19,67	0,26
50	**Service workers and shop and market sales workers without specification**	**92,33**	**1,23**
51	Personal and protective services workers	85,33	1,14
52	Models, salespersons and demonstrators	7,00	0,09
60	**Skilled agricultural and fishery workers without specification**	**44,33**	**0,59**
61	Skilled agricultural and fishery workers	44,00	0,59
62	Subsistence agricultural and fishery workers	0,33	0,00
70	**Craft and related trades workers without specification**	**3432,33**	**45,89**
71	*Extraction and building trades workers*	*1849,00*	*24,72*
72	Metal, machinery and related trades workers	1423,00	19,02
73	Precision, handicraft, printing and related trades workers	44,00	0,59
74	Other craft and related trades workers	116,33	1,56

Table 7.14 Distribution of the number of occupational injuries according to the occupation of the victim (continued)

80	**Plant and machine operators and assemblers without specification**	**1002,67**	**13,41**
81	Stationary-plant and related operators	168,33	2,25
82	Machine operators and assemblers	448,00	5,99
83	Drivers and mobile-plant operators	386,33	5,17
90	**Elementary occupations without specification**	**2426,33**	**32,44**
91	Sales and services elementary occupations	341,33	4,56
92	Agricultural, fishery and related labourers	10,00	0,13
93	*Labourers in mining, construction, manufacturing and transport*	*1662,33*	*22,22*
99	Other Parts of occupation, not mentioned above	412,67	5,52
T	**Total**	**7479,67**	**100**

9) The distribution of the number of the accidents according to the type of accidents

Table 7.15 describes the distribution of the number of the accidents according to the type of accidents for the years 2003-2005. The average values representing these years and the percentages in each year are also illustrated.

Figure 7.12 demonstrates the distribution of the percentages of the average values. 19 main types of accidents are defined in the tables. As it is seen from this figure the prevailing accident type is “Stepping on, striking against or struck by objects excluding falling objects” with 29,17 %. The second and third highest values are observed by “Falls of persons” and “Struck by falling objects” with values 21,93 % and 17,08 %; respectively. This is actually an unexpected distribution since the prevailing accident type in construction is known as “Falls of persons” with percentages in total about 50. This difference can a number of reasons: Different classification systems, failures in the coding of the accident types etc. In addition it should be kept also in mind that these main groups have also many subgroups which can cause this difference.

Other important types of accidents are “Accident caused by machinery” and “Transportation accidents” as it can be figured out from the figures. In addition the percentages of accident types do not much change between the years.

Table 7.15 Distribution of the accidents according to the type of accidents

Code	Type of Accidents	#				%			
		2003	2004	2005	Ave.	2003	2004	2005	Ave.
100	Transportation accidents	445	408	341	398	5,46	5,24	5,26	5,33
200	Accidental poisoning	6	2	14	7	0,07	0,03	0,22	0,10
300	Falls of persons	1729	1690	1497	1639	21,21	21,71	23,09	21,93
400	Accident caused by machinery	777	717	518	671	9,53	9,21	7,99	8,97
500	Accident caused by explosion	89	97	81	89	1,09	1,25	1,25	1,19
600	Exposure to or contact with extreme temperatures	103	119	87	103	1,26	1,53	1,34	1,38
700	Struck by falling objects	1340	1286	1203	1276	16,44	16,52	18,56	17,08
800	Stepping on, striking against or struck by objects excluding falling objects	2428	2329	1782	2180	29,78	29,92	27,49	29,17
900	Exposure to or contact with electric current	146	141	132	140	1,79	1,81	2,04	1,87
1000	Injuries due to challenging of the body	208	179	152	180	2,55	2,30	2,34	2,40
1100	Contamination of the part of body with a foreign object	231	284	147	221	2,83	3,65	2,27	2,95
1200	Biting and kicking by animals, by poisonous insect	10	5	7	7	0,12	0,06	0,11	0,10
1300	Treatment accident and vaccination complications	1	0	0	0	0,01	0,00	0,00	0,00
1500	Accident while welding	51	30	35	39	0,63	0,39	0,54	0,52
1600	Murder and wound	143	148	173	155	1,75	1,90	2,67	2,07
1700	Trauma due to battle operation	0	3	1	1	0,00	0,04	0,02	0,02
1800	Exposure to or contact with harmful substances or radiations	9	8	11	9	0,11	0,10	0,17	0,12
1900	Other types of accident, not elsewhere classified	423	339	301	354	5,19	4,35	4,64	4,74
U	Unknown	13	0	0	4	0,16	0,00	0,00	0,06
T	Total	8152	7785	6482	7473	100,00	100,00	100,00	100,00

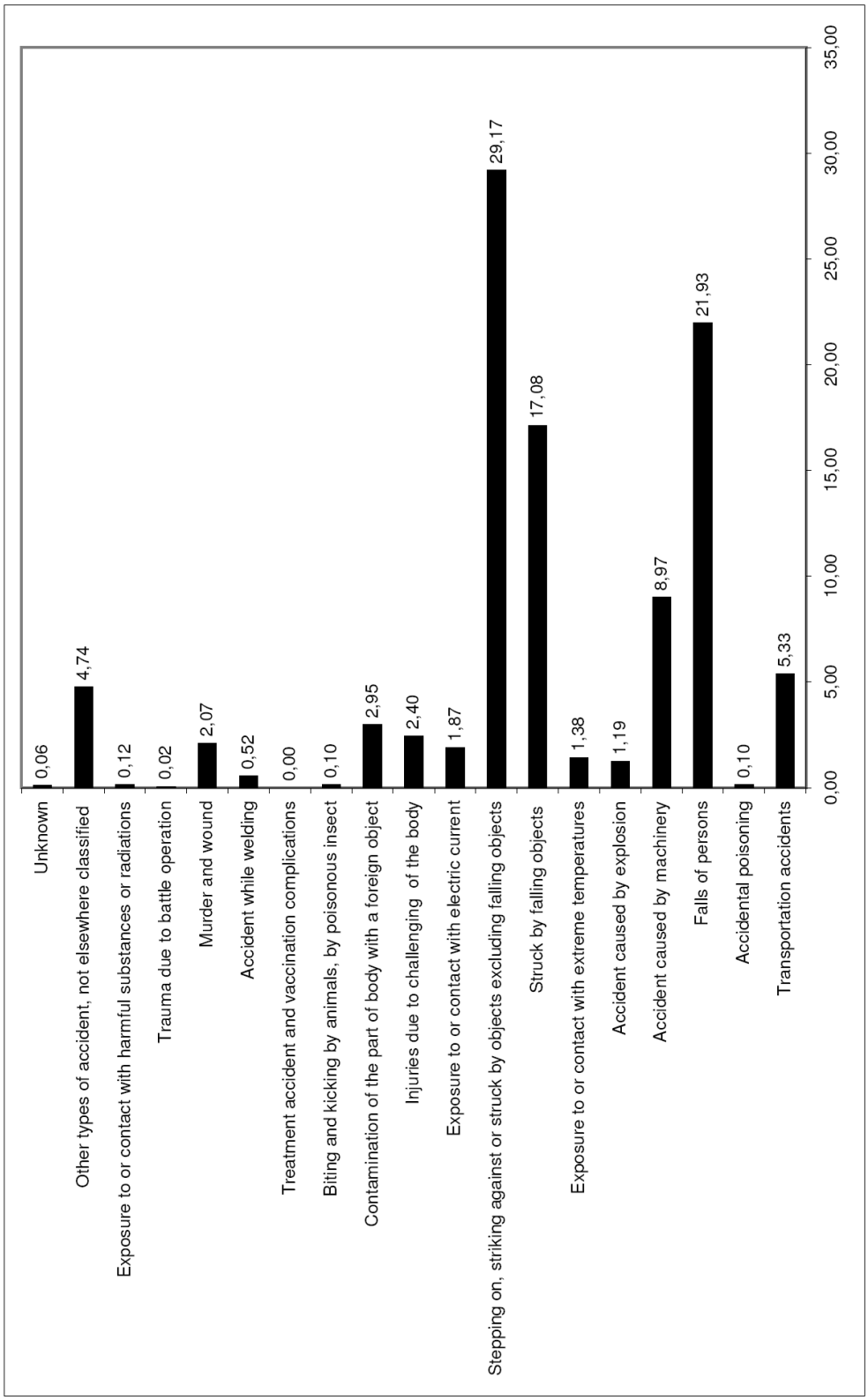

Figure 7.12 Distribution of the accidents according to the type of accidents

10) The distribution of the number of the occupational injuries according to the type of injury

Table 7.16 describes the distribution of the number of the occupational injuries according to the type of injury for the years 2003-2005. The average values representing these years and the percentages in each year are also illustrated.

Figure 7.13 demonstrates the distribution of the percentages of the average values. 19 main types of injury are defined in the tables. As it is seen from this figure the prevailing injury type is “Superficial injuries and open wounds” with 29,88 %. This injury type is followed by “Crushed and contusions”, “Fractures” and “Dislocations, sprains and strains” with percentages 24,43; 18,38 and 15,76; respectively.

Table 7.17 presents the percentages representing all industries in addition to the percentages of construction industry calculated with average values of the years. A comparison of the last columns show that the share of occupational injuries that result in fractures and dislocations, sprains and strains is higher in construction industry than the same share in all industries. It can figured out from this comparison that the results of occupational injuries in construction are more serious.

Table 7.16 Distribution of the number of the occupational injuries according to the type of injury

Code	Type of injury	#				%			
		2003	2004	2005	Ave.	2003	2004	2005	Ave.
100	Fractures	1515	1326	1279	1373	18,58	17,03	19,73	18,38
200	Dislocations, sprains and strains (Including avulsions, lacerations, sprains, strains, traumatic haemarthroses, ruptures, subluxations and tears of joints and ligaments)	1393	1235	905	1178	17,09	15,86	13,96	15,76
300	Superficial injuries and open wounds	2376	2397	1926	2233	29,15	30,79	29,71	29,88
400	Crushed and contusions	1920	1936	1621	1826	23,55	24,87	25,01	24,43
500	Contamination of the body or the eye with a foreing object	269	317	168	251	3,30	4,07	2,59	3,36
600	Concussion and internal injuries (Including blast injuries, bruises, concussion, crushing, lacerations, traumatic haematoma, punctures, ruptures and tears of internal organs)	41	21	12	25	0,50	0,27	0,19	0,33
700	Burns, corrosions, scalds and frostbite	257	217	222	232	3,15	2,79	3,42	3,10
800	Acute poisonings and infections	9	7	23	13	0,11	0,09	0,35	0,17
900	Other specified types of injury	203	176	150	176	2,49	2,26	2,31	2,36
1000	Type of injury, unspecified	159	153	176	163	1,95	1,97	2,72	2,18
U	Unknown	10	0	0	3	0,12	0,00	0,00	0,04
T	Total	8152	7785	6482	7473	100,00	100,00	100,00	100,00

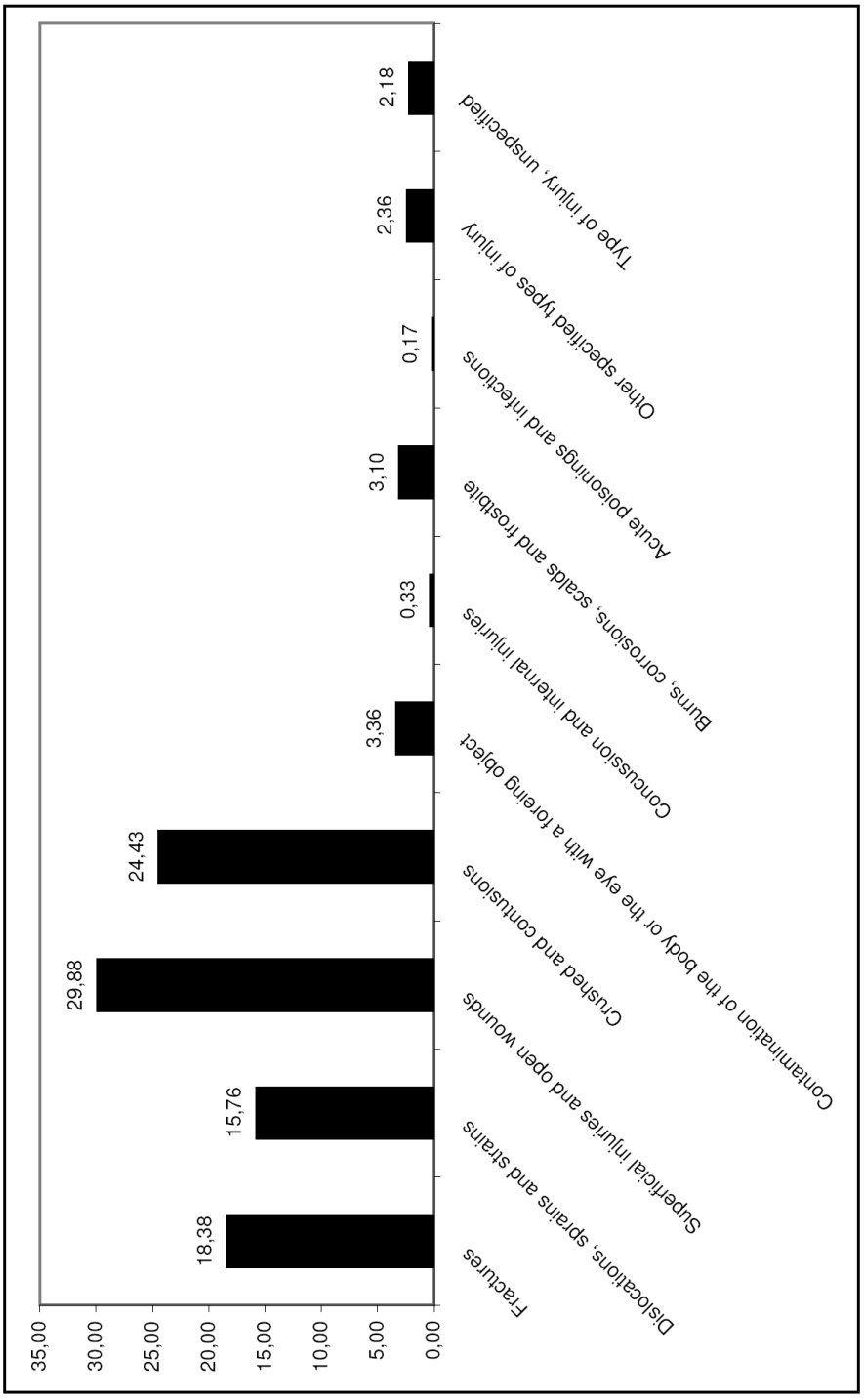

Figure 7.13 Distribution of the number of the occupational injuries according to the type of injury

Table 7.17 Distribution of the percentages of the occupational injuries according to the type of injury

Code	Type of injury	CI	AI
100	Fractures	18,38	10,04
200	Dislocations, sprains and strains	15,76	14,47
300	Superficial injuries and open wounds	29,88	38,38
400	Crushed and contusions	24,43	26,31
500	Contamination of the body or the eye with a foreign object	3,36	3,23
600	Concussion and internal injuries	0,33	0,19
700	Burns, corrosions, scalds and frostbite	3,10	3,69
800	Acute poisonings and infections	0,17	0,44
900	Other specified types of injury	2,36	1,48
1000	Type of injury, unspecified	2,18	1,53
U	Unknown	0,04	0,24

11) The distribution of the number of the occupational injuries according to the part of the body injured

Table 7.18 describes the distribution of the number of the occupational injuries according to the part of the body injured for the years 2003-2005. The average values representing these years and the percentages in each year are also illustrated.

Figure 7.14 demonstrates the distribution of the percentages of the average values. Ten main parts of the body are defined in the tables. It can be seen from the figure that 42,2 % of the occupational injuries resulted in an injury in upper extremities. This peak value is followed by lower extremities and the head with percentages 30,7 and 10,2; respectively.

Table 7.18 Distribution of the number of the occupational injuries according to the part of the body injured

Part of body injured	#				%			
	2003	2004	2005	Ave.	2003	2004	2005	Ave.
Head	809	887	600	765	9,9	11,4	9,3	10,2
Neck, inclusive spine and vertebra in the neck	47	60	50	52	0,6	0,8	0,8	0,7
Back, including spine and vertebra in the back	500	337	307	381	6,1	4,3	4,7	5,1
Trunk and internal organs	413	280	303	332	5,1	3,6	4,7	4,4
Upper Extremities	3422	3216	2818	3152	42,0	41,3	43,5	42,2
Lower Extremities	2448	2500	1939	2296	30,0	32,1	29,9	30,7
Whole body and multiple sites	354	304	247	302	4,3	3,9	3,8	4,0
Other Parts of body injured	53	57	59	56	0,7	0,7	0,9	0,8
Part of body injured, unspecified	96	144	159	133	1,2	1,8	2,5	1,8
Unknown	10	0	0	3	0,1	0,0	0,0	0,0
Total	8152	7785	6482	7473	100,0	100,0	100,0	100,0

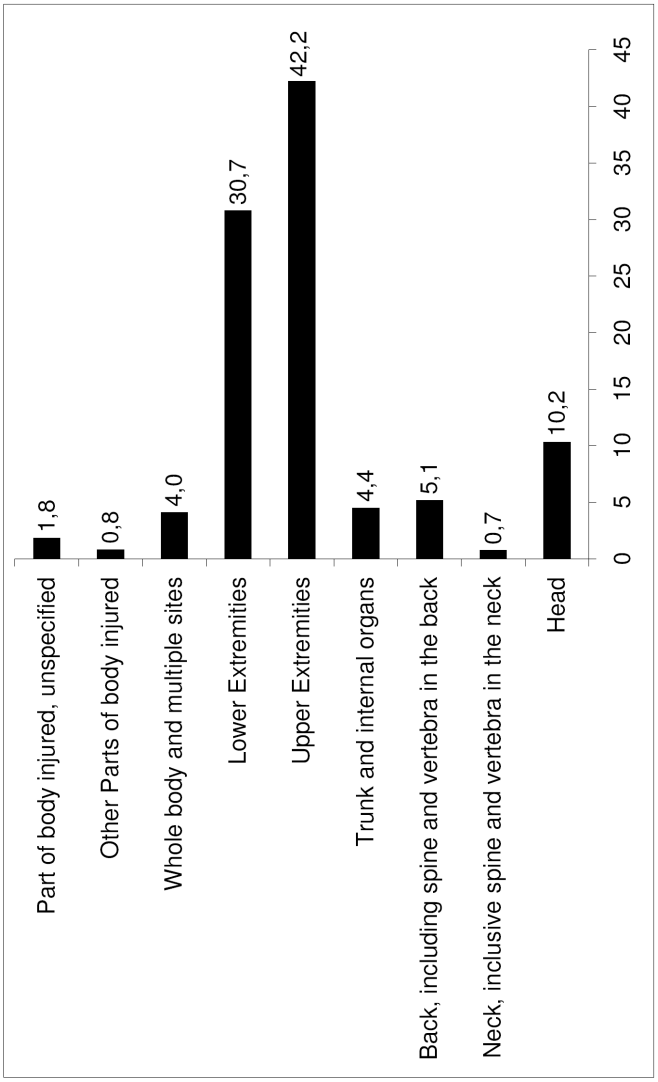

Figure 7.14 Distribution of the number of the occupational injuries according to the part of the body injured

CHAPTER 8

CONCLUSIONS AND RECOMMANDATIONS

8.1 Conclusions

1 - It is seen in the second and third chapters that;

- the statistics concerning occupational health and safety can be used for a number of purposes which also include the planning of preventive actions and the comparison of performances.
- the importance of statistics concerning occupational health and safety are discovered in the international area. Many conventions are published by ILO to ensure a minimum standard of these statistics.
- the statistics are generally published by the insurance companies and social security agencies, as it is in Turkey. Other sources of statistics are labour inspectorates and statistical offices.
- the coverage of statistics differs much between countries which makes the harmonization and standardization of the data necessary.
- there is not a unique definition of an occupational accident or an occupational disease. Occupational accident and occupational injury are used interchangeably in some sources even though they are different concepts.
- the interpretations undertaken with absolute accident figures are misleading and that accident statistics should always base on relative values. Comparative measures based on the relative values were investigated. It is realized that there are discrepancies in the definition of the measures and in

the names of the measures. In addition, the advantages of some comparative measures are hindered by the lack of data.

2 - It is found in the fourth chapter that;

- many obstacles exist in the detection of the occupational diseases which result in unrealistic numbers and rates of occupational diseases, especially in Turkey.
- the number of occupational diseases given in SII statistics does not represent the real situation in construction industry.
- the statistics of occupational diseases of SII should not be used in the comparison of health performances of industries.
- failures exist in the statistics of SII.

3 - Chapter five yielded the following results in the comparison of industries in terms of safety:

It is seen that the construction industry ranks the first places in the comparisons undertaken with absolute numbers. The number of cases of permanent incapacity to work, the number of fatal occupational injuries, the number of total days of temporary incapacity to work and the number of workers were highest in the construction industry.

Construction industry had the second highest values in the comparison of numbers of work places and occupational injuries.

But these results should be interpreted carefully since it was stated in Chapter 3 that comparisons based on absolute numbers are misleading.

It is found that the construction industry has a very low incidence rate of occupational injury. Construction industry ranked 24th place among 43 industries.

That means that the risk of exposure of the construction workers to accidents is lower than the risk of workers employed in several other industries. But this positive picture changes when a measure indicating a severer result is chosen for comparison, such as the incidence rate of fatal occupational injuries or the severity rate which takes the permanent incapacities and fatalities also into account. This can be best observed by looking at the increasing ranks of the construction industry in comparisons made with the incidence rates R_1, R_2 and R_3. The ranks in these comparisons were found as 24, 11 and 4, respectively. The same observation can also be made when one considers the rankings of the severity rates S_1 and S_2. Thus it is clear that the construction industry is more important when the severity of the occupational injuries is considered.

4 - Chapter six yielded the following results in the comparison of provinces in terms of safety:

- The number of accidents per worker is highest in Kocaeli, Tekirdağ, Zonguldak, Bolu and İzmir. Ankara and İstanbul come much later in this ranking.
- The first four provinces which perform worst are found to be as Bolu, Kocaeli, Zonguldak and İzmir. It can be said that the safety performance of the provinces Bolu and Kocaeli can partly be the result of the demand on rapid construction after the earthquakes when the negative effects of the acceleration of the usual production process on the consideration of the occupational health and safety measures is considered.

- When the ranking of İzmir, Ankara and İstanbul is examined it is seen that the ranking between these provinces is İzmir, Ankara and İstanbul. (İstanbul performs better than the others)

5 - Chapter seven examined some distributions of the number of occupational injuries, and the following results were found:

- The workers at their first days at a new workplace experience more accidents than the workers with working period 2-7 days.
- More than a quarter of the temporary incapacities of 365+ days were caused by accidents in construction industry. The share of construction in temporary incapacities increases with increasing lost days.
- The safety performance of small firms is worse than greater firms. This is especially true for firms with less than 4 workers.
- The hour in which the number of accidents is highest is the first working hour. This decreases until the 6^{th} hour and then it increases again. The decrease can be explained by the adaptation of the worker to the working environment and the increase can be the result of the getting tired of the workers.
- The number of occupational injuries is highest at incapacity degrees less than 20 %.
- The share of construction industry in the number of permanent incapacities increases while the incapacity degree considered increases, supporting the argument that the share of construction is higher in worse resulting injuries than in other injuries.
- The age group in which the number of accidents resulting in permanent incapacity was highest was the group “30 - 34”.
- The age group in which the number of fatal occupational injuries was highest was the group “30 - 34”.
- More than 91 % of the victims in construction industry have the occupations defined in the last three categories in the related table of SII. That means a composition of 45 % qualified workers, 13 % operators and about 32 % unqualified workers.
- The prevailing accident type in construction industry is “Stepping on, striking against or struck by objects excluding falling objects” with 29,17 %. The second and third highest values are observed as “Falls of persons” and “Struck by falling objects” with values 21,93 % and 17,08 %;

respectively. This is actually an unexpected result since the prevailing accident type in construction is known as “Falls of persons” with percentages in total about 50.

- The prevailing injury type in construction is “Superficial injuries and open wounds” with 29,88 %. This injury type is followed by “Crushed and contusions”, “Fractures” and “Dislocations, sprains and strains” with percentages 24,43; 18,38 and 15,76; respectively. The share of occupational injuries that result in fractures and dislocations, sprains and strains is higher in construction industry than the corresponding share in all industries.
- 42,2 % of the occupational injuries in the construction industry resulted in an injury in upper extremities. This value is followed by lower extremities and the head with percentages 30,7 and 10,2; respectively.

8.2 Recommendations for Future Research

- Statistics of the occupational accidents and diseases of the Turkish construction industry should be compared with the statistics of other countries by taking the issues of Chapter 2 into consideration.
- The examination of the occupational accidents in the construction industry should be expanded with several other construction specific variables. It should be kept in mind that the denominator data is necessary for a sound comparison and interpretation.
- The information about the occupational diseases is insufficient due to the unrealistic statistics of the occupational diseases in Turkey and should be completed with the data of a country which has similar characteristics to Turkey.
- The analysis should consider a longer duration when the evolution over time will yield valuable information.
- More statistical analysis should be added such as hypothesis testing.

REFERENCES

[1] *World Day for Safety and Health at Work 2005: A Background Paper*, International Labour Organization, Geneva, 2005.

[2] *Statistical Year Book,* TURKEY: Social Insurance Institute, Ankara, 2005.

[3] Hoyos, C. G., Zimolong, B. *Occupational Safety and Accident Prevention*. Elsevier: Amsterdam, 1988.

[4] *Resolution concerning statistics of occupational injuries (resulting from occupational accidents)*, adopted by the Sixteenth International Conference of Labour Statisticians, October 1998.

[5] *C155 Occupational Safety and Health Convention*, 1981.

[6] *P155 Protocol of 2002 to the Occupational Safety and Health Convention*, 1981.

[7] *C160 Labour Statistics Convention*, 1985.

[8] *R170 Labour Statistics Recommendation*, 1985.

[9] *Recording and Notification of Occupational Accidents and Diseases*. An ILO Code of Practice, International Labour Office, Geneva, 1996.

[10] The Framework Directive 89/391/EEC on the introduction of measures to encourage improvements in the safety and health of workers at work

[11] *Employment Outlook,* OECD, 1989.

[12] *506 sayılı Sosyal Sigortalar Kanunu*

[13] *4958 sayılı Sosyal Sigortalar Kurumu Kanunu*

[14] *Statistical Year Book,* TURKEY: Social Insurance Institute, Ankara, 2004.

[15] *Statistical Year Book,* TURKEY: Social Insurance Institute, Ankara, 2003.

[16] *Statistical Year Book,* TURKEY: Social Insurance Institute, Ankara, 2002.

[17] Taswell K., Digby P.W, *New Methodologies for Collecting Occupational Injury Data,* ILO, Geneva.

[18] *Eurostat's Activities in the Area of Health Statistics,* European Commission, Luxembourg, 2006.

[19] *The European Statistics Code of Practice,* Eurostat, 2006.

[20] *European Statistics on Accidents at Work (ESAW)*, Methodology, 2001.

[21] *European Occupational Diseases Statistics (EODS)*, Phase 1 Methodology, European Commission, 2000.

[22] Heinrich H.W., *Industrial Accident Prevention,* McGraw-Hill, USA, 1950.

[23] *Occupational Health and Safety Management Systems,* Occupational Health and Safety Management Assessment Series, OHSAS 18001, 1999.

[24] *Present Status of Japanese Industrial Safety and Health,* Japan Industrial Safety and Health Association (JISHA), Tokyo, 2006.

[25] Ridley J., Channing J., *Safety at Work Sixth Edition,* Butterworth-Heinemann, Great Britain, 2003.

[26] Petersen D., *Techniques of Safety Management,* McGraw-Hill Book Company, 1971.

[27] *Employment Outlook, OECD,* 1990.

[28] Karjalainen A., Niederlaender E., *Occupational Diseases in Europe in 2001,* Eurostat, European Communities, 2004.

[29] International Labour Organization, http://laborsta.ilo.org, 02.01.2007.

[30] *Statistical Office of the European Communities Accidents Eurostat Metadata in SDDS Format,* Summary Methodology, Luxembourg, 2007.

APPENDIX A

SYNOPTIC TABLE

Synoptic table — Tableau synoptique — Cuadro sinóptico

Country, area or territory	Type of data and source	Minimum period of absence	Maximum period for death	Coverage					Days lost	Reference year
				Workers		Economic activities	Occupational diseases	Commuting accidents		
				Type	% of total emp.					
Pays, zone ou territoire	Type de données et source	Période d'absence minimum	Période maximale du décès	Portée					Journées perdues	Année de référence
				Travailleurs		Activités économiques	Maladies professionnelles	Accidents de trajet		
				Type	% emploi total					
País, área o territorio	Tipo de datos y fuente	Período mínimo de ausencia	Período máximo para defunción	Alcance					Días perdidas	Año de referencia
				Trabajadores		Actividades económicas	Enfermedades profesionales	Accidentes de trayecto		
				Tipo	% empl. total					
1	2	3	4	5	6	7	8	9	10	11
Africa - Afrique - Africa										
Bénin	R/Ins	...	...	...	...	All	Excl.	Incl.	.	C
Botswana	R/Not	...	...	...	...	All	...	...	WD	C 1
Burkina Faso	R/Ins	none	none	I	...	All	Excl.	Incl.	WD	C
Egypt (1)	R/Not	1 day	6 months	E	10.5	All	Excl.	Incl.	CD(TPD)	C 1
Eritrea	R/Not	...	...	...	..	All	Inc.	Incl	WD	C
Ethiopia	R/Not	...	...	E,SE	...	All	Excl.	Incl.	WD	C
Guinée	C/Ins	8 days	none	I	...	...	Excl.	Excl.	WD	C
Maroc	R/Ins	none	none	E	1.0	M,Q	Excl.	Excl.	WD	C
Mauritius	R/Ins	3 days	30 days	E	74.5	All x P	Incl.	Incl.	.	C 1
Namibia	C/Ins	3 days	1 year	E	...	All	Incl.	Incl.	CD(TPD)	F 2
Seychelles	R/Not	none	none	E	...	All	Excl.	Excl.	.	C
South Africa	R/Not	14 days	...	E,SE	...	...	Incl.	Excl.	.	C
Swaziland	R/Not	none	none	E,SE	...	All	Incl.	Excl.	.	C
Togo	R/Ins	...	...	E	...	All x Agr,PA,F	Incl.	Incl.	WD	C
Tunisie	C/Ins	4 days	...	E	38.5	All x P	Excl.	Excl.	WD	C
Zambia	R/Not	...	...	E	...	M,E,C,TRH	Incl.	Excl.	WD	C
Zimbabwe	R/Ins	1 day	1 year	IE	..	All x PA,D,Inf	Incl.	Excl.	WD(TPD)	C 1
America - Amérique - America										
Anguilla	R/not	...	...	...	...	...	...	...		...
Argentina	R/Ins	...	...	E,SE	59.6	All	...	...	WD	F
Barbados	R/Not	3 days	...	E	...	All	Excl.	Incl.	CD	C
Belize	C/Ins	none	none	I	78.5	All	Incl.	Incl.	WD(TI)	C 2
Bermuda	R/Not	...	...	E,SE	100	All	Excl.	Excl.	.	C
Bolivia	C/Ins	...	...	I	18.7	All	Excl.	Excl.	WD	C
Brasil	C/Ins	1 day	none	E	27.1	All	Excl.	Incl.	.	C 1
Canada	C/Ins	1 day	none	E, SE	85.1	All x AF	Incl.	Excl.	WD(TPD)	C 2
Costa Rica	C/Ins	none	none	I	56.2	All	Incl.	Incl.	WD	C
Chile	R/...	...	...	IE	47.4	All	...	...	CD	C
El Salvador	C/Ins	none	none	IE	23.6	All x P (P from 1998)	Excl.	Incl.	WD	C
Guatemala (2)	C/Ins	none	none	IE	26.6	All	Incl.	Incl.	CD(TI)	C 1
Guyana	C/Ins	none	1 year	E,SE	...	All	Excl.	Excl.	WD	C
Honduras (3)	R/Not	...	...	...	...	All, Pr	...	...		C
Jamaica	R/Not	...	...	...	...	M,TSC,E	Incl.	Excl.	.	C
México	R/Ins	1 day	none	IE	31.9	All	Incl.	Incl.	WD(TI)	C 1
Nicaragua	C/Ins	1 day	15 days	IE	18.9	All	Incl.	Incl.	CD(TITP)	C 1

1	2	3	4	5	6	7	8	9	10	11
Puerto Rico (4)	R/Survey	1 day	1 year	E	86.0	All x PA,Agr.	Excl.	Excl.	WD	C 1
Puerto Rico	R/Census	.	...	E,SE	97.3	...	...	...	.	...
St. Kitts and Nevis	R/...	...	...	...	...	All	...	...	...	...
St. Vincent and the Grenadines	R/Not	4 days	none	E	...	All x AF,Pol	Excl.	Excl.	WD(TI)	C 1
Suriname	R/Not	1 day	same year	E	41.2	All x PA,AF	Excl.	Incl.	WD(TPD)	C 1
Trinidad and Tobago	R/Not	…	…	E,SE	100.0	All	Excl.	Excl.	.	C
United States (4)	R/Survey	1 day	.	E	77.6	All x G	Incl.	Excl.	WD(TI)	C 1
United States	R/Census	.	none	E,SE	100	All	Incl.	Excl.	.	C 1
Venezuela	R/Ins	none	none	I	37.0	All	Excl.	Excl.	CD(TPD)	C 1
Virgin Islands (US)	R/Survey	…	…	E,SE	…	All	Excl.	Excl.	.	C
Asia - Asie - Asía										
Armenia	R/Not	…	…	…	…	…	…	…	…	…
Azerbaijan	R/Not	1 day	…	E	…	…	Excl.	Excl.	WD(TI)	C
Bahrain	R/Ins	none	none	E,SE	100	All	Incl.	Incl.	WD(TI)	C 1
Bangladesh	R/Not	…	…	E	…	M, TSC	Excl.	Excl.	WD	C
China	R/Not	1 day	30 days	E	…	All x Pr.	Excl.	Incl.	.	C
Cyprus	C/Ins	3 days	none	E	74.2	All	Excl.	Incl.	WD(TI)	C 2
Hong Kong (China)	R/Not	3 days	none	E	77.3	All	Excl.	Incl.	WD(TI)	C 1
India	R/Not	…	…	E	…	Mines	Excl.	Excl.	.	C
Indonesia	C/Ins	…	…	I	…	All	Excl.	Incl.	.	C
Israel	C/Ins	3 days	same year	E,SE	100	All	Incl.	Incl.	WD	C
Japan	R/Not	…	…	E	…	All	Excl.	Excl.	.	C
Jordan	R/Ins	1 day	none	E	…	All x AF	Incl.	Incl.	WD(TPD)	C 1
Kazakhstan	R/Not	1 day	varies	E,SE	54.0	All	Incl.	Excl.	WD(TPD)	C 2
Korea, Rep. of (3)	C/Ins	…	…	I	45.0	All	Incl.	Incl.	WD	C
Kuwait	R/Not	1 day	none	E	...	M	Excl.	Incl.	WD(TPD)	C 1
Kyrgyzstan	R/Not	none	none	E	33.4	All	Excl.(up to 1998)	Incl.	WD	C
Macau (China)	R/Not	none	none	E	55.7	All x P	Excl.	Incl.	CD(TI PI)	C 2
Malaysia	R/Not	3 days	none	E,SE	83.3	All x AF	Incl.	Incl.	WD(TI)	C 2
Malaysia	C/Ins	...	...	I	...	...	...	...	.	...
Myanmar (5)	R/Not	2 days	…	E,SE	…	M	Excl.	Excl.	.	C
Pakistan (6)	R/Not	…	…	E	1.1	M, MQ	Incl.	Excl.	.	C
Philippines	R/Survey	none	same year	E,SE	9.1	All x P,AF	Excl.	Excl.	WD(TPD)	C 1
Singapore	R/Not	0-3 days	none	E	32.6	All	Excl.	Excl.	WD(TPD)	C 1
Sri Lanka	R/Not	3 days	1 year	E	34.7	M,E,TSC,C	Incl.	Excl.	WD(TPD)	C 1
Rép. arabe syrienne	C/Ins	…	…	I	46.0	All	Incl.	Incl.	.	C
Tajikistan	R/Not	…	…	…	…	M,E,G,W,C	…	…	.	…
Thailand	C/Ins	3 days	…	I	16.4	All	Incl.	Incl.	.	C

1	2	3	4	5	6	7	8	9	10	11
Europe - Europe - Europa										
Austria	R/Ins	none	none	E, SE	71.0	All	Excl.	Excl.	.	C 3
Belarus	R/Not	1 day	same year	E	…	All	Excl.	Excl.	WD(TI)	C
Belgique	C/Ins	1 day	none	IE	47.5	All x P,AF	Excl.	Incl.	CD(TPD)	C 2
Bulgaria	R/Not	…	…	E,SE	35.1	All	Incl.	Incl.	.	C
Croatia	C/Ins	none	immediate	E,SE	83.5	All	Excl.	Incl.	WD(TI)	C 2
Czech Republic	R/Not	1 day	none	E,SE	95.1	All x AF,Pol	Excl.	Excl.	CD(TI)	C 1
Denmark	R/Not	1 day	1 year	E,SE	100	All x ASO	Excl.	Excl.	.	C 1
España	R/Not	1 day	none	I	85.3	All x PA,AF	Excl.	Excl.	CD(TI)	C 1
Estonia	C/Ins	1 day	1 year	I	100	All x AF,Pol	Incl.	Incl.	CD(TPD)	C 1
Finland	C/Ins	3 days	1 year	E	84.8	All	Non-fatal	Excl.	CD(TI)	C 1
France	C/Ins	1 day	varies	E	74.5	All x P	Excl.	Excl.	CD(TI)	C 3
Germany	C/Ins	3 days	none	E,SE	100	All	Excl.	Incl.	CD	C
Grèce	C/Ins	1 day	none	E	48.1	All	Excl.	Incl.	CD(TPD)	C 2
Hungary	R/Not	3 days	90 days	E,SE	98.4	All	Excl.	Excl.	CD	C
Iceland	R/Not	2 days	…	E	…	All	Incl.	Excl.	.	C
Ireland	R/Not	3 days	none	E,SE	100	All	Excl.	Excl.	CD	C
Isle of Man	R/Not	4 days	1 year	E	…	All x SF,AT	Excl.	Excl.	.	C
Italy	C/Ins	3 days	none	I	76.1	All	Excl.	Incl.	CD(TI)	C
Latvia	R/Survey	1 day	none	E	...	All	Excl.	Excl.	WD	C
Lithuania	R/Not	1 day	none	E,SE	63.8	All x AF	Excl.	Incl.	CD(TPD)	C 1
Macedonia, Former Yugoslav Rep. of	C/Ins	…	…	I	…	All	Excl.	Excl.	.	C
Malta	C/Ins	4 days	…	E,SE	…	All	Incl.	Excl.	WD	C
Moldova, Rep. of	R/Not	1 day	none	E	52.4	All	Excl.	Excl.	WD(TPD)	C
Norway	R/Not	none	none	E (7)	99.8	All	Excl.	Excl.	CD(IT)	C 1
Poland	R/Not	none	6 months	E,SE	76.1	All x Agr	Excl.	Excl.	CD(TI)	C 1
Portugal	R/Not	none	one year	E,SE	67.1	Al x PA,AF	Excl.	Excl.	CD(TI PI)	C 3
Roumanie	R/Not	3 days	same year	E,SE	60.6	All x AF,P	Excl.	Incl.	CD(TPD)	C 2
Russian Federation	R/Not	1 day	none	E	4.9	AllxLowrates	Excl.	Incl.	WD(TPD)	C 1
San Marino	R/Not	...	...	E	...	All	Excl.	Excl.	.	C
Slovakia	R/Not	1 day	none	IE	97.9	All	Excl.	Excl.	CD(TI)	C
Slovenia	R/Not	1 day	1 month	I	85.2	All	Excl.	Incl.	WD(TI)	C 1
Suisse	C/Ins	3 days	same year	IE	88.0	All	Incl.	Excl.	.	C 2
Sweden	R/Ins	1 day	none	E,SE	97.3	All	Excl.	Excl.	WD(TPD)	C 1
Turkey	R/Ins	…	…	IE	25.3	All	Incl.	Excl.	WD	C
Ukraine	R/Not	1 day	4 months	E	71.3	All xAF	Excl.	Excl.	WD(TI D)	C 1
United Kingdom	R/Not	3 days	1 year	E,SE	91.8	All x SF,AT	Excl.	Excl.	.	F 1
Oceania - Océanie - Oceania										
Australia (7)	C/Ins	5 workdays	3 years	E	83.0	All x AF	Incl.	Excl.	WD(TI)	F 3
New Zealand	R/Ins	6 days	1 year	E,SE	100	All	Incl.	Incl.	…	F

Notes

(1) Establishments with 50 or more workers.

(2) Excluding establishments with 2 workers or less.

(3) Establishments with 10 or more workers.

(4) Excluding farms with less than 11 employees.

(5) Establishments with 10 or more workers and using power, and those with 20 or more workers and without power.

(6) Establishments using power or with 20 or more employees.

(7) Excluding Victoria and Australian Capital Territory.

Notes

(1) Etablissements occupant 50 travailleurs et plus.

(2) Non compris les établissements occupant 2 travailleurs et moins.

(3) Etablissements occupant 10 travailleurs et plus.

(4) Non compris les fermes occupant moins de 11 salariés.

(5) Etablissements de 10 salariés ou plus lorsqu'ils utilisent l'électricité et dans le cas contraire, établissements de 20 salariés ou plus.

(6) Etablissements utilisant électricité et occupant 20 salariés et plus.

(7) Non compris Victoria et Australian Capital Territory.

Notas

(1) Establecimientos con 50 trabajadores o más.

(2) Excl. establecimientos con 2 trabajadores o menos.

(3) Establecimientos con 10 trabajadores o más.

(4) Excl. granjas con menos de 11 asalariados.

(5) Establecimientos con 10 trabajadores o más y que utilizan electricidad, y los con 20 trabajadores o más sin electricidad.

(6) Establecimientos que utilizan electricidad o los con 20 asalariados o más.

(7) Excl. Victoria y Australian Capital Territory.

Explanations				
Type of data and source	R	reported injuries	/Not	notification system
	C	compensated injuries	/Ins	insurance scheme
(col. 2)			/Survey	survey of establishments or establishment reporting
			/Census	census of occupational fatalities
Minimum period of absence from work	workdays		none	
(col. 3)	day(s)			
Maximum period for death after accident	days		immediate	
	month(s)		same year	
	year(s)		none	
(col.4)			varies	
Coverage				
Workers	E	employees	I	insured persons
Type (col. 5)	SE	self-employed persons	IE	insured employees
% of total emp.	Workers covered by the statistics as a percentage of total employment; latest year available			
(col. 6)				
Economic activities	All	all economic activities		
	x	excluding		
(col. 7)	AF	armed forces	Lowrates	activities with low rates of injuries
	Agr	agriculture	M	manufacturing
	ASO	air, sea and offshore accidents	MQ	mining and quarrying
	AT	air transport	P	public sector
	C	construction	PA	public administration
	D	domestic services	Pr	private sector
	E	electricity, gas and water	Pol	police
	F	financial services	SF	sea fishing
	G	Government	TRH	wholesale and retail trade, restaurants and hotels
	Inf	Informal sector	TSC	transport, storage and communication
Occupational diseases	Incl.	occupational diseases included	Excl.	occupational diseases excluded
	Non-fatal	non-fatal occupational diseases included		
(col. 8)				
Commuting accidents	Incl.	commuting accidents included	Excl.	commuting accidents excluded
(col. 9)				
Time lost	WD	workdays	measured for:	
	CD	calendar days	(TI)	cases of temporary incapacity only
	weeks		(TI PI)	cases of temporary and permanent incapacity
	none	time lost not measured	(TID)	cases of temporary incapacity and death
(col. 10)			(TPD)	all cases of occupational injury (temporary and permanent incapacity and death)
Reference year	C	calendar year	1	injuries incl. in statistics for year of accident
	F	financial year	2	injuries incl. in statistics for year of notification or submission of claims
(col. 11)			3	injuries incl. in statistics for year in which compensation was paid.

APPENDIX B

LIST OF INDUSTRIES

Code	Industry
1	Agriculture and livestock
2	Forestry and logging
4	Fishing
11	Coal mining
12	Mines except of coal
13	Crude petroleum and natural gas
14	Stone quarrying clay and sand
19	Pits other non-metallic material products
20	Food manufacturing industries (except beverages)
21	Beverage industry
22	Tobacco industry
23	Textile industry
24	Manufacturing of foot wear other wearing apparels and made up textile goods
25	Manufacture of wood and cork (except manufacture of furniture)
26	Furniture industry
27	Manufacture of paper and paper products
28	Printing, publishing and allied industries

List of Industries (continued)

29	Manufacturing of leather and manufacturing of goods from leather (except shoes)
30	Rubber industries
31	Manufacturing of chemicals and chemical products
32	Manufacturing of petroleum and coal derivates
33	Products obtaining from stone, clay, sand etc.
34	Basic metal industries
35	Manufacturing of metal products industry (except machinery and transport equipment)
36	Manufacturing and repairing of machine (except electrical machinery)
37	Manufacturing and repairing of electrical machineries and apparatus
38	Manufacturing of transport equipments and supplies
39	Miscellaneous manufacturing industries (not elsewhere classified)
40	Construction
51	Heating with electric, gas and steam
52	Water and sanitary instalments
61	Wholesale and retail trade
62	Banks and other financial institutions
63	Insurance
64	Real estate works (services)
71	Transport
72	Storage and warehousing
73	Communication services
81	Government services
82	Public services
83	Legal, commercial and technical services
84	Cinema, theatre and similar services
85	Personnel services