APPLICATION OF OHSAS 18000 TO BİGADİÇ BORON WORK IN ORDER TO IMPROVE THE WORKING CONDITIONS

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APPLICATION OF OHSAS 18000 TO BİGADİÇ BORON WORK TO IMPROVE THE EXISTENT WORKING CONDITIONS

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ABSTRACT

APPLICATION OF OHSAS 18000 TO BİGADİÇ BORON WORK TO IMPROVE THE EXISTENT WORKING CONDITIONS

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OHSAS 18000 Occupational Health and Safety Assessment System Series have a special importance to mining. OHSAS standardization aims to provide secure, more tranquil and healthier working space to the employees by means of establishing an assessment system. As mining activities are generally carried out in high risk environments, OHSAS has been improved and has increased its importance for mining in the world.

In this study, Bigadiç Boron Work is taken as a case for the application of OHSAS 18001. Theoretical information about OHSAS and risk assessment is provided, and some exemplifying mines that implemented this standard are given to illustrate their benefits. All possible hazard sources are identified and a "Hazard Source Inventory" is proposed. Together with this hazard source inventory, a risk assessment method is developed for Bigadiç Boron Work. Several tasks are evaluated according to this proposed form.

In order to define policy, principles and structure of Occupational Health and Safety Assessment System, an "OHSA Manual" is prepared. Several sets of standard forms

were prepared and recommended for Bigadiç Boron Work. Consistency throughout the organization was established by means of these created standard documents, procedures and forms.

Proposed Job Safety Analysis form can be used to identify, analyze and record the steps involved in performing a specific task, and the existing or potential safety and health hazards associated with each step. Several safe job procedures were also prepared with the help of the risk assessment process.

In addition to this, an "Emergency Plan" is proposed for enterprise to prevent loss of life, property and information, and provide safety in case of any emergency or natural disaster. An "OHS Audit Instrument" is suggested for the Bigadiç Boron Work that will play a key role for continuous improvement of the system. Audits are integral part of OHSAS in order to identify hazards, improve health and safety conditions, and check compliance with regulations.

These studies also show that there are some problems in the implementation of the system. The main problem is ineffective data recording and keeping. Lack of consciousness of employees and low commitment of top management constitute another important difficulty. Although these problems are commonly encountered in practice, applying OHSAS 18000 standard is still worthwhile method of improving work environment.

Keywords: OHSAS 18000, Occupational Health and Safety, Risk Assessment.

ÖZ

MEVCUT ÇALIŞMA KOŞULLARININ İYİLEŞTİRİLMESİ İÇİN BİGADİÇ BOR İŞLETMESİNE OHSAS 18000'İN UYGULANMASI

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OHSAS 18000 İş Sağlığı ve Güvenliği Yönetim Sistemi Serisinin madencilik için özel bir önemi bulunmaktadır. OHSAS standardı bir yönetim sistemi oluşturarak çalışanlar için daha güvenli, daha huzurlu ve sağlıklı bir çalışma ortamı sağlamayı hedeflemektedir. Madencilik genellikle yüksek risk taşıyan çalışma ortamlarında gerçekleştirildiğinden, OHSAS dünya madenciliğinde önem kazanmaktadır.

Bu çalışmada, Bigadiç Bor İşletmesine OHSAS 18001'in uygulanması örnek olarak alınmıştır. Çalışmada, OHSAS 18000 standart serisi ve risk yönetimi hakkında teorik bilgiler verilmekte ve bu bilgiler bazı OHSAS 18001 uygulanmış madenlerden örnekler ile desteklenmektedir. Bütün olası tehlike kaynakları belirlenmiş ve bir "Tehlike Kaynakları Envanteri" hazırlanmıştır. Bu envanter ile birlikte işletme için bir risk yönetimi metodu geliştirilmiştir. Bazı iş kalemlerinin önerilmekte olan bu forma göre değerlendirilmesi gerçekleştirilmiştir.

İş Sağlığı ve Güvenliği Yönetim Sistemi'nin (İSGYS) politikasını, prensiplerini ve yapısını tanımlamak için bir "İSG El Kitabı" oluşturulmuştur. Bigadiç Bor İşletmesi

için bazı standart form setleri hazırlanmış ve önerilmiştir. Hazırlanan bu doküman, prosedür ve formlar aracılığıyla organizasyon genelinde tutarlılık sağlanmıştır.

Önerilen İş Güvenlik Analizi formu bir işi gerçekleştirirken yapılan iş basamaklarını ve mevcut veya olası tehlikeleri tanımlamak, analiz etmek ve kayıt altına almak için kullanılabilir. Risk değerlendirmesinin yardımı ile bazı güvenli iş prosedürleri hazırlanmıştır.

Buna ek olarak bir acil durum ya da doğal afet durumunda can, mal ve bilgi kayıplarını önlemek ve güvenliği sağlamak için bir "Acil Durum Planı" önerilmektedir. İşletme için sistemin sürekli gelişiminde çok önemli bir rol oynayacak olan "İSG Denetleme Aracı" önerilmiştir. Tehlikelerin tanımlanmasında, iş sağlığı ve güvenliğinin geliştirilmesinde ve sistemin mevzuata uygunluğunu kontrol etmede denetimler İSGYS'nin ayrılmaz bir parçasıdırlar.

Yapılan bu çalışmalar sistemin uygulanmasında bazı sorunlar meydana çıktığını göstermektedir. En büyük problem veri kaydetme ve saklamadaki yetersizliktir. Çalışanların bilinç düzeyinin azlığı ve üst yönetiminin sorumluluktan kaçışı da bir diğer önemli sorunu oluşturmaktadır. Bu sorunlar madencilik sektörü içerisinde oldukça yaygın olmasına rağmen, OHSAS 18000'in uygulanması çalışma koşullarının iyileştirilmesinde oldukça önemli bir yer arz etmektedir.

Anahtar Kelimeler: OHSAS 18000, İş Sağlığı ve Güvenliği, Risk Yönetimi.

To mine workers of Turkey who shall someday understand that accidents are not their destiny

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CHAPTER 1

INTRODUCTION

Occupational health and safety requirements in many countries have become very important in recent years. Organizations of all types are increasingly concerned with achieving and practicing good occupational health and safety performance by controlling their OH&S risks, consistent with their OH&S policy and objectives. They do so in the context of increasingly better legislation and the development of economic and social policies those encourage better OH&S practices. It is undebatable that the OHSAS 18000 Occupational Health and Safety Assessment System series have a special importance to mining. It aims to provide a secure and healthier working space for the employees. As mining is, in general, a high risk work, the importance of OHSAS has drastically increased for mining industry. Therefore, this study aims to show that application of the OHSAS provides considerable improvements in the working environment. In this regard, Bigadiç Boron Work is studied as an example of application of the OHSAS.

Chapter 2 underlines the severity of accidents in mining industry. Some dramatic statistical information is given about mine accidents in Turkey and in the world. The impact of accidents on the mining industry is described from both occupational safety and financial point of views.

Chapter 3 gives general information about the Occupational Health and Safety Assessment System (OHSAS) 18000, and describes its purpose. It delineates the benefits and requirements of the system. The standardization of the OHSAS in Turkey, documentation requirements and certification processes are given. It also focuses on the OHSAS 18000 in the mining industry and gives several examples of the OHSAS implemented mines both in Turkey and the world. Lastly, Chapter 3 focuses on the application of the OHSAS 18001. It gives the four main stages of the

OHSA System. It points out that the standard follows the Plan-Do-Check-Review cycle, with an emphasis on continuous improvement.

Chapter 4 deals with risk assessment in the OHSA System. The chapter clearly explains what risk assessment is and examines its stages. It focuses on risk evaluation techniques, and compares quantitative and qualitative risk evaluation techniques.

In Chapter 5, the application of the OHSAS 18000 to Bigadiç Boron Work is given in details. It describes Bigadiç Boron Work and provides some technical information about it. This chapter also covers the statistical data about Bigadiç Boron Work. An OHSA System was prepared for Bigadiç and its implementation stages are given from planning to management review. This chapter also introduces a risk assessment system, and gives its application stages. Moreover, an OHSA System Manual and Emergency Plan are constructed for Bigadiç Boron Work. The OHSA System Manual describes application of the OHSAS 18000 standard series to Bigadiç Boron Work and clearly shows its benefits. Especially, it identifies hazards and evaluates risks in the work environments of Bigadiç Boron Work within the context of the OHSAS 18000, and tries to improve existing conditions by proposing an occupational health and safety system with auxiliary documents, forms and procedures. As for the proposed Emergency Plan, it provides a comprehensive approach to emergency situations. It defines the roles and responsibilities of emergency teams and introduces how the organization and units should act in case of an emergency.

Chapter 6 gives the implementation results of the OHSA system. It shows what the benefits of applying the OHSAS 18000 requirements and an OHSA System are. Also the expected results and future benefits of the proposed system are emphasized.

CHAPTER 2

THE IMPORTANCE OF ACCIDENT PREVENTION IN MINING INDUSTRY

Historically, mining has been the industry with the highest fatal and nonfatal injury rates. Still today, one of the drastic features of the mining industry is the very high accident rate. Many directives, regulations and standards have been published for the industry to reduce the accident rates. Thousands of miners die from mining accidents each year, especially in coal mining and hard rock mining industries. Today, most of the deaths occur in developing countries, especially China, Brazil, and rural parts of developed countries. The worst coal mining disaster in the world took place on April 26, 1942 in Benxihu Colliery, located at Benxi, Liaoning, China. A coal-dust explosion killed 1,549 miners working that day. In 2003 China accounted for the largest number of coal-mining fatalities, accounting for about 80% of the world's total, although it produced only 35% of the world's coal (China Daily, 2004).

According to the ILO (International Labor Organization), annually about 250 million occupational accidents occur, causing 1.2 million fatalities and 160 million work-related diseases, in the world. In other words, 1 person dies in every 3 minutes. This fatality rate is 1 person in every 5-6 hours in Turkey. This makes Turkey's accident rate highest in Europe and third in the world after India and Russia. Most of the accidents occur in small organizations but the situation in big industrial organizations still cannot be compared with European ones (ILO-LABORSTA, 2009 and ILO, International Labour Conference 2002).

Figure 2.1 shows the rate of people suffered from occupational accidents by sectors in Turkey (2006 - 2007). It shows that average of 2.9% of all employees is suffered from an accident in one year period. Among these sectors, the mining sector

has the highest rate. That is, 10.1% of the employees in mining industry are suffered from occupational accidents.

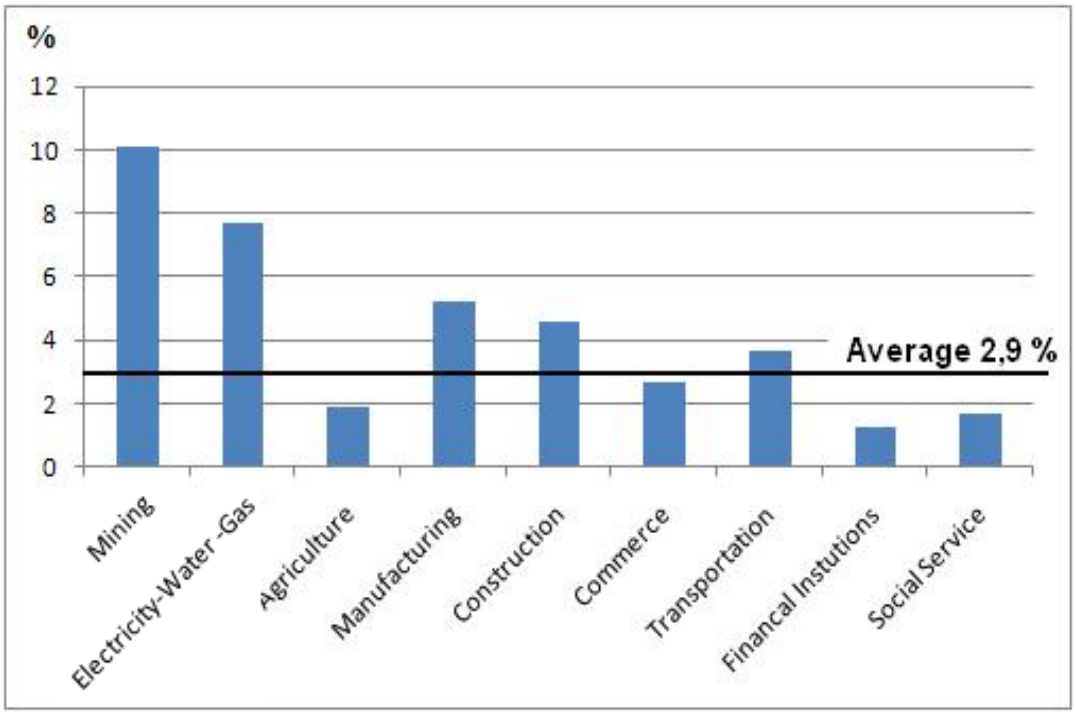

Figure 2.1: Percentage Distribution of People Suffered from Occupational Accidents by Sectors in Turkey (2006 - 2007) (TSI, 2008).

Statistical data also shows that Turkey has a very high accident rate compared to Europe and the world. Table 2.1 indicates that the average of fatalities due to occupational accidents in mining industry in Europe from 2004 to 2006 is 20.15 per hundred thousand while this rate is 92.47 per hundred thousand in Turkey. This means Turkish mining industry has a fatality rate 4.5 times more than that of the European mining industry. The same fatality rate is 35 per hundred thousand in Canada and 13.07 per hundred thousand in Australia.

Table 2.1: Fatality Rate due to Occupational Accidents in European Mining Industry (per hundred thousand) (ILO, 2009).

Country	**2004**	**2005**	**2006**	**Average**
Austria	23.00	15.40	7.90	15.43
Bulgaria	23.90	30.00	25.80	26.57
Croatia	19.10	38.10	19.20	25.47
Czech Republic	41.70	13.60	7.80	21.03
Estonia	0	17.00	38.50	18.50
Finland	0	43.50	0	14.50
France	0	11.20	19.20	15.20
Hungary	0	6.71	0	2.24
Ireland	1.00	4.20	2.10	2.43
Italy	19.00	10.00	22.00	17.00
Lithuania	0	0	35.50	11.83
Latvia	65.10	31.40	0	32.17
Malta	0	0	0	0
Moldavia	43.40	36.90	0	26.77
Norway	9.10	3.00	0	4.03
Poland	33.60	19.00	15.80	22.80
Portuguese	82.50	31.40	17.10	43.67
Romania	18.00	16.00	19.00	17.67
Slovakia	34.00	0	65.00	33.00
Slovenia	0	0	26.00	8.67
Spain	40.20	32.00	38.40	36.87
Sweden	0	0	13.30	4.43
Switzerland	2.20	1.50	1.70	1.80
Turkey	78.70	124.50	74.20	92.47
United Kingdom	3.50	8.80	15.40	9.23
Average	**21.52**	**19.77**	**18.56**	**20.15**

Occupational accidents in mining industry are not only causing the injuries or causalities but also a huge amount of economic loss. Approximately 4% of the GDP (gross domestic product) of the world as a whole is lost due to occupational accidents and diseases. This means loss of 1.25 trillion U.S. dollar annually. For example, the cost of the occupational accidents and diseases is 5-10 % of the total income of British companies (Leigh et. al., 2000).

Direct costs (medical, legal, administrative), worker's compensations, property damages, lost earnings, and lost benefits are typically considered as economic impacts of occupational injuries. However, there are also a number of less obvious indirect costs that substantially contribute to the overall loss. In fact, for every one unit of direct costs an estimated 3 to 5 unit of indirect costs is also incurred. Thus, the cost to individuals and industry from occupational injury and fatality is very huge. The indirect costs associated with workplace injuries are often not taken into account when assessing the monetary impact of a workplace injury or fatality. Direct costs can be described as the costs including actual money spent on medical expenses, health care, property damages, police and fire services, and legal and administrative expenses for insurance and workers' compensation. Although direct costs can be substantial, they only represent about 34% of the total costs while indirect costs contributing to 66% of the total (Leigh, et al., 1996). Indirect costs to employers include costs associated with time delays, additional hiring and re-training due to disruption of work processes, and the effects of workplace injury, exposure, or fatality on the productivity of coworkers who see themselves at higher risk. However, costs to the employer are only a part of the whole. Indirect costs to workers and their families may include reduced income, depletion of savings, and loss of assets. Additional potential costs to workers and their families include professional counseling, caregiver services in the home, home modifications and equipment related to disability, and deferral or loss of education opportunities for family members. Costs may also be absorbed by the community with the increased use of social services. While fatalities are the most dramatic and tragic, nonfatal injuries may still have devastating impacts on families, often with fewer organized sources of support. The effect of earning losses for workers with injuries on family

incomes and its social consequences is an area of increasing interest to occupational economics researchers.

A study at sand and gravel mines estimated the average cost of nonfatal injuries to be $46,400 per incident. However, the actual costs may be substantially higher than this figure. Moreover, costs per incident are expected to increase in the future. For example, in March 2003, a jury awarded $163.8 M to the widow and children of a contractor fatally injured in a mine. Many workers are reporting their jobs are “very or extremely stressful” in mining industry (Camm and Girard-Dwyer, 2003). Therefore, the health care expenditures are quite high for these workers. Clearly, a comprehensive investigation of the costs of injury requires occupational health psychology along with the disciplines of engineering and economics. Integrating the social consequences of workplace injuries with economic impacts in a systems engineering framework provides a rich and comprehensive analysis of the effects of workplace injuries. There are also substantial non-economic consequences of workplace injuries and illnesses on quality of life. Physical and psychological functioning in everyday activities may be affected, self-esteem and self-confidence may be reduced, and an individual's role in the family and community may change. Despite all these adverse effects, less research has been focused on non-monetary costs. Studies of unemployed workers and their families, and workers with chronic illnesses and disabling injuries show that income and employment losses, illnesses, and physical impairments can have profound human consequences on both workers and their families. Better measures of both economic impacts (direct and indirect) and non-economic impacts will improve targeting resources for research, prevention, compensation (Camm and Girard-Dwyer, 2003).

CHAPTER 3

OHSAS 18000 OCCUPATIONAL HEALTH AND SAFETY ASSESSMENT SYSTEM

3.1 Information about the OHSAS 18000

An Occupational Health and Safety Assessment System (OHSAS) is a framework that allows an organization to consistently identify and control its health and safety risks, reduce the potential for accidents, help to achieve compliance with health and safety legislation and continually improve its performance. The OHSAS 18000 is an internationally accepted specification that defines the requirements for establishing, implementing and operating an OH&S Management System. (UNMAS, 2001) It comprises two parts, 18001 and 18002 and embraces a number of other publications. The following documents were used in the creation process of the OHSAS 18001:

- BS8800:1996 Guide to occupational health and safety management systems
- DNV Standard for Certification of Occupational Health and Safety Management Systems(OHSMS):1997
- Technical Report NPR 5001: 1997 Guide to an occupational health and safety management system
- Draft LRQA SMS 8800 Health & safety management systems assessment criteria
- SGS & ISMOL ISA 2000:1997 Requirements for Safety and Health Management Systems
- BVQI SafetyCert: Occupational Safety and Health Management Standard
- Draft AS/NZ 4801 Occupational health and safety management systems Specification with guidance for use
- Draft BSI PAS 088 Occupational health and safety management systems
- UNE 81900 series of pre-standards on the Prevention of occupational risks

- Draft NSAI SR 320 Recommendation for an Occupational Health and Safety Management System (BSI, 2007)

Safety management practices may vary depending on types of organization and organizational structures. Many organizations have undertaken OH&S "reviews" or "audits" to assess their OH&S performance. However, these "reviews" and "audits" may not be sufficient to provide performance needs, legal requirements. In order to be effective, the organizations need to be conducted within a structured management system that is integrated within the organization. The OHSAS 18000 series is the emerging standard set occupational safety and health. It consists of the OHSAS 18001 and the OHSAS 18002.

- **OHSAS 18001:** is the "Occupational Health and Safety Management Systems Specification". It was developed in response to urgent demand for a recognized standard against which occupational safety management systems can be assessed. It is compatible with ISO 9001 and ISO 14001. It covers issues such as planning for hazard identification, risk assessment/control, OHS management, awareness and competence, training, communication, emergency preparedness and response, performance measuring and improvement.

- **OHSAS 18002:** is published by the British Standards Institute as Occupational Health and Safety Management Systems Guidelines to assist in the implementation of OHSAS 18001. The OHSAS 18002 seeks to explain the underlying principles of the OHSAS 18001. It describes the intent, typical inputs, processes and typical outputs, against each requirement of the OHSAS 18001, to aid in the understanding and implementation of the OHSAS 18001. It does not create additional requirements to those specified in the OHSAS 18001 nor does it prescribe mandatory approaches to the implementation of the OHSAS 18001. The OHSAS 18002 is a much more detailed document than the OHSAS 18001 (64 pages compared with 18). The OHSAS 18002 states that it imposes no requirements which are additional to those imposed by the OHSAS 18001.

3.1.1 Evolution and Brief History of the OHSAS 18000

British Standards Institute published an occupational health and safety management system standard (BS 8800) which provides general guidance for developing a health and safety management system in 1996. It is based mainly on the ISO 14001 Environmental Management Systems model, and BS 8800 provided general guidance for developing a health and safety management system. After that, the British Standards Institution expanded 8800 into the OHSAS 18000. The OHSAS 18001, as a separate document, specifically provides employers with requirements for their health and safety management systems against which a third-party registrar can assess and certify them. The OHSAS 18001:1999 can be considered as an application of the OHSAS 18000. One year later, to compliment the OHSAS 18001, the British Standards Institute published the OHSAS 18002:2000 to assist in the implementation of OHSAS 18001. Then after, it was revised in 2008 as the OHSAS 18002:2008. In 2007, the British Standards Institution revised the OHSAS 18001:1999 and published the OHSAS 18001:2007. Table 3.1 compares these two version of the document.

Table 3.1: Comparison of the OHSAS 18001:2007 and OHSAS 18001:1999

OHSAS 18001:2007		**OHSAS 18001:1999**	
---	foreword	---	---
1	scope	1	scope
2	Reference publications	2	Reference publications
3	Terms & definitions (23 items)	3	Terms & definitions (17 items)
4	OH&S management system requirements	4	OH&S management system elements
4.1	General requirements	4.1	General requirements
4.2	OH&S policy	4.2	OH&S policy
4.3	Planning	4.3	Planning
4.3.1	Hazard identification, risk assessment & determining controls	4.3.1	Planning for hazard identification, risk assessment & risk control

Table 3.1: (continued)

4.3.2	Legal & other requirements	4.3.2	Legal & other requirements
4.3.3	Objectives & program(s)	4.3.3	Objectives
		4.3.4	OH&S management program(s)
4.4	Implementation & operation	4.4	Implementation & operation
4.4.1	Resources, roles, responsibility, accountability & authority	4.4.1	Structure & responsibility
4.4.2	Competence, training & awareness	4.4.2	Training, awareness & competence
4.4.3	Communication, participation& consultation	4.4.3	Consultation & Communication
4.4.4	Documentation	4.4.4	Documentation
4.4.5	Control of documents	4.4.5	Document & data control
4.4.6	Operational control	4.4.6	Operational control
4.4.7	Emergency preparedness & response	4.4.7	Emergency preparedness & response
4.5	Checking	4.5	Checking & corrective action
4.5.1	Performance measurement & monitoring	4.5.1	Performance measurement & monitoring
4.5.2	Evaluation of compliance	---	---
4.5.3	Incident investigation, nonconformity corrective action & preventive action	4.5.2	Accidents, incidents, non conformances &corrective & preventive action
4.5.3.1	Incident investigation	---	---
4.5.3.2	Nonconformity corrective action & preventive action,	---	---
4.5.4	Control of records	4.5.3	Records & record management
4.5.5	Internal audit	4.5.4	Audit
4.6	Management review	4.6	Management review

The key changes between the OHSAS 18001:1999 and the OHSAS 18001:2007 are as follows:

1) OHSAS 18001:2007 refers to itself as a standard and not a specification, or document, as in the earlier edition. This reflects the increasing adoption of OHSAS 18001 as the basis for national standards on occupational health and safety management systems.

2) Property damage and damage to the workplace environment are no longer part of the scope for the OHSAS (also reflected in revised definition of “Hazard”).

3) Health is more clearly addressed and emphasized, as this was more diminished in the ’99-edition.

4) Six new terms are defined in OHSAS:2007 to harmonize with common terminology in ISO 14001 and ISO 9001: “Document”, “procedure”, “record”, “corrective action”, “preventive action” and “OH&S policy”.

5) OHSAS 18001:2007 is more explicit on:

- Continual improvement of the OHSMS.
- Need for the organization to define and document the scope for the OHSMS.

6) OH&S Policy more explicit to require communication of policy to “all persons working under the control of the organization” and not only to “employees” as in previous edition.

7) OHSAS 18001:2007 is explicit in requiring that applicable legal requirements and other requirements to which the organization subscribes are taken into account in establishing, implementing and maintaining its OH&S management system.

8) OHSAS 18001:2007 is more explicit in requiring:

- All people in the workplace take responsibility for aspects of OH&S over which they have control and adhere to OH&S requirements.

- Commitment from top management on OH&S assessment.

- Addressing awareness training for “persons working under its control” and not limited to employees as in previous edition.

- Retaining records of relevant training, education and experience

9) OHSAS 18001:2007 more explicit in addressing communication to contractors and other visitors to the workplace with regard to the OH&S hazards and consultation with contractors when there are changes affecting their OH&S

- The new chapter 4.4.3.2 requires appropriate involvement from workers in hazard identification, risk assessment and determination of controls and within incident investigation and development of OH&S policies and objectives.

10) Performance measurement and monitoring:

- OHSAS: 2007 includes new clause c) for monitoring the effectiveness of controls and stating explicitly that this shall be done for health as well as for safety.

11) Evaluation of compliance:

- New clause in OHSAS 18001:2007, requirements fully aligned to ISO 14001.

12) Incident investigation, nonconformity, corrective action and preventive action:

- OHSAS 18001:2007 includes new chapter 4.5.3.1 on Incident investigation. Although partly covered in previous edition more emphasis has been put on this issue.

13) Management review:

OHSAS 18001:2007 is largely aligned with ISO 14001. Compared to the previous edition, OHSAS 18001:2007 lists the following required input to Management review:

- Results of internal audits and evaluations of compliance with applicable legal requirements and with other requirements to which the organization subscribes,

- The results of participation and consultation

- Relevant communication(s) from external interested parties, including complaints,

- The OH&S performance of the organization,

- The extent to which objectives have been met,

- Status of incident investigations, corrective actions and preventive actions,

- Follow-up actions from previous management reviews.

3.1.2 Purpose of OHSAS 18000

The aim of OHSAS is to support and promote good OH&S practices, in balance with socio-economic needs and prevent accidents to organizational staff within the work environment. Occupational Health and Safety Assessment Series (OHSAS) 18001 provides the mechanism for occupational health and safety management that helps companies in the inspection and measurement of the degree of their suitability, also in training employee to understand their role in the health & safety system and its improvement.

3.1.3 Benefits of OHSAS 18000

The benefits of implementing a systematic and effective OH&S management system include the followings:

• Reducing the number of personnel injuries by prevention and control of workplace hazards.

• Reducing the risk of major accidents.

• Ensuring a well-qualified and suitable workforce by fulfillment of the increasing expectations of your employees.

• Competitive advantage (via demonstration of commitment to health and safety)

• Reducing the loss of materials caused by accidents and in production interruptions

• Reducing costs due to elimination of hazards

• Serving the possibility for an integrated management system including quality, environment and health and safety

• Ensuring that appropriate legislation is addressed and acted upon

• Meeting the increasing importance of OH&S for public image

The need for internationally recognized standards for occupational health and safety management has long been apparent. The OHSAS 18001 standards have emerged to fill this void, and are being adopted across the globe.

3.2 OHSAS Standardization in Turkey

In Turkey, "OHSAS 18001 Occupational Health and Safety Assessment Series – Requirements" has been adopted and published as "TS 18001 İş Sağlığı ve Güvenliği Yönetim Sistemleri – Şartlar" by Turkish Standards Institute in 2001. The final version of TS 18001 is published in April 2008. As a guideline like the BSI did in 2000, TSI published "Guidelines for the implementation of TS 18001" in 2004. The original name of the document is "TS 18002:2004 İş Sağlığı Ve Güvenliği Yönetim Sistemleri – TS 18001 Uygulama Kılavuzu".

3.2.1 Documentation of OHSAS 18001

What the OHSAS 18000 requires is a complete system managing health and safety affairs, not a bunch of scattered management techniques. Hence, every management method and document regulation of the system should be systematically and documentarily expressed for the creation of a future management system that is "written into uniformity". Therefore, document amendment, utilization, maintenance, preservation, and control should be regulated through written rules for utilization and management convenience. Documents should be properly updated, valid, clearly identified, and easily traced for the effective management execution. Every document should be able to reflect work conditions, and duly evaluated by the approving authority. Document compilation, preservation, and revision should be proper to time and place. OHSAS 18001 does not have many "documentation procedures", but an appropriately sized and scoped OH&S manual should be

prepared and maintained. The manual should at a minimum fulfill relevant national and international requirements for the activities of the organization. The manual should include: OH&S Policy, OH&S organization and allocation of responsibilities, schedules, procedures, instructions and other internal documents used for OH&S management and control. There should be a section identifying key risks and hazards arising from the organization's activities together with arrangements for their prevention and control. The manual should establish procedures, schedules and methodologies for review of safety and control features, as well as plans and schedules for monitoring ambient working environment quality and individual exposure levels as appropriate and applicable.

OH&S records with details appropriate to the needs of the organization should be established, managed, and maintained locally. The records should contain appropriate information regarding national OH&S laws and regulation, the OHSMS itself, as well as monitoring data regarding elements such as workers health and exposure, ambient working environment, work-related injuries, ill health, diseases, incidents, training programs and lists of trainees

3.2.2 Certification of OHSAS 18001

The organizations that want to obtain OHSAS certificate needs to be satisfied all requirements of TS 18001 whether by the help of a professional assistance from consulting or not. Those consulting firms who provide assistance called as TS 18001 Occupational Health and Safety Consulting Firms. They cooperate with willing company to satisfy requirements of standards and together establish an OH&S management system. Otherwise, the organization could make a self-determination and declaration of conformance with the OHSAS specification. After that, the implementation of system would start and study for detection of nonconformities would be conducted. Plan-Do-Check-Review (PDCA) cycle is followed and required revisions and improvements have to take into action. Then after, an impartial observation is performed by consulting firm.

While the implementation of system is continuing, the application for

certification to the conformity assessment and certification bodies is fulfilled. These certification firms can be foreign or local bodies. In Turkey, the important point is that the certification firm has to be approved by TÜRKAK (Turkish Accreditation Agency). Firstly, all documents which are asked to be provided to the certification body (OH&S Manual, Organization Scheme, etc.) are sent to certification firm. If the document examining stage is positive then after auditor of the certification body and consulting firm audit the applicant company. This certification audit can last for one week depending on the company size and facilities. After this audit, the certification can be granted if it is acceptable and it is valid for three years period.

The key steps of the OHSAS 18001 certification process include:

• Definition of certification scope;

• Pre-audit (optional); gap analysis and diagnosis of the willing organization current position against the scheme.

• Initial audit to verify the implementation of the basic structure of the Management System.

• Certification audit (certificate issued)

• Surveillance audits to follow the continual improvement

• Re-certification after 3 years through full audit or continual assessment.

The companies certified according to OHSAS 18001:1999 are required to pass OHSAS 18001:2007 after July 2009.

3.3 OHSAS 18000 in Mining Industry

The need for health and safety systems programs in the mining industry has been an area of controversy for some time. Many in the mining industry feel that written safety and health programs are just more paperwork, a deterrent to productivity, and nothing more than another bureaucratic way of mandating safety and health on the job. But over a period of years, data and information have been mounting in support of the need to develop and implement written safety and health programs in mining industry. In research conducted by the Lincoln Nebreska Safety Council in 1981, the following conclusions were based on a comparison of responses

from a survey of 143 USA national companies. All conclusions have a 95% or more confidence level. Table 3.2 is an abstraction of results from that study.

Table 3.2: Effectiveness of Safety and Health Program Findings (Reese and Eidson, 2006)

Statement	Findings
Do not have separate budget for safety	43 % more accidents
No training for new hires	52 % more accidents
No outside sources for safety training	59 % more accidents
No specific training for supervisors	62 % more accidents
Do not conduct safety inspections	40 % more accidents
No written safety program compared with companies that have written programs	106 % more accidents
Those using canned programs, not self-generated	43 % more accidents
No employee safety committees	74 % more accidents
No membership in professional safety organizations	64 % more accidents
No established system to recognize safety accomplishments	81 % more accidents
Did not document / review accident reports, and reviewers did not have safety as part of their job responsibility	122 % more accidents
Did not hold supervisor accountable for safety through merit salary revives	39 % more accidents
Top management did not actively promote safety awareness	470 % more accidents

According to Reese and Eidson, there are three major considerations involved in the development of a safety program namely, humanitarian, legal obligation, and economic. Besides these reasons it provides standardization of policies, procedures for all staff and forces the company to actually define its view of health and safety. It delineates the goals and objectives regarding workplace health and safety and clarifies misconceptions. Today many mining companies are seeking for OHSAS certificate in order to reduce the number of personnel injuries by prevention and control of workplace hazards also for competitive advantage (via demonstration of commitment to health and safety). There are many available success story of companies which are applied OHSAS 18001.

3.3.1 Examples of OHSAS 18000 Implemented Mines

A large, OHSAS 18001-registered European corporation directed its U.S. satellite company to pursue OHSAS 18001 registration. The U.S. company employs approximately 355 employees, has an established safety program with a core safety team in place. The safety and environmental manager is responsible for the safety program and reports to the senior vice president of operations. The task of obtaining OHSAS 18001 registration was assigned to the director of quality. The director of quality was immediately confronted with the task of modifying a system that met industry standards and was working well but didn't meet the formal requirements outlined in OHSAS 18001 (Roderick and William, 2005). An in-depth audit checklist was developed, and a formal audit was conducted according to the requirements of both of ISO 9001 and OHSAS 18001. The audit confirmed that the current system met the intent of the health and safety requirements but lacked the formal system requirements referenced in the OHSAS standards manuals. Nonconformances were documented and action plans developed to address all audit findings. Emphasis was also placed on the area safety audits conducted by the safety team. A more comprehensive audit was developed that included root cause analysis and systemic corrective actions. The safety team had previously focused on correcting specific issues (i.e., symptoms), which resulted in repeat issues in other areas of the plant during subsequent audits (Roderick and William, 2005). A companywide training and awareness program was launched that emphasized plant safety and each employee's responsibility with respect to safety, as well as the consequences of not following procedures. The training program was expanded to include new-employee orientation and periodic refresher training on major issues such as safe working practices, plant evacuation drills, and accident and/or injury reporting and corrective measures. A quarterly management review was established to instill a higher level of management commitment to and awareness of the implementation process, and to develop communication channels for continual improvement and support of the system following the registration audit (Roderick and William, 2005).

The company established an OHSAS 18001 system that promoted continual improvement and a systemic method of corrective actions. Preventive measures were developed from the enhanced area safety audits. Resulting benefits include:

- The number of incident reports was reduced for three consecutive quarters, from 21 to 15 to 4. The number of lost workdays was reduced in the same three quarters, from 34 to 11 to 0.

- The company initiated a $50 rebate for each employee each year for the purchase of safety shoes. An ear protection policy was put in place in selected areas of production.

- Procedures were updated to reflect current practices; these procedures served as the basic training format for all employees. Records were maintained on standardized forms, which resulted in a standardized reporting system and more meaningful data.

- The quarterly management review meeting served as a means of informing management of the status of the health and safety program and resulted in immediate attention to the current plant issues. Personal safety equipment such as gloves, welding aprons, welding sleeves and respirators were enhanced.

- The entire workforce has been trained and/or retrained, and training has been extended into the new employee orientation program. Evacuation drills were held as well as specialized training in cardiopulmonary resuscitation (CPR), proper fire-extinguisher use, spill cleanup, pollution prevention, and conservation of energy and resources.

- An already low turnover rate has decreased by an additional 1.3 percent

during the last six months. (Roderick and William, 2005)

Another successful OHSAS applicant mine is Beatrix Gold Mine, a Central Rand Group company. Beatrix's safety performance remained stable with the lost time injury frequency rate (LTIFR) improving 28 % year on year to 3.9 while the fatal injury frequency rate for 2008 remained steady at 0.13 per million man hours worked. Regrettably, four employees lost their lives during the year in four separate incidents, two of which were caused by falls of ground, one by trimming and one heat related incident.

As a last example the engineering projects firm TWP Projects can be given. The firm recommended for OHSAS 18001 certification and is awaiting certification from the international certification authority in Germany. Further, the company reports that its lost-time injury frequency (LTIF) rate decreased by almost 50%, from 1.03, in 2008, to 0.63, in 2009, based on 200,000 work hours, which is notable as the company's current project mix includes a high percentage of high-risk deep mining and shaft sinking projects (Seggie, 2010).

There are several OHSAS certificated mining companies in the world, but still these companies can be counted by hand. In Turkey, there are not many mining companies having OHSAS certificate. Some of them have started to their OHSAS procedures recently, and this trend is increasing. The following list is showing some examples of TS 18001 certified mines.

- Camiş Madencilik – Dolomite, Silicate, Quartzite Mines – Şişecam Group
- Erdemir Madencilik – Iron Mine, Oyak Group, Sivas
- ADO Madencilik, Barite Mine, İstanbul
- APSA Mermer – Marble Quarry, Sivas
- Göltaş Madencilik – Granite Quarry, Ankara
- Fimar Mermer – Marble Quarry, Sivas
- Özmersan Mermer – Marble Quarry, Sivas
- Koza Altın İşletmeleri – Gold Mine, İzmir
- Topaktaş Madencilik – Magnesite Mine, Kütahya

3.4 Application of OHSAS 18001

The OHSAS 18001 Specification follows the Plan-Do-Check-Review cycle, with an emphasis on continual improvement. This process, adopted from PDCA approach (*Plan – Do – Check – Act*), is also known as Deming Cycle (Wikipedia, 2009). The following steps form the basic structure of the management system and link into the Structure of OHSAS 18001:

- Planning
- Implementation of Health and Safety Management System

- Checking the management system and taking any necessary corrective action
- Management review

These steps are followed continuously and improved meanwhile, and this process is called as continuous improvement. Occupational health and safety, including compliance with national OH&S requirements, is the responsibility and duty of the employer. Implementation of a fully transparent OHSMS in an organization is a powerful tool towards fulfilling these obligations. The OHSMS signals the commitment of the organization to ensure safe working conditions. However, active participation from workers is required for optimum results. Meaningful participation by employees may be obtainable through efficient awareness raising and training to change the prevailing labor safety culture. An OHSMS model is given in Figure 3.1 and it must have features for continuous feedback and self-improvement (ILO-OHS, 2001).

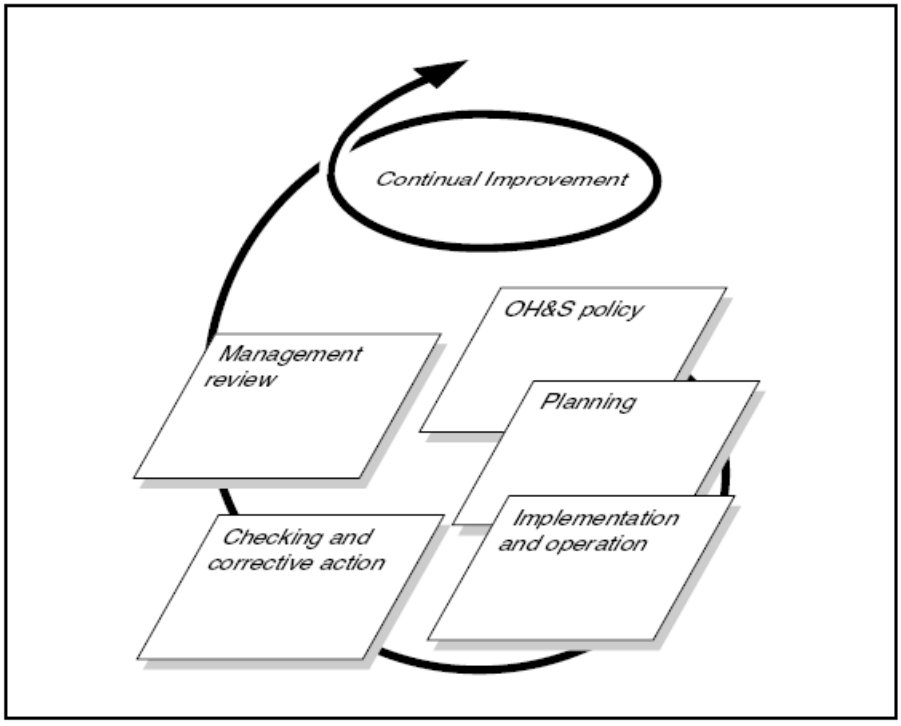

Figure 3.1: OH&S Management System Model for OHSAS 18001 (BSI, OHSAS 18001:2007, 2007).

The employer is responsible for planning, implementing and monitoring programs and systems required to ensure OH&S on its premises. Such provisions should be pro-active and preventive by identification of hazards as well as by evaluation, monitoring, and control of work related risks.

3.4.1 Planning

The organization needs to establish, implement and maintain a procedure(s) for the ongoing hazard identification, risk assessment, and determination of necessary controls. The Figure – 3.2 shows the stages of planning. Hazard identification and risk assessment should take into account: routine and non-routine activities, activities of all persons having access to the workplace, human behavior, all human factors, infrastructure, equipment and materials at the workplace, the design of work areas, processes, installations, machinery/equipment etc. The methodology for hazard identification and risk assessment should be defined with respect to its scope, nature and timing to ensure it is proactive rather than reactive, and should provide for the identification, prioritization and documentation of risks, and the application of controls, as appropriate.

The organization should document and keep the result of identification of hazards, risk assessments and determined controls up-to-date. The Legal requirements have to be considered also. All applicable legal requirements should be examined and should be taken into account in establishing the OH&S management system. These legal requirements should be informed to persons working under the control of the organization.

In planning, the organization should also establish OH&S objectives at relevant functions and levels within the organization. These objectives should be measurable, where practicable, and consistent with OH&S policy. To achieve these objectives, the organization should have a program. This program shall include minimum:

- Designation of responsibility and authority for achieving objectives

- The means and time-frame reviewed at regular and planned intervals, and adjusted as necessary

Figure 3.2 Planning Stage of OHSAS

3.4.2 Implementation of OHSAS

The top management should take the ultimate responsibility for OH&S and the OH&S management system. It should ensure the availability of resources (including human resource, organizational structure, technology, financial resources essential to establish, implement, maintain and improve the OH&S management system. (BSI OHSAS 18001:2007, 2007). Top management should also define roles, allocate responsibilities and accountabilities, and delegating authorities. The organization should appoint members of top management with specific responsibility for OH&S. These members have to ensure that OH&S management system is established.

The organization should ensure that any person(s) under its control performing tasks that can impact on OH&S is (are) competent on the basis of

appropriate education, training or experience, and shall retain associate records. The training need associated with OH&S risks and OH&S management system has to be identified and implemented.

The communication, participation and consultation within the company are another important point. For all activities, the organizations should implement and maintain procedures for participation of workers by their appropriate involment in hazard identification, risk assessments, incident investigation, development and review of OH&S policies and objectives. The operational control and emergency preparedness are also very important in implementation of OH&S management system. All activities within the organization shall integrate operational control and the organization should establish, implement and maintain procedures to identify the potential for emergency situations and to respond to such emergency situations.

3.4.3 Checking and Corrective Action

The organizations should establish, implement and maintain procedures to monitor and measure OH&S performance on a regular basis. These procedures provide for both qualitative and quantitative measures, appropriate to needs of the organization. Also they provide for monitoring of the extent to which the organization's OH&S objectives are met and reactive measures of performance that monitor ill health, incidents (including accidents, near-misses, etc.).

The incident investigation is the most important point of the checking and corrective action. The organization should establish, implement and maintain procedures to record, investigate and analyze incidents in order to:

- Determine underlying OH&S deficiencies and other factors that might be causing or contributing to occurrence of incidents
- Identify the need for preventive action
- Identify opportunities for preventive action
- Identify opportunities for continual improvement
- Communicate the results of such investigations

The organization should establish and maintain records as necessary to demonstrate conformity to the requirements of its OH&S management system and of this OHSAS standard, and the results achieved. Also, the implementation and maintaining procedures for identification, storage, protection, retrieval, retention and disposal of records can be considered in checking and corrective actions.

The organization should ensure that internal audits of the OH&S management system are conducted at planned intervals to:

- Determine whether the OH&S management system conforms to planned arrangements, including the requirements of OHSAS standard, and whether has been properly implemented and is maintained, and also whether it is effective in meeting the organization's policy and objectives.

- Provide information on the results of audits to management.
- Determine the audit criteria, scope, frequency and methods

3.4.4 Management Review

Top management shall review the organization's OH&S management system, at planned intervals, to ensure its continuing suitability, adequacy and effectiveness. Reviews should include assessing opportunities for improvement and the need for changes to the OH&S management system, including the OH&S policy and OH&S objectives. Input to management reviews should include:

- The results of internal audits and evaluations
- The results of participation and consultation
- Relevant communications from external interested parties, including complaints
- The OH&S performance of the organization
- The extent to which objectives have been met
- Status of incident investigations, corrective actions and preventive actions
- Follow-up actions from previous management reviews
- Recommendations for improvement

CHAPTER 4

RISK ASSESSMENT IN OHSAS

4.1 Definition of Risk Assessment

Risk is the likelihood of the harm or undesired event occurring, and the consequences of its occurrence. It is the probability that the substance or agent will cause adverse effects under the conditions of use and/or exposure, and the possible extent of harm. Hence, it is a function of both exposure to the hazard and the likelihood of harm from the hazard.

A risk assessment is simply a careful examination of what, in your work, could cause harm to people, so that you can weigh up whether you have taken enough precautions or should do more to prevent harm. It is a structured and systematic procedure which is dependent upon the correct identification of the hazards and an appropriate estimation of the risks arising from them, with a view to making inter-risk comparisons for purposes of their control or avoidance. Risk assessment also provides the link between the scientific knowledge of the risks and the risk reduction measures to be taken. While risk assessment can be qualitative in nature, increasingly, the methods being used are becoming quantitative. In occupational health terms, the purpose of risk assessment is to enable a valid decision to be made about measures necessary to control exposure to substances or conditions hazardous to health arising in any workplace (Rampal and Sadhra, 1999).

"Risk Assessment" terminology is just a new concept for almost all employers in Turkey. Workers and all employees have right to be protected from harm caused from any source by means of a failure of control measures. Occupational accidents and ill health can destroy lives and affect your business too if output is lost, machinery is damaged, insurance costs increase or even result in going

to court. All organizations are required to assess the risks in their workplace so that you put in place a plan to control the risks.

4.2 Stages of Risk Assessment

Risk characterization is the primary means for communicating risk assessment findings. Many risk characterizations have relied primarily on mathematical estimates of risk to communicate risk assessment findings, often conveying an unwarranted sense of precision while failing to convey the range of scientific opinion. They are particularly difficult for audiences unfamiliar with risk assessment to comprehend. Effective risk management is impeded without effectively communicating information about who is at risk, how they might be affected, what the severity and reversibility of adverse effects might be, how confident the risk assessors are in their predictions and other qualitative information that is critical to decision-making.

In general opinion the risk assessment consists of five different steps. While performing risk assessment the following steps should be followed:

Step 1: Identify the hazards (Hazard Identification)
Step 2: Decide who might be harmed and how
Step 3: Evaluate the risks and decide on precautions
Step 4: Record your findings and implement them
Step 5: Review your assessment and update if necessary

The Risk Assessment process can be also schematized as in Figure 4.1

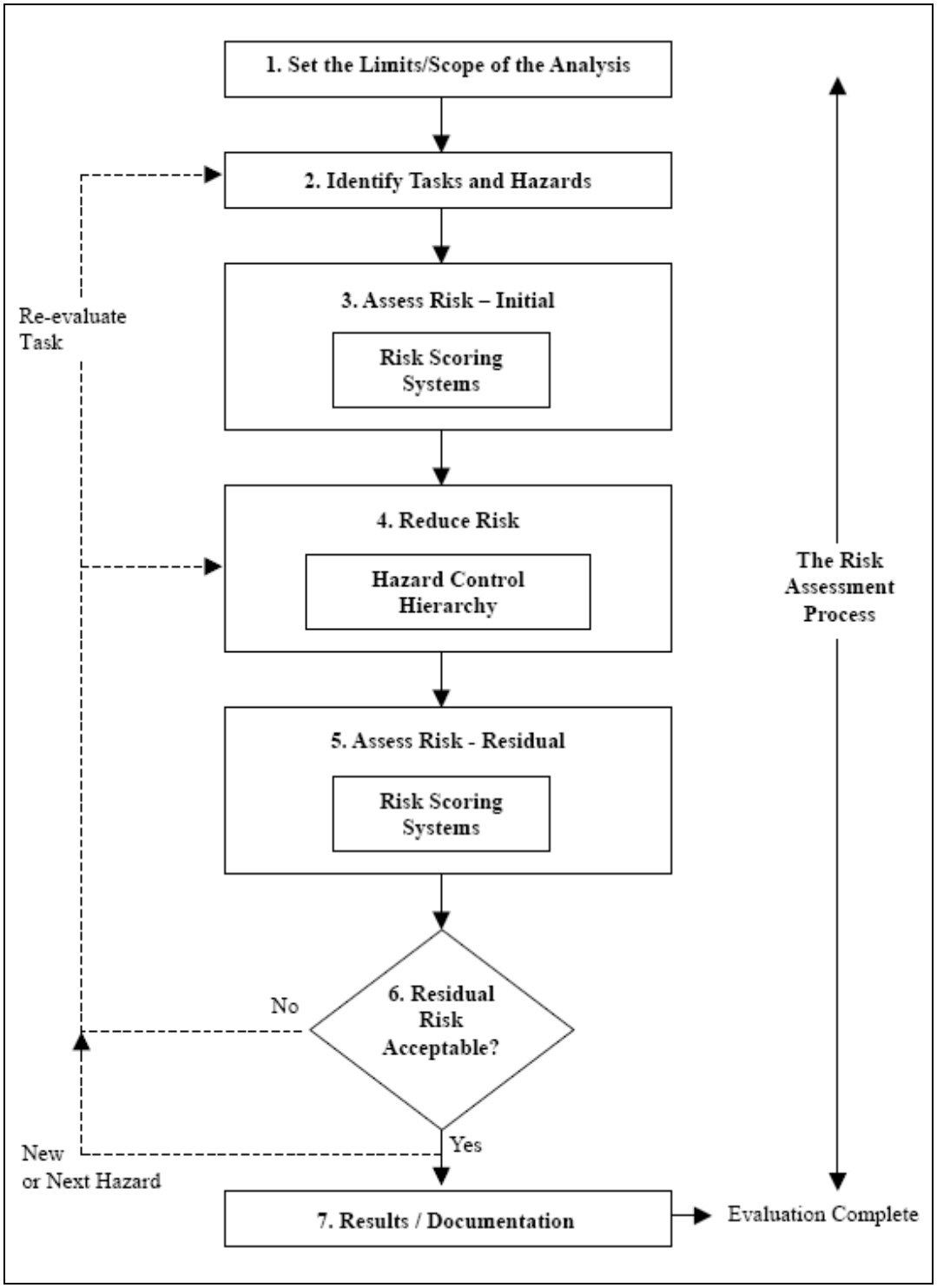

Figure 4.1 Risk Assessment Framework (Main, 2004)

4.2.1 Hazard Identification

Hazard identification, the first step in the risk assessment, is completely qualitative, and it is defined as the process of recognizing any hazard exists in workplace and defining its characteristics. It could be argued that the identification of hazards is the most important step in any risk assessment. Only the identified hazards can be assessed, and risk assessments will rarely reveal unidentified hazards. Hazard identification includes items that can help about identifying workplace hazards and determining what corrective actions are necessary to control them. These items include jobsite safety inspections, accident investigations, health and safety comities etc. After all basic steps of the operation are listed; we need to examine each to identify hazards associated with each job step. The purpose is to identify and list the possible hazards in each step of the job. The accidents in workplaces can be grouped and this categorization may be useful for identification process. The basic types of accidents are given below:

- Struck-against: A forceful contact with something that cause injury
- Struck-by: Something moves and strikes the worker abruptly with force
- Contact-with: The worker can come in contact with some agent or object.
- Contacted-by: The worker could be contacted by some object or agent that are capable of injuring by nonforceful contact.
- Caught-in: It is one in which the person, or some part of his or her body, is caught in an enclosure or opening of some kind.
- Caught-on: The worker may caught-on some projection of a moving object which pulls the worker into an injury contact.
- Caught-between: These accidents involve having a part of the body caught between something moving and stationary, or between two moving objects.
- Fall-same-level: Slip, trip, and fall to same level.
- Fall-to-below: Slip, trip and fall to level below.
- Overexertion: Any repetitive task or overexertion while lifting, pulling, pushing etc may cause injury
- Exposure: The workers may expose to something cause injury such as noise, temperature, poor air, gases, dust etc. (Reese, 2004)

To identify hazard which are associated with work environment questions about these accident types should be asked to identify hazards. These points may be considered in checklist in more detailed way. By answering each of the above questions while examining each job step, the basic types of potential accidents and hazards may be identified (Güyagüler, et al. 2005). In order to identify the hazards, firstly the definition of activities and determination of tasks for all staff should be carried on within a task analysis. For this purpose the Job Safety Analysis (JSA) may be very useful. A JSA is a method that can be used to identify, analyze and record the steps involved in performing a specific task, the existing or potential safety and health hazards associated with each step, and the recommended procedures that will eliminate or reduce these hazards and the risk of a workplace injury or illness (Della-Guistina, 2004). All activities and related tasks should be listed carefully. After identifying all activities and tasks the hazard identification could be performed. While performing hazard identification the pre-detected hazards for all tasks and activities should be taken into account. The hazard identification can be carried out by means of the field observations of responsible occupational health and safety staff as well as negotiation with working staff. There are several qualitative approaches to hazard identification which provide a more formalized and structured procedure. The selection of the appropriate procedure will depend on the type of process and the hazards involved. Checklists may be used to identify hazards, while more open-ended techniques may be needed to identify and analyze failures and error. Within an organization, there are several ways in which hazards may be identified. These may include following: Accident Statistics; Investigations of accidents, and complaints; Audits; Checklists and task analyses; Workplace inspections, including discussion and use of basic OHS instrumentation.

4.2.2 Identifying “Who may be harmed?”

For each hazard that you aim to identify, it should be clear who might be harmed. This will help about managing the risks. That does not mean listing everyone by name, but rather identifying groups of people. For each group, identify how they might be harmed, and what type of injury or ill health might occur. The following point should take into consideration while performing this identification process:

- Some workers may have particular requirements. For example, newcomers or inexperienced workers, expectant mothers and people with disabilities may be at particular risk. Therefore, an extra attention will be needed for some hazards

- People who may not be in the workplace all the time like visitors, and contractors.

- Members of the public, if they could be hurt by your activities.

- If you share your workplace (HS&E Office - Loughborough University, 2009)

4.2.3 Risk Evaluation

What level of risk is deemed to be acceptable? This question leads to risk comparisons being made. Risks are less likely to be acceptable if individuals or community bearing the risks do not derive any benefit from them. There are some certain standards of the levels of risks which employers must meet. These levels of risks range from those which are considered to be “unimportant”, “low”, “moderate”, “high” to those that are “unacceptable”. These levels are used as guidance for action on control measures to be taken by employers. Risks are considered to be negligible when the level of risk is such that no thought is given to their likelihood in the conduct of normal life. The risks are usually presumed to be below 1 in a million per annum of the occurrence of seriously adverse consequences. Acceptable risks or broadly acceptable risks are in the region of 1 in a million per annum of the occurrence of seriously adverse consequences, and where the conduct of life is not affected provided that reasonable precautions are in place (Rampal and Sadhra, 1999). Broadly acceptable risks are those which are part of the background risk accepted as part of daily life. Those risks below the background level of risks already present and apparently acceptable to society are considered to be acceptable. This has led to the determination of estimates of the “background risk”, including risk from lighting, floods or earthquake. Hence, a question is emerged: “Are these risks acceptable or are they being tolerated by society?”

Tolerability does not mean acceptability. It refers to the willingness to live with a risk to secure certain benefits, and in the confidence that the risk is being properly controlled. Acceptable risk may change from place to place. Table 4.1

shows several acceptable levels of risks. Tolerable risks are a range of risks that are not negligible and which cannot be ignored, but which need to be reviewed and reduced still further if possible.

Table 4.1 Acceptable Levels of Risk (Rampal and Sadhra, 1999)

Health and Safety Executive, UK	1x10-5	Upper Level
	1x10-6	Acceptable Level
	1x10-7	Sensitive Population
Du Pont	0.3x10-6 / year	-
UK Nuclear Power	1x10-6 / year	Upper Level
Netherlands (n=5)	1x10-5 / year	Unacceptable
	1x10-7 / year	Acceptable
Netherlands (n=100)	1x10-7 / year	Unacceptable
	1x10-9 / year	Acceptable

4.2.4 Record of Findings

It is a good practice to record any accidents involving injuries or illness in a computer or a network database. The following information should be included in entries:

- Date and time of accident or incident
- Place of accident or incident
- Name and position of subjected person or people
- Details of accident or incident and first aid given
- The situation of causality after the event (hospitalized, back to work, etc.)
- Name, position and if applicable the signature of person dealing with the accident or incident.

The record keeping is required for nearly all areas of workplace and it is important to keep these records up-to-date. For OHS point of view, the records that

need to be maintained are employee accidents, injuries, illnesses, accident investigations, causalities, near misses, training records, medical records.

4.2.5 Hazard Control

Once the hazards have been identified for work steps, the next step is to develop solutions to eliminate or control them. The solutions will normally be one of the following five categories:

- Engineering revision: Find a less hazardous way by using an engineering revision about new and safe way to do works.
- Environment change: Change the physical conditions that create the hazard
- Job frequency reduction: Try to reduce the necessity of doing job or reduce the frequency that it must be performed.
- Protection apparel: Use personal protective apparels for potentially dangerous condition.
- Changes in job procedure: To eliminate those hazards which can not be engineered out of the job, change the job procedure and try to eliminate hazards.

4.3 Risk Assessment Methods

All projects have risks and uncertainties. In some cases the effect of such risks and uncertainties can be very significant. However many managers still did not employ proper project risks management processes. In many cases they do not believe that establishing and implementation of such process will be beneficial, since it is difficult to predict all potential risks and their affect of the project. There exist several methodology to assess the risks such as Fault Tree Analysis (FTA), Hazard and Operability Study (HAZOP), Job Safety Analysis (JSA), Preliminary Hazard Analysis (PHA), X-type Matrix). The Table 4.2 shows the type of risk assessment methods and compares according to some basic features.

Table 4.2: Comparison of Risk Assessment Methods (TSE, 2004)

	Risk Assessment Methods											
Criteria	**What if …?**	**PHA**	**JSA**	**Check List**	**HAZOP**	**FMEA / FMECA**	**Safety Control**	**FTA**	**ETA**	**L Type Matrix**	**X Type Matrix**	**Cause – Result Analysis**
Need for Documents	Few	Moderate	Much	Few	Much	Much	Few	Much	Much	Few	Much	Much
Team Work	May be performed by one analyst	May be performed by one analyst	Team Work	Team Work	Team Work	Team Work	May be performed by one analyst	Team Work	Team Work	May be performed by one analyst	Team Work	Team Work
Experience of Team Leader	Moderate	Moderate	Much	Moderate	Much	Moderate	Moderate	Much	Much	Moderate	Much	Much
Qualitative / Quantitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative / Quantitative	Qualitative / Quantitative	Qualitative	Qualitative	Qualitative / Quantitative
Sector	Proper for all sectors	Proper for all sectors	Proper for all sectors	Proper for all sectors	Chemistry Industry	Electric / Mechanical	Proper for all sectors	Proper for all sectors	Proper for all sectors	Proper for all sectors	Proper for all sectors	Proper for all sectors
Rate of Application Success	Sufficient for risk identification. The experience of Team Leader is a distinctive mark	Primary Risk Evaluation method. The experience of Team Leader is a distinctive mark	Successful especially if the tasks are defined for staff properly.	Applicable for simple task procedures	It is hard a method. Requires high level of experience and performance	Performing FTA before analysis increase the rate of	The experience of Team Leader is a distinctive mark	Requires high level of experience and performance	Requires high level of experience and performance	Applicable for simple task procedures and The experience of Team Leader is a distinctive mark	The experience of Team Leader is a distinctive mark	Requires high level of experience and performance

4.3.1 Qualitative Methods of Risk Assessment

The basic process for qualitative assessments is very similar to what happens in the quantitative approach. The difference is in the details. Comparisons between the values of risks are more relative, and participants do not invest a lot of time trying to calculate precise numbers. The benefits of a qualitative approach are that it overcomes the challenge of calculating accurate value, and so the process is much less demanding on staff. Qualitative risk management projects can typically start to show significant results within a short term, whereas most organizations that choose a quantitative approach to see more comprehensive and precise results. The drawback of a qualitative approach is that the resulting figures are vaguer and some decision makers may not be comfortable with the relative values determined during a qualitative risk assessment projects. The qualitative techniques outlined in Table 4.2 require only the employment of hardware familiar personnel. However, FMEA or FMECA tends to be more labor intensive, as failure of each individual component in the system has to be considered. These qualitative techniques can be also used in the design as well as operational stage of a system. All qualitative methods have been used widely in the nuclear power and chemical processing plants. As an example, FMEA has been used by Intel Co. and National Semiconductor Co. to improve the reliability of their product. HAZOP also has been widely used in the chemical industries for detailed failure and effect study on the piping and instrumentation layouts.

The most frequently used approach is the Risk Assessment Decision Matrix which was initially developed as a military standardization. The matrix diagrams are used to analyze the correlations between two or more parameters. 5x5 matrix diagram is ideal for especially individual analyses. The rating and measurement of probability of occurrence of an event and the corresponding results can be performed by using this method. Actually, in many source the matrix methods are classified as semi-quantitative as its risks categorization based on a quantitative value. In this method the risk categorization is made upon a risk criticality scoring. The risk scores can be easily found by following formulae:

Risk Score = Accident Frequency Score x Hazard Severity Score

The risk evaluation can be also performed by means of simple computer software. The electronic Risk Score Nomograms are based on OH&S Risk Assessment AS/NZS 4804:2001 (Standards Australia, 2004). The risk assessment calculator is intended as a guide to identify level of risk. Its logic is the same as matrix method, but in this case there are three different variables namely, probability, exposure and consequence. This namogram is prepared based upon the Kinney Risk Assessment Method which will be mentioned Chapter 5.

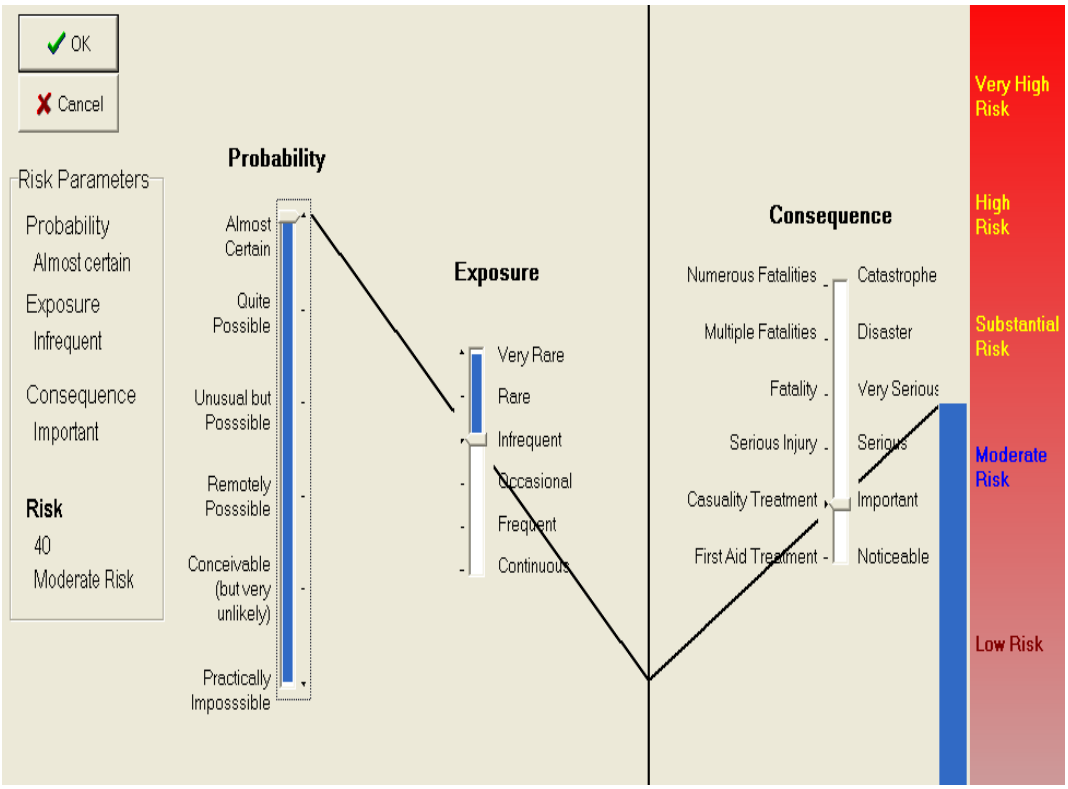

Figure 4.2: Screenshot of the Riskex Risk Score Calculator Software

As shown in Figure 4.2 in computer software Riskex Score Calculator Software the risk criticality score evaluation is made upon the following formulae:

$$\mathbf{R = L \times E \times C}$$

Where L is the likelihood of exposure to hazards, E is the frequency of exposure time to the hazard and C is the consequence of hazard that causes an

accident. A typical L-type matrix is used to evaluate the risks in Bigadiç Boron Work. The risk evaluation method that is implemented to enterprise is mentioned in Chapter 5 in details.

4.3.2 Quantitative Methods of Risk Assessment

Quantitative risk assessment is methodology based on calculating probabilities and frequencies of sequential events using algebra, and it is normally used to perform safety assessments for complex interacting systems. Although quantitative risk assessment has been commonly used in aerospace and nuclear industries, it can also be used for quantifying economic risk and for estimating possibilities of potential production losses in many several production industries. In developing quantitative risk assessment models for companies, component failures as well as human errors are taken into consideration in developing the plant's fault-tree logic, in which is used to predict probabilities of future plant upsets. Quantitative risk analysis is a complex and effective tool which may be selected by the decision maker when assessing risks. There are many quantitative methods for evaluation of the risks. Providing a suitable model can be constructed and its data inputs realistically quantified this method can provide insight into problems surrounded by uncertainty. The trend in risk assessment is toward to more quantitative methods for risk analysis especially engineering related disciplines. Quantitative risk analysis attempts to assign independently or dependently values to the components of the risk assessment. Conversely, a qualitative risk analysis is somehow scenario-based. Although a qualitative risk analysis may be easier to do at times; a quantitative risk analysis offers the following distinct advantages:

· More objectivity in its assessment
· More powerful and precise tool for management
· Can be fine-tuned to meet the needs of specific situations
· Can also be modified to fit the needs of specific industries
· Much less prone to arouse disagreements during management review
· Analysis is often derived from some irrefutable facts

CHAPTER 5

APPLICATION OF OHSAS 18000 TO BİGADİÇ BORON WORK

5.1 Information about Bigadiç Boron Works

Bigadiç Boron Works has been established in 1976 and located at 12 Km. North-East of Bigadiç which is a district of Balıkesir. Bigadiç is 36 Km far from the city center and it has population of 15.000. The enterprise has three open-pit boron mines, one mineral processing plant, and a Crushing & Grinding Plant. Previously the mines were operated by a French company and its operating right was given to Etibank in 13.02.1976 by council of ministers. The brief history of the enterprise is given in Table 5.1.

Table 5.1: The History of Bigadiç Boron Work

DATE	STATUS
14.06.1935	Etibank was established by M.K. ATATÜRK
13.02.1976	The Tülü Open-pit mine is given to Etibank by the decision of Council of Ministers and the Ministry of Energy and Natural Resources.
08.04.1976	It is affiliated to Emet Enterprise by decision of Board of Directors as a directorate
23.03.1977	Plant Directorate
04.10.1978	Nationalization of Boron Mines by Law
04.06.1982	Enterprise Management
01.01.1984	Bigadiç Enterprise Management affiliated to Etibank General Management
01.05.1998	Bigadiç Enterprise Management affiliated to Eti Bor A.Ş.
17.01.2004	Bigadiç Boron Works affiliated to Eti Mine Works General Management

5.1.1 Open-Pit Mines

Bigadiç Boron Work has three open pit mines from which 800.000 tons/year ulexite and colemanite ores with 29–31% B_2O_3 grade are produced. Concentrated colemanite and concentrated ulexite are produced by enriching the ore at the concentrator facilities, which began its activity in 1980 and has the current capacity of 650.000 tons/year. Ground colemanite and ground ulexite are produced in the grinding facilities, activated in 1998, with the capacity of 90.000 tons/year. In order to meet the customer demand for ground colemanite, 2nd Boron Milling Plant with 100,000 ton/ years in Bigadiç was completed and the production was started in 2007. In conjunction with the increase in ground colemanite production capacity, the existing concentrator capacity in Bigadiç Plant increased to 975.000 tons/year by the addition of 325.000 tons/year capacity.

5.1.2 Mineral Processing Plant

The mineral processing plant was established in 1980 with the capacity of 150.000 tons/year. In 1990, the capacity was increased to 650.000 ton/years. After 2007 its capacity is increased to 975.000 tons/year. The output of this plant is given below:

Table 5.2: The Products of Mineral Processing Plant

Product Size (mm)	Ore Type	B_2O_3 %
25 – 125	Colemanite	42
3 – 25	Colemanite	36
0.2 – 3	Colemanite	27
+3	Ulexite	37
-3	Ulexite	25

5.1.3 Crushing and Grinding Plant

The crushing and grinding plant is working continuously and provides size reduction to -25 mm and ore blending. The crushing capacity is 50 tons/hour. The

outputs of crushing are 40% B_2O_3 grade colemanite ore and 37% B_2O_3 grade ulexite ore. These crushed products are grinded to 75 micron size.

5.1.4 Information about Personnel

113 white-collar and 223 blue-collar personnel work in Bigadiç Boron Work. Among the white-collars only 3.6 % is working as employee and the rest is contract personnel. The distribution of personnel in enterprise is given Table 5.3.

Table 5.3: Distribution of Personnel in Bigadiç Boron Work

Personnel Type	Number	% Distribution
Contract Personnel	99	25.4
Employee	14	3.6
TOTAL WHITE-COLLAR	113	29
Worker	276	71
TOTAL BLUE-COLLAR	276	71
GRAND TOTAL	389	100

As it can be seen in Table 5.3, totally 276 workers are employed and the distribution of them by departments is given in Table 5.4.

Table 5.4: Distribution of Blue-collar Personnel by Department

Departments	Number of Personnel	% Distribution
Tülü Open-pit Mine	10	3.6
Acep Open-pit Mine	11	4
Simav Open-pit Mine	18	6.5
Mineral Processing Plant	53	19.2
Crushing & Grinding	62	22.5
Stock & Dispatching	29	10.5

Table 5.4: (continued)

Mechanical Supply & Maint.	33	12
Transportation	15	5.5
Administration	14	5
Material Supply	2	0.7
Laboratory	21	7.6
Social Service	8	2.9
Total	**276**	**100**

Table 5.5: Distribution of White-collar Personnel by Branch of Services

Branch of Service	**Number of Personnel**	**% Distribution**
Administrative	66	58.41
Technical Services	44	38.94
Legal Services	1	0.88
Medical Services	2	1.77
Total	**113**	**100**

5.1.5 Accident Statistics

The statistical data recording in Bigadiç Boron Work is not neat. The records are outworn and several data is missing. The accident records have not been electronically saved and updated yet. This deficiency should be corrected by a good recording system. All new data should be recorded as hardcopy and electronic-copy. The structure of enterprise has been changed many times and many statistical data is now useless. In order to maintain an effective data recording “Procedure for Control of Records” is proposed for Bigadiç Boron Work. It is designed to ensure that all records are identified, collected, completed, filed, stored, maintained, managed and disposed in a consistent manner. This procedure is given in Appendix B.4. As an attachment of this procedure also a “Records Index Form” is prepared. All department and units have to use this form for identifying OH&S records, establishing filling and indexing method, and defining the access and retention period of each record. All records should be assigned a unique name and/or number

and all employees that have the authority to access to each record, should be registered in Records Index Form.

The most important structural change about Bigadiç Boron Work is that the underground borate mine was changed to open-pit mine in 2001. Due to organizational changes and unhealthy record keeping, only the last four years of statistical data is stressed in this study. Between these years totally 52 accidents were recorded. As it is shown in Table 5.6, the most frequent type of accident is "struck by" accidents. However it can be seen from Figure 5.1 which shows the distribution of workday loss by accident type that "traffic accidents", "fall-to-below" accidents constitute the main portion of injuries and they causes the highest workday loss together with "exposure" accidents.

Table 5.6: Accident Statistics by Type

Type of Accident	**Number of Accident**	**Number of Injury**	**Number of Fatality**	**Total Number of Victims**	**Number of Workday Loss**
Traffic Accident	2	13	1	14	6132
Struck-by	13	13	0	13	67
Fall-same-level	2	2	0	2	55
Fall -to-below	3	2	1	3	6117
Caught between	5	5	0	5	52
Overexertion	8	8	0	8	63
Cut	6	6	0	6	43
Burn	1	1	0	1	14
Exposure	4	5	1	5	6072
Caught-on	4	2	0	2	21
Struck-against	2	2	0	2	21
Caught-in	2	2	0	2	14
TOTAL	**52**	**61**	**3**	**63**	**18671**

Table 5.7: Accident Statistics by Departments

Department	Number of Accident	Number of Injury	Number of Fatality	Total Number of Victims	Number of Workday Loss
Mineral Processing Plant	14	14	0	14	193
Laboratory	10	11	0	11	85
Crushing & Grinding Plant	5	6	1	7	6098
Acep Open-pit Mine	4	4	0	4	45
Administration	1	7	0	7	30
Construction	2	3	0	2	20
Machine Supply& Maintenance	4	6	0	6	29
Material Supply	6	6	0	6	3
Simav Open-pit Mine	2	1	1	2	6001
Stock & Dispatching	3	3	0	3	167
Study & Control	1	0	1	1	6000
TOTAL	**52**	**61**	**3**	**63**	**18671**

Table 5.7 shows accident statistics by departments. Especially, the laboratory and mineral processing plant loom large about number of victims as it can be seen in Figure 5.2. Crushing & Grinding plant, Simav Open-pit mine and Study & Control Departments have the highest workday losses.

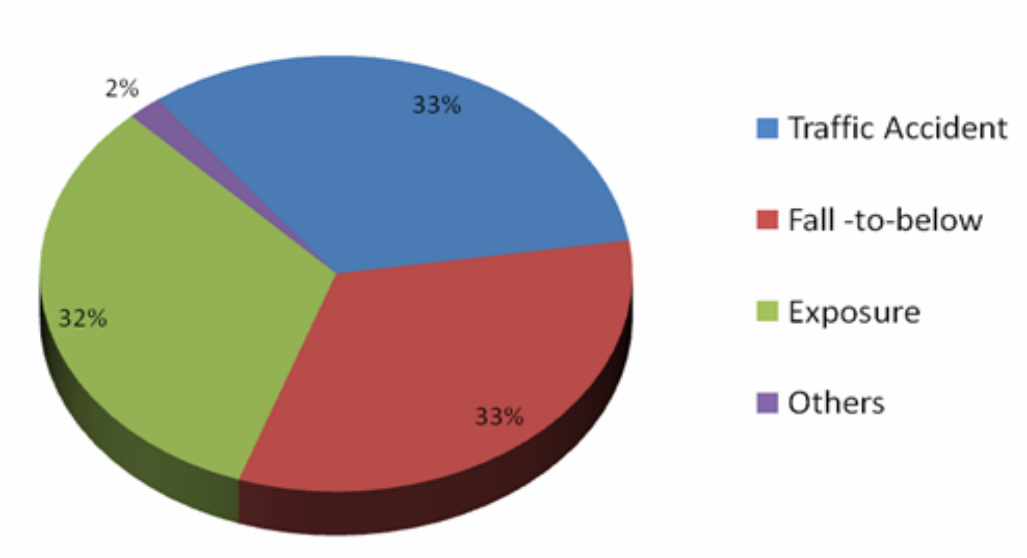

Figure 5.1: Distribution of Workday Loss by Accident Type

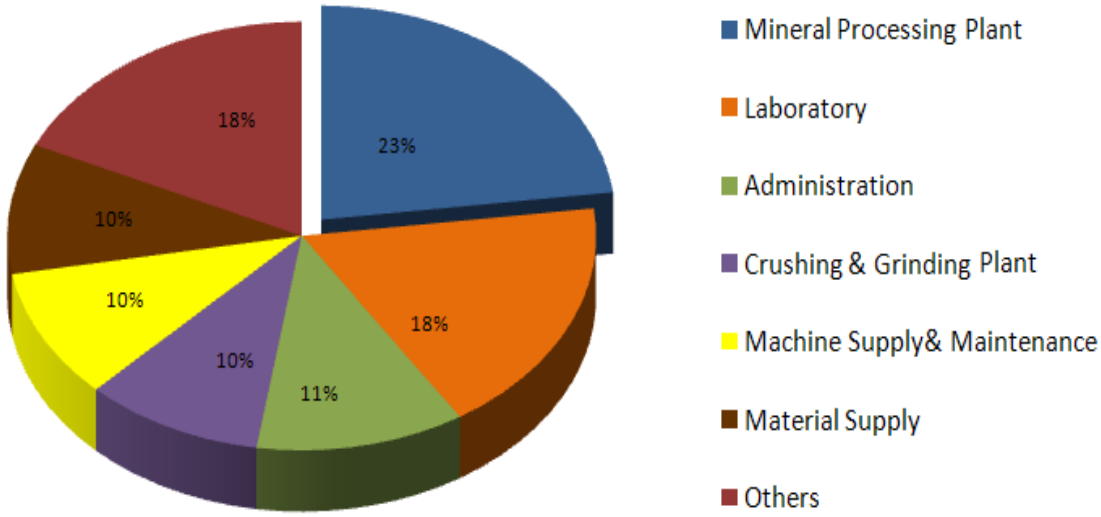

Figure 5.2: Distribution of Number of Victims by Departments

As a result, between 2004 and 2008 there are 52 accidents occurred and caused to 61 injuries, 3 fatalities, and 18671 workday loss. Deaths are caused by electrical shock (while performing topographic survey), fall-to-below (while trying to open a choked feeding chute) and truck (while dumping the overburden).

5.2 Developing the OHSA System

The studies required to establish an effective Occupational Health and Safety Assessment System in Bigadiç Boron Work are identified as follows:

- Establishing an Occupational Health and Safety Policy
- Construction of Occupational Health and Safety Manual
- Risk Assessment
- Accident Investigation and Analysis
- Emergency Plan
- Occupational Safety Rules
- Personal Protective Tools
- Hazardous Material Handling
- Medical Transactions
- Checking and Corrective Actions
- Management Review

As an initial step, the document, “Occupational Health and Safety Assessment System Requirements”, which explains what would be required to establish OHSA System, has been distributed to all department managers. Then by means of a comprehensive training session, the requirements of the system should be explained to responsible staff. The prescribed period to establish the system is two years. In this two years period, meeting should be made once a week with the participation of Occupational Health and Safety Management Representative and Occupational Health and Safety Supervisor. After deciding general points, the required procedures, instructions and forms would be published. The required information is given to OHSA Field Teams and application may start as soon as possible.

5.2.1 Structure of OHSAS Preparation Group

After determination of general points of OHSA System, the peoples are assigned to work in this context. In this step, OHS Management Representative and

OHS Supervisor, Department Representative, OHSA Field Teams are determined and their responsibilities and duties are stated. The task distribution of these units or people is shown in Table 5.8.

Table 5.8: The Task Distribution and Responsible Units

RESPONSIBLE UNIT	**TASK DEFINITION**
OHS Management Representative	Responsible to fulfill the requirements of OHSA System. Make connection and communications between Top Management and OHSA Staff
OHS Supervisor	Responsible to fulfill the requirements of OHSA System which are defined in procedures
Department Representative	Responsible to evaluate all requirements of OHSA System and establish a system for the company
OHSA Field Teams	Responsible to apply OHSA System established by Department Representative in working areas

It is obvious that the OHS Management Representative should be selected from top management as he or she would behave like a bridge between Top Management and other staff in order to fulfill the requirements, since there is a need for certain degree of authority. OHS Supervisor should be chosen among the staff that knows the company very well and has experienced. This expert may be involved in additional external training programs. Department Representative should be selected from the staff that can spent time on this issue. Different peoples should be selected for different subjects as much as possible and one person should not take too much responsibility. The work content should be distributed equally as much as possible. In accordance with the organizational structure and the size of company, OHSA Field Teams are composed of 4 - 5 people to perform the implementation of system. These teams should include engineers, foreman, and workers.

5.2.2 Elements of Occupational Health and Safety Assessment System

OHSA System studies are evaluated and improved continuously in accordance with Application Management method that is shown in Figure 5.3.

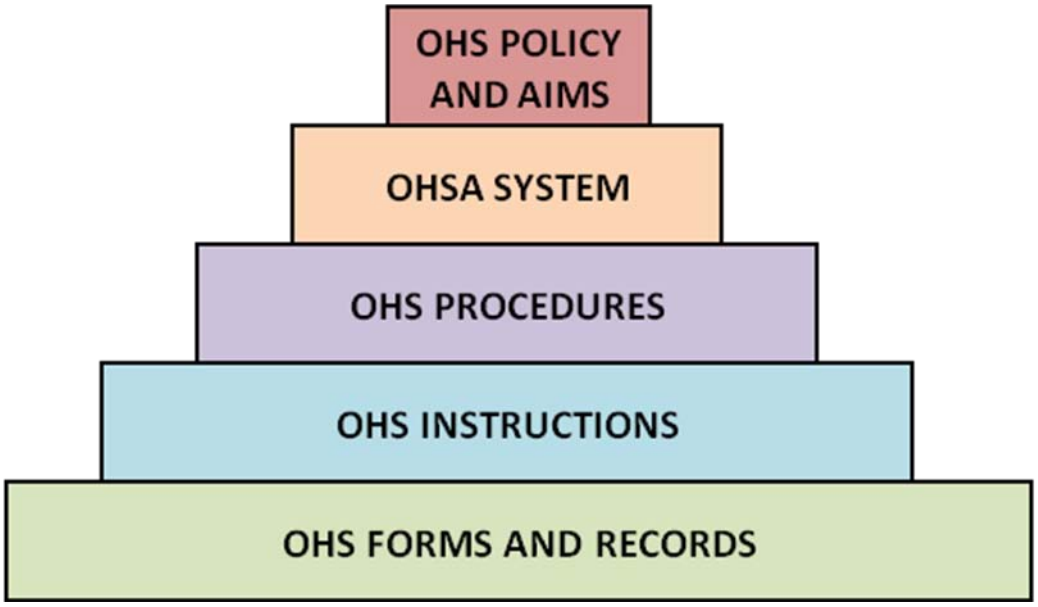

Figure 5.3: OHSA System Application Management

OHSA System is based upon the OHS Forms and Records. OHS Instruction and Procedures constitute the upper steps. The continuous improvement and updating take place in these steps mainly. The OHS Policy and Aims are standing at the top level of Application Management.

5.3 OHS Policy, System and Procedures

In this study to construct the system initially an “OHSA System Manual” is proposed. This manual is given in Appendix A. The OHSA System Manual is the key document of the system. This document aims to define policy, principles and structure of Occupational Health and Safety Assessment System. It comprises general information about enterprise, history, location, products, OHSAS policy and application of OHSAS 18001 standard to Bigadiç Boron Work. It defines general layout of the system and valid for all departments, social facilities and all sub-

contractors of Bigadiç Boron Work. OHSA Policy of Bigadiç Boron work is prepared within the context of this document (See OHSA System Manual in Appendix A). The Occupational Health and Safety Policy of Bigadiç Boron Work puts forth all health & safety targets, and undertakes the improvement of performance. As usual, the topics that may be included in OHS Policy are:

- Safe working environment
- Reducing accidents and risks
- Health
- Training
- Importance of staff
- Continuous improvement
- Consistency to Laws

It is essential to construct an OHS Policy which should include all health & safety aims and commitment. The OHS Policy must consistent with all organizational structure and other Assessment Systems (Quality, Environment etc.) This OHS Policy is showing the direction of Assessment System and forms a frame for OHS Aims and Objectives. For all activities, the organizations should implement and maintain procedures for participation of workers by their appropriate involvement in hazard identification, risk assessment, incident investigation, development and review of OH&S policies and objectives. Safe Work Procedures (or Job Safety Analysis) might be prepared for many activities and tasks.

5.4 Planning

The planning stage involves hazard identification, selection of risk assessment method, risk evaluation procedures and forms. Planning stage of the OHSA System must provide for briefings to be held prior to initiate system. The data obtained by means of Risk Assessment Forms is evaluated and several measurements can be developed at first. Pre-inspections may be conducted by OHS Supervisor or other individuals who are knowledgeable in occupational health and safety. Any

deficiencies in the effectiveness of the plan shall be corrected by top manager, supervisors, and chief engineers.

5.4.1 Establishing the Risk Assessment System

The documents that describe OHSA System are prepared in consistent with ISO 9001 Quality Management and ISO 14001 Environment Management Systems. Hazard identification process provides a basis for risk evaluation application which will be mentioned next section. The data collected owing to Hazard Source Inventory and Hazard Identification Checklist documents in which to be mentioned next section would constitute a helpful feedback for risk evaluation. As long as the data collected, it would give hints about prominent hazards and form guidance for risk assessment.

Two documents are prepared for risk evaluation. These are “Risk Assessment Document” and “Risk Evaluation Form”. The risk score of identified hazards is calculated according to Risk Evaluation Charts which are given in Risk Assessment Document. The Risk Assessment Document is provided in Appendix B.1. This risk evaluation method is known as Kinney Risk Evaluation Method. According to Kinney Risk Evaluation Method, three parameters exist in evaluation of risks. These are the likelihood of risk, frequency of exposure to risk, and consequence of its associated hazard. The Risk Score is calculated from the formulae given below:

$$\mathbf{R = L \times E \times C}$$

where;

R: Risk Score
L: Likelihood Score
E: Exposure Score
C: Consequence Score

There are three charts available in Risk Assessment Document. These are the score charts for these three parameters, Likelihood, Exposure, and Consequence. These parameters are shown in Table 5.9, Table 5.10, and Table 5.11 respectively.

Table 5.9: Likelihood Score Chart

Likelihood	**Score**	**Qualitative Expression of Likelihood**	**Quantitative Value of Probability**
Highly Unlikely	0.2	Practically Impossible	$P > 10^{-6}$
Unlikely	0.5	Once in fifty years	$10^{-4} > P > 10^{-5}$
Unusual but Possible	1	Once in 3-4 years period	$10^{-3} > P > 10^{-4}$
Possible	3	Tree times or more in a year	$10^{-2} > P > 10^{-3}$
Very Likely	6	Once a month	$10^{-1} > P > 10^{-2}$
Almost Certain	10	Once a week or more	$1 > P > 10^{-1}$

Table 5.10: Exposure Score Chart

Frequency of Exposure to Risk	**Score**	**Qualitative Expression of Exposure**
Very rare	0.5	Once per year or less
Rare	1	A few times per year
Unusual	2	Once per month
Occasional	3	Once per week
Frequent	6	Daily (some hours)
Continuous	10	Constant (during shift)

Table 5.11: Consequence Score Chart

Consequence Category	Score	Qualitative Expression of Hazard Severity
Noticeable	1	Will not result in injury, no work hour loss
Minor	3	No workday loss but first aid may required
Major	7	Major injury, workday loss
Serious	15	Severe injury or occupational illness, Permanent partial disability, long term
Fatality	40	Fatality
Disaster	100	Number of Fatalities

For each hazard identified for a specific job the likelihood score is attributed from the chart. For example, if the likelihood of a hazard is expected or known as “once in 3 - 4 years period” than its likelihood score is 1 according to Likelihood Score Chart. The exposure and consequence scores are found by the same logic. For each hazard it should be considered that “what is the frequency of exposure to risk?” and “what would be the consequence of that hazard if it occurs?”. The answers of these two questions give the scores of exposure and consequence. The scores are attributed according to given charts and by simply multiplying these scores the “Risk Score” is calculated for each hazard. The risk categorization can be made and the required action is found from the risk score chart which is given in Table 5.12.

The highest risk score that can be attributed is 10000 and the lowest is 0.1. According to risk score a risk categorization is constructed and required action for this categorization is specified (Taylor, G., et. al., 2004). The Risk Evaluation Form is used to detect risks and their corresponding risk scores by means of Risk Evaluation Charts. The Risk Evaluation Form is given in Appendix C.1. This is a systematic approach to detect risks and their risk scores. After that the risk are listed from highest score to lowest and the risk reduction action should be naturally started from risk which has the highest risk score.

Table 5.12: Risk Score Chart

Risk Category	**Risk Score**	**Action**
Unimportant Risk	R < 20	No attention required. There may be no need for extra risk reduction process but current controls have to be continued and controlled. A long-range study may be initiated.
Low Risk	20 ≤ R < 70	Attention required. Plan to reduce risk in 30 – 90 days
Moderate Risk	70 ≤ R < 200	Risk reduction is required. Take precautions within a month
High Risk	200 ≤ R < 400	Corrective actions required. Stop working and correct within 7 days. Immediate precautions have to be taken
Intolerable Risk	R ≥ 400	Stop working and correct immediately. If risk reduction is not possible than this operation has to be abandoned.

As it is mentioned before each hazard should be indicated in this form. The “Result” at the top of the form refers to hazard category and “Completion Date” means the required action which has to be taken within the given period of time. The “Present Situation” refers that whether the suggested result (or suggestion) is available in enterprise or not. Finally, the “Responsible people” refers to responsible superior if the hazard is exposed and the person who is responsible to take precautions against the indicated hazards.

A procedure has been constructed to increase effectiveness of system and the key points are indicated below:

- It is the responsibility of all personnel to provide safe, healthy and comfortable working environment. Therefore, the risk evaluation works should be performed as “Team Works” and the coordination should be ensured between the teams.

- Based on the concept of “The one best knows a job is who does it”, the ideas of all personnel should be regarded as inputs of risk evaluation.

- The period to review the performed risk analysis should be decided. It is usually one year.

- The performed risk analysis must be repeated whenever the following situations take place:

- Accidents
- Layout plan changes
- New machinery/equipment/construction installation
- Modifications of existent machinery/equipment/construction
- Change of legal requirements

5.4.2 Application of Risk Assessment System

In order to assess risks, firstly the hazards should be identified. As it is mentioned in Chapter 4, hazard identification is the process of recognizing any hazard exists in workplace and defining its characteristics. Only the identified hazards can be assessed, and risk assessments will rarely reveal unidentified hazards. Hazard identification includes items that can help about identifying workplace hazards and determining what corrective actions are necessary to control them. These items include jobsite safety inspections, accident investigations, health and safety comities etc. While performing hazard identification the pre-detected hazards for all tasks and activities should be taken into account. The hazard identification can be carried out by means of the field observations of responsible occupational health and safety staff as well as negotiation with working staff.

Before start to risk evaluation, the work fields of Bigadiç Boron Work is identified and listed in Table 5.13.

Table 5.13: Workplaces of Bigadiç Boron Work

No	Workplace	No	Workplace
1	Open-pit Administrative Buildings	24	Company Accommodation Center
2	Dynamite Warehouse	25	Health Center
3	Drainage Pump Station	26	Fire brigade
4	Stockpiles	27	WC
5	Dumping Site	28	Dressing rooms
6	Pits	29	Bathrooms
7	Weigh-bridges	30	Laboratories
8	Transformer Station	31	Mechanical Workshop
9	Benches	32	Electrical Workshop
10	Haulage Roads	33	Control (PLC) Rooms
11	Crushers	34	Compressors
12	Conveyors	35	Boiler Room
13	Screens	36	Security Hut
14	Washing Pools	37	Electrical Networks
15	Hand-picking	38	Mosque
16	Traveling crane	39	Liquid fuel tanks
17	Warehouses	39	Tailing Ponds
18	Woodshop	40	Closed Stock Area
19	Metal and wood workshops	41	Packing Plant
20	Electrical Saw	42	Grinding Mills
21	Administrative Building and Offices	43	Junk Pile
22	Dining Hall	44	Pumping Station
23	Dormitories and Guest house		

By the guidance of this list, a “Hazard Source Inventory” is created for Bigadiç Boron Work. This document is provided in Appendix B.2. The main source of all hazards and their possible effects are indicated in this form. The inspector and

his/her assistants or team should go through the fields and identify the hazards. This form delineates hazard identification and gives a rough idea about their effects. In order to comprehend all hazards in every workplace, a more comprehensive and effective tool “Hazard Identification Checklist” is proposed. This checklist is given in Appendix C.2.

Before starting to risk evaluation, a meeting should be made in order to determine fields and details of tasks with department representatives and OHSA Field Teams. After that the risk had been identified by means of going to work fields. The opinion of department representatives, operators or workers were considered also and the common ideas has been accepted as hazard and been recorded. The Risk Evaluation Form which has been prepared to record and follow-up the identified risks were sent to all related staff of departments and top management. To contribute risk reduction process the comments, precautions, and suggestions from the department representatives and management are requested.

Application of risk assessment system is based on risk evaluation forms. These forms are prepared with utilization of past accident data, health service records, statistics and experiences. The processes which have high risks are prioritized. In this study, several tasks are examined and some examples of risk evaluation are prepared. These examples are shown in Appendix D.1. In these examples, initially the process, sub-system, activities and staff who may be affected by potential risks are identified. Then L, E, and C scores are assigned according to Risk Evaluation Charts. The risk score is calculated for each activity or hazard, and their expected results and several suggestions are indicated in order to escape from risks by means of these forms.

5.5 Implementation of OHSA System

After performing an effective risk evaluation process the OHSA System implementation can be started. The prepared risk evaluation forms are very important documents for future measurements and preventive actions. Another important document is OHSA Manual. It can be said that the backbone of the system is the

Occupational Health and Safety Assessment Manual. In this manual almost all information is given about system implementation. It provides for guidance to all staff of enterprise while implementing and constructing the assessment system.

5.5.1 Accident Investigation and Job Safety Analysis

5.5.1.1 Accident Investigation

The OHSA System is based on proactive approach. However, statistical record of accidents, report preparation, and analyses are very vital for functionality of system. Accident investigation is handled in two parts:

- Occupational Accidents
- Near Misses

Occupational Accidents

An “Accident Report Form” is proposed for Bigadiç Boron Work. In case of any occupational accident this form should be filled. This form should be filled by head engineers. This form requires some information about victim such as name, age, occupation. The date, time, type and location of accident should also be indicated in this form. A brief description of accident is given with this form. The causes of accident must be indicated in pertinent part of the form. It can be a direct, indirect or basic cause. The “Accident Report Form” is given in Appendix C.11. An “Accident Investigation Form” is prepared for data collecting and further investigation aims of enterprise. This investigation form is provided in Appendix C.3. This form requires simply the information about victim and supervisor. It tries to define accident by means of supervisor inspections and witness aid. This form constitutes a good feed-back for the risks assessment because it gives real information about accidents and risks. The main tasks that have to be performed in case of an accident are indicated below:

1) The first witness of accident informs to First Aid Staff, Department Representative, and Occupational Health and Safety Supervisor. Since even the

seconds are very important, all personnel must know first aid staff of their department.

2) The first aid staff helps to victims and carries them to Health Service. The first aid may rescue life and make the medical attention easier. Therefore, the first aid staffs should be selected carefully. They have to take first aid training and principals of this training must have been remembered annually.

3) The required medical attention and examination are performed in Health Service. If the victim is injured seriously then he or she has to be hospitalized. All diagnosis of victim should be kept under record and they are attached to victim's personal health file.

4) Accident Report Form should be filled for each individual accident to report the accidents by head engineers. Accident Investigation Form must be filled by first superior or OH&S Supervisor. The accidents due to occupation and reported to Health Service should be accepted as occupational accident. Thereafter, it should be recorded and investigated in detail. Occupational accident legally should be reported to related authorities within two days.

5) The base reason of accident is founded and precautions are planned. Work should be stopped in places having high risk and the precautions should be taken immediately in these areas.

6) The risk evaluation process should be reviewed, repeated and updated whenever it is required.

7) The accident records are saved systematically and required analyses are performed. The information about occupational accidents and results of analyses should be announced to working staff by means of clipboards.

Near Misses

The event which almost happen or just missed is called as Near Miss. The accidents which occur so often are obviously messenger of new accidents. Therefore, the near misses should also be recorded and required precautions should be taken. For this purpose, the type of accident should be indicated in Accident Investigation

Form and a Near Misses investigation system should be planned including the following points:

1) Near Misses should be reported to OHS Supervisor. Therefore, the concept and scope of near misses should be explained to all working staff clearly.

2) In order to get feed-back of near misses, a notification form is prepared and these forms would be gathered in “Near Miss Boxes”. The proposed “Near Miss Report Form” is given in Appendix C.4. The near miss report form simply asks for description of near-misses in workplaces from the employees.

3) OHS Supervisor collects these forms, examine, fill relevant parts, and record. Supervisor may go the related working place and make an investigation if it is required. The notifications marked “Urgent” on the form should be treated as soon as possible.

4) OHS Supervisor controls all planned precautions and keeps the records for an effective control process.

5.5.1.2 Job Safety Analysis

Job safety analysis (JSA), also known as Safe Work Procedure, is a basic approach to develop improved accident prevention procedures by documenting the firsthand experience of workers and supervisors and at the same time it tends to instill acceptance through worker participation. The five basic steps of JSA are:

1) Select jobs with the highest risk for a workplace injury or illness.

2) Separate the job into its basic steps

3) Identify and record each step necessary to accomplish the task. Use an action verb (i.e. pick up, turn on) to describe each step.

4) Identify all actual or potential safety and health hazards associated with each task.

5) Determine and record the recommended action(s) or procedure(s) for performing each step that will eliminate or reduce the hazard (i.e. engineering changes, PPE, etc.).

When selecting the job to be analyzed, it should be ranked in the order of greatest accident potential. Jobs with the highest risks should be analyzed fist. In order to rank jobs to be analyzed, the following criteria should be used:

1) Accident frequency

2) Accident Severity

3) Judgment and experience

4) New jobs, non-routine jobs, or job changes (Reese, 2003)

The first two articles are already covered with risk evaluation process. Therefore, the tasks which have high risk score should be analyzed first. After a job is selected, the JSA can be initiated. A "Job Safety Analysis Form" is introduced for Bigadiç Boron Work. The JSA form lists the basic job steps, the corresponding hazards, and offers notes in order to control each step. The Job Safety Analysis Form is given in Appendix C.5. If the sequence of job steps or the deviations from established job steps are critical to the safe performance of a job, this should be noted in JSA. The next step of the JSA is to eliminate or reduce potential accidents or identified hazards. The following points should also be considered for each identified hazard and to them some notes and comments should be indicated for the each job step in the JSA form:

1) Can a less hazardous way to do the job be found?

2) Can an engineering revision take place to make the job or work area safer?

3) Is there a better way to do the job?

4) Are there work-saving tools and equipment available that can make the job safer? (Reese, 2003)

Several tasks are selected and job safety analyses of for these selected tasks are prepared and shown in Appendix D.2. It is important to get involvement of workers in the JSA process. Workers are familiar with the jobs and can combine their experience to develop the JSA. A complete JSA is a continuing effort to analyze one hazardous job after another until all jobs with sequential steps are included in JSA. Once it is established, the standard procedures should be followed by all employees.

5.5.2 Emergency Plan

The actions performed in case of accidents, explosion, fire and natural disasters (flood, earthquake etc.), and any emergency situations should be indicated in an Emergency Plan. The preparation of emergency plan is based on risk evaluation process. It is decided that an effective emergency plan must include following points:

- Identification of potential emergency situations
- Identification of personnel assigned to work in emergency situations
- Definition of tasks which personnel would perform in case of emergency.
- Definition of mission and authority of teams (fire team, first aid team, rescue team)
- Evacuation procedure, identification of hazardous materials layout
- Communication information about external official authorities and services
- Recovery of crucial information and equipment
- Accessibility of required information

Rescue and Save Team, First-aid Team, Fire Team, which consist of minimum seven people, are constructed by the management in Bigadiç Boron Work. These teams perform fire, first-aid, rescue and evacuation drills twice a year. The items of emergency equipment of Bigadiç Boron Work are determined and ensured. The operability of these equipment items should be tested and recorded within a year. All companies may be faced with emergency situations, yet these can show some differences according to company's structure and work.

Identification of risks that may cause to emergency constitutes the basis of Emergency Plan. According to risk evaluation process the "Emergency Plan" of Bigadiç Boron Work is constructed. The Emergency Plan is given in Appendix B.3. It consists of evacuation plan, firefighting, first aid and rescue procedures. The emergency teams are established and their missions and responsibilities are defined. The emergency plan introduces how to act in case of emergencies. The preparation of this plan has no importance alone. The important point is that this document must be distributed to all departments and all personnel must be trained.

5.5.3 Emergency Teams

The time is vital in emergency situations and the lack of coordination may cause many causalities. The Coordinator of Emergency should be selected from top management for high level of authority and experience. Hence, Manager of Company is being the coordinator in many cases like in Bigadiç Boron Work. The coordinator of emergency should have profound knowledge about crisis management and so he/she must have the following training programs:

- Crisis management
- Emergency response planning
- First-aid planning
- Evacuation
- Fire Fighting
- Safety Planning

As the enterprise is dependent on external emergency services, the time is very important. Therefore, the company should establish “Emergency Teams” which have the following properties and capabilities:

1) There should be different teams for each work field.

2) There should be First-aid, Rescue, Fire Fighting missions and these are assigned to different people.

3) The teams should be composed of proper people. For example, the rescue mission should be assigned to person who is physically powerful while the first-aid staff should be selected among the handy and quick people.

4) Teams should consist of voluntary people

All working staff must know the emergency teams of their workplace. For this purpose, the list of people and their mission in teams should be posted on walls and it should be kept up-to-date.

5.5.4 Establishing Emergency Communication System

To communicate other departments, there should be a means of emergency communication after an unwanted urgent event happens. In Bigadiç Boron Work the most effective and rapid communication way is telephone. Therefore, the emergency situations would most probably be informed via telephone. The first witness of event may not know the internal and external phone numbers or he/she can forget the numbers due to panic. For this reason, a card showing emergency numbers is prepared and it must be mounted on all phones in Bigadiç Boron Work. This Emergency Telephone Numbers Card is given in Figure 5.4.

EMERGENCY SERVICE	PHONE NUMBER
FIRE BRIGADE	110
AMBULANCE	112
POLICE	155
GENDARME	156
ENTERPISE HEALTH SERVICE	1010
ENTERPRISE CIVIL PROTECTION UNIT	1011

Figure 5.4: Emergency Phone Numbers Card

5.5.5 Emergency Drills

No matter how the emergency plan is prepared absolutely, it does not show that the application will be successful. Therefore, the plan should be tested by means of emergency drills. The following points should not be disregarded:

1) The drills should be performed once a year and covers all shifts.

2) A scenario and time plan should be prepared before the drills. The scenario should be truthful as much as possible.

3) The emergency drills should be recorded by video camera and proper recordings can be saved.

4) A detailed report should be presented to top management after the drills. This report must include all negative points of drill and measures which alleviates them.

5) According to drill results the emergency plan may be revised or changed.

An “Emergency Drill Control and Evaluation Form” is prepared and suggested in order to evaluate the adequacy of drills. The form is given at Appendix C.6. In this form several questions are asked about emergency drills and some explanations can be indicated for each question. This form should be filled by Coordinator of Emergency and submitted to OHSA Supervisor in order take related measurements about the deficiencies indicated in this form.

5.5.6 OHS Rules

The companies must obey the legal rules of their country. The legal requirements of Bigadiç Boron Work are predicated in Occupational Health and Safety Regulations of Ministry of Labor and Social Security. This legislation forms the basis of Occupational Health & Safety Rules of Bigadiç Boron Work.

There are some jobs that require special pre-permission in Bigadiç Boron Work. These tasks have high risk and may require a job license to perform. Therefore the selection of workers is important. Regarding all operations in company, it is very hard and comprehensive process to determine different rules and enforce them. Therefore, only the tasks that require permission are identified. Before starting to these works, the related superior must be informed and permission must be granted. A “Job Order Form” is prepared for this purpose. This form is given

Appendix C.7. The tasks that require permission are identified and can be listed as follows:

1) Blasting
2) Working in high level
3) Maintenance of high voltage network
4) Topographic Surveying
5) Drilling

5.5.7 Personal Protective Equipment

Personal protective equipment means all equipment which is intended to be used or held by a person at work and which protects his/her health and safety against one or more risks, and any tools or accessories designed to meet this objective. Personal protective equipment (PPE) includes protective equipment or tools for eyes, face, head, and extremities of human body. This equipment may be clothing, shields, glasses, gloves, helmets, shoes, ear plugs etc. In all workplaces the required and suitable PPE must be used. Meanwhile, the main target should be decreasing dependence to PPE by means of amendment of working conditions and risk reduction. The observations indicate that there is no common habit of PPE usage in Bigadiç Boron Work. This creates a big problem for OHSA System. The studies about PPE are planned as follows:

1) Determination of PPE
2) Procurement of PPE standards
3) PPE usage follow-up

In order to protect workers the PPE should be used effectively. However, the proper PPE must be used for suitable works. The risk analysis detects the required PPE items and they are purchased from different suppliers. Initially this equipment should be tested by different workers. Then the opinions of the testers are taken and evaluated by OHS supervisor and enterprise doctor. After selection of the

equipment the training about these PPE items are given to relevant staff and PPE items are started to use.

As employees do not concern about workplace risks or the PPE make them to feel indisposed, they don't want to use PPE. In order to keep high rate of usage a PPE follow-up system should be used. For this purpose, a form called "Personal Protective Equipment Record Form" is proposed to record PPE distributed to workers. This form is given in Appendix C.8. A copy of this form is prepared for all working staff that uses the PPE. The workers should sign this form and it is saved by head engineers. The OHS supervisor may also keep a copy of these forms. The workers who do not use the PPE initially must be warned and make them conscious about the importance of PPE usage. At this point the managers should lead by example of PPE usage while they are visiting the working areas. Despite all warnings to workers, if the disuse is became a habituation then the required strict punitive procedures must be applied.

5.5.8 Hazardous Material Handling

Chemical materials are not consumed so much in Bigadiç Boron Work. The chemical analysis laboratory unit uses several chemicals to perform analyses. In order to handle chemical materials the existent problems are identified:

1) The chemical materials which are used in laboratories are unlabeled or labeled with the languages other than Turkish.

2) Some of the Material Safety Data Sheet (MSDS) are missing or deficient.

3) The MSDSs do not exist in working place and the employees have lack of knowledge about their importance.

The first step of problem solving is to contact with chemical materials suppliers and request to put on the Turkish labels and MSDS of purchased materials. If there would be still a problem about labeling then the enterprise must label them

itself. The MSDSs must be posted onto workplace clipboard. Furthermore, Material Safety Data Sheets of products are posted at warehouses where the concentrated boron products are stored. A standard MSDS form is prepared and given in Appendix C.9. Also, a sample MSDS for “Bigadiç Colemanite” is prepared and given at Appendix D.3. Material Safety Data Sheets are the internationally standardized way to document the hazardous properties of chemicals and other hazardous agents. It is a summary of the health hazards of the material and associated recommended safe work practices.

5.5.9 Medical Transactions

Bigadiç Boron Work has a Health Service with Medical Personnel according to Occupational Health and Safety Regulation. The Health Service has two tasks namely, preventive medicine and first-aid. The aim of preventive medicine is preventing the occupational diseases and accidents by means of periodical inspections and participating to melioration works. To succeed this following points have to be considered:

1) The Health Service should have a good record system. All personnel should have a private health record and these files cannot be accessible except the health service employees. In addition to this, these files should be prevented in case of a fire, and natural disasters.

2) Health Service employees should participate risk evaluation process actively and also they should have periodical visit to workplaces.

3) A plan should be prepared about periodical inspections and this plan should be preformed carefully.

4) A procedure which explains the operations of Health Service should be prepared and announced to company.

5) The records of health service should be examined and the results of this study should be announced to company.

6) The newcomers and relocated workers should be medically inspected.

5.6 Checking and Corrective Action

As it is mentioned before the main principle of Occupational Health and Safety Assessment System is proactive and preventive approach. Therefore, safe application of new projects or tasks is very important point of OHSAS. The existent risk analyses and risk evaluations became a lodestar to these new tasks. If new tasks are performed according to output of risk analyses properly, the risk identification and reduction process of subsequent new tasks would be easier.

5.6.1 Monitoring and Measurement

The production and service processes of Bigadiç Boron Work are measured and monitored. The performance criteria, technique and period of monitoring and measuring have to be conducted according to legal regulations. In case of any deviation of objectives, required treatment and precautions have to be performed. The head of department is responsible to monitoring and measurement of his/her department, and if nonconformity exists, they contact with relevant department to solve this nonconformity. The following measurements should be performed within the context of Occupational Health and Safety in Bigadiç Boron Work. Some of these measurements have not been made as it is indicated in Table 5.14.

Table 5.14: Periodical Measurements

Measurement	Period	Existent Condition
Volatile Organic Compounds	6 months	A
Noise	2 years	NA
Thermal Comfort (moisture – temperature)	2 years	NA
Illumination	1 year	NA
Audio Test	1 year	NA
Grounding of Structures	1 year	NA
General Medical Inspection	1 year	NA
Drinking Water Chemical Analysis	6 months	NA
Porter (Medically holder of diseases) Inspections	1 year	NA
Dust	1 year	A

5.6.2 Audits

Workplace audits are inspections, which are performed to evaluate certain aspects of the working environment considering occupational health and safety. The use of health and safety audits shows positive effect on companies' loss control initiative. Actually, companies that perform audits have lower accident rate than that of do not perform audits. The audits are not only a part of checking or controlling activity, but also a part of hazard identification and corrective actions. The audits can provide the followings:

1) Identification of the existence hazards
2) Checking compliance with rules and regulations
3) Determination of Health and Safety conditions of workplace
4) Evaluation of supervisors' and workers' health and safety performances
5) Evaluation of progress and effectiveness of health and safety issues.

In Bigadiç Boron Work the daily regular inspections are performed by head engineers or engineers in order to detect hazardous conditions, equipment, material or unsafe working practices. In addition to this, the periodic internal audits are performed by Department of OH&S headed by OHS supervisor. The supervisor, together with health service personnel and management, determines the frequency of audits based on the level and complexity of activities and hazards associated with these activities. The frequency of internal audits is established in the Occupational Health and Safety Manual (at least once a year). For Bigadiç Boron Work an audit topic list has been constructed and given in Table 5.15.

Table 5.15: Audit Topics

Acids	Electrical Equipment	Noise
Alarms	Emergency Procedures	Oil Barrels
Atmosphere	Environmental Factors	Ore Washing
Automobiles	Excavating	Personal Protective Equipment
Benches	Excavators	Pit stability

Table 5.15: (continued)

Blasting	Explosives	Power sources
Boilers	Extinguishers	Road rollers
Buildings	Flammables	Safety Devices
Bulldozers	Fork lifts	Screens
Chemicals	Grinding	Stairways
Containers	Hand Tools	Storage Facilities
Controls	Hauling	Tanks
Conveyors	Hard Hats	Transportation
Confined Spaces	Heavy Equipment	Trucks
Cranes	Horns and Signals	Ventilation
Crushing	Hoses	Walls and Floor Openings
Doors	Housekeeping	Warning devices
Drainage and piping	Ladders	Welding and Cutting
Drilling	Lifting	Work Permit
Drilling machines	Lighting	Unsafe Conditions
Dumping	Loading	Unsafe Acts
Dusts	Medical Services and First Aid	

According to these identified audit topics, a “Health and Safety Audit Instrument” is proposed for Bigadiç Boron Work. It is a written instrument that can be applied for internal audits of Bigadiç Boron Work. This instrument is given in Appendix C.10. This audit instrument asks several questions about workplace. These are yes or no questions. For further detailed inspections, audit reports may also be prepared by inspectors.

5.7 Management Review

Management Review Meetings should be organized at least twice a year. In these review meetings, the results of risk evaluations, audits and the requirements of OHSAS 18001 are checked and reviewed. One of the most important points is that the

support and emphasize of top and middle level management. Especially, the usage of PPE should be encouraged by management. The on-site audits, inspections and visits of management are also vital for the system. To sum up, the management should support Occupational Health and Safety Assessment System by means of:

- being a model to all personnel
- considering occupational health and safety parameters in the scope of top and middle level aims.
- performing audits in their workplaces and establishing good relationships with workers and all personnel.

Active participation in and support of health and safety system are essential. Therefore, all management officials should display their interest in health and safety matters at every opportunity. They are expected to follow the job safety rules and enforce them equally. Management personnel's safety performance comprises a significant portion of their annual merit evaluations.

CHAPTER 6

RESULTS AND DISCUSSION

OHSAS 18000 is an Occupational Health and Safety Assessment standard series for health and safety management systems. It is intended to help organizations control occupational health and safety risks. It was developed in response to widespread demand for a recognized standard that facilitates certification and assessment. The primary focus of the Occupational Health and Safety Assessment System is to meliorate existing conditions of the work environment, as well as to prevent occupational accidents and disease in employees. In this regard, Bigadiç Boron Work, which is within the body of Eti Mine Works, is the main point of this study. This thesis aims to establish an occupational health and safety assessment system for Bigadiç Boron Work according to the requirements of OHSAS 18001. It first identifies substantial hazards and risks, and then focuses on mitigation of these hazards and risks to improve existing working conditions. It is obvious that safety regulations can be ineffective or insufficient if they are not understood or complied with properly. In addition, occupational health and safety in all work environments are always dynamic and changing. It is impossible to get an absolute and perfect health and safety program since the requirements will change as the company evolves. However, the aim of the company should be, “all accidents and incidents are preventable and all levels of management are responsible for health and safety”. To satisfy the requirements of OHSAS 18001 in Bigadiç Boron Work, an “Occupational Health and Safety Manual” was prepared. This manual defines the main principles of the system. An OH&S policy, aims, and plans were proposed with this manual. Several sets of standard forms were prepared and recommended for Bigadiç Boron Work. These provide both standardization and feedback for the OHSA system.

In order to identify the current hazards which exist in the workplace of Bigadiç Boron Work, two documents, namely “Hazard Source Inventory” and

“Hazard Identification Checklist”, were prepared in this study. Then, mitigation and elimination of hazards and risks by means of the proposed risk assessment system was set out for Bigadiç Boron Work. The system definition is given in “Risk Assessment Document”. Some existent risks and their potential hazards were studied with the prepared “Risk Evaluation Forms” according to this assessment system. The risk evaluation forms were prepared for drilling, blasting, operating excavator, changing a truck tire, and topographic surveying tasks. These tasks were observed and all possible hazards were listed. Their likelihood, exposure and consequence scores were assigned with the help of risk assessment charts. The risk score defines the level of urgency of risks and the preventive actions.

A Job Safety Analysis form was prepared for Bigadiç Boron Work. The proposed JSA form can be used to identify, analyze and record the steps involved in performing a specific task, and the existing or potential safety and health hazards associated with each step. Several safe job procedures were also prepared with the help of the risk assessment process. The selected example jobs were drilling, blasting, changing tires on trucks, service truck use, operating an excavator, and hand tool usage. As JSA requires, all activities and related tasks were listed carefully and the job steps were clearly indicated in imperative form. The JSA forms were filled through field observations as well as negotiation with working staff. Firstly, several jobs were selected to analyze and they were separated into their basic steps. After that, each necessary step to accomplish the task were identified and recorded. Then, all actual or potential safety and health hazards associated with each task were identified. Finally, the recommended action(s) or procedure(s) for performing each step that would eliminate or reduce the hazard was determined and recorded.

Furthermore, an “Emergency Plan” was prepared for the enterprise. The proposed emergency plan provides a comprehensive approach to emergency situations. It defines the roles and responsibilities of emergency teams and introduces how the organization and units should act in case of an emergency. The existing incompetent emergency teams were broadened and widened within the organization in this plan.

As a result of this study, consistency throughout the organization was established by the creation of standardized documents, procedures and forms in the short term. The opinions of field workers and foremen were taken. This also improved participation and motivation. The proposed OHSA System lessens dependency on key individuals. It distributes responsibility and accountability across the work force, allowing more people to share more information and accountability for safety tasks. Therefore, tasks or processes do not collapse because of one person leaving or changing jobs. Each person carries his/her share of the load. This long term preparation and application process initializes the awareness of importance of PPE.

The top management agreed to a change in organizational structure and established the OHS Department in order to organize, plan and manage all occupational health and safety issues. The system decreases management oversight and increases the attention of management to health and safety issues. The prepared self-auditing tool (OHS Audit Instrument) is a very powerful “early warning system” to help management spot the health and safety threats. It gives the management the chance to address and resolve them before they occur, rather than after. This gives management objective data upon which to base decisions.

During this study some cold facts were observed. The most important matter was deficient and chaotic data recoding. The enterprise had no adequate data recording system and existing statistical data was insufficient and did not cover all workplaces. This should be corrected immediately in order to provide healthier information for the OHSA System. To solve this problem, a document, “Procedure for Control of Records”, and “Records Index Form” were prepared. These documents were designed to ensure that all records are identified, collected, completed, filed, stored, maintained, managed and disposed of in a consistent manner. Recording and record keeping should be digitalized and the information of sub-contractors should also be acquired.

Another important problem is that the usage of personal protective equipment is not habitually common. This study shows that it is very hard to change

the habits and thoughts of people. Therefore, the support of top management to break down the resistance to change and development is necessary. All levels of management should have a proper understanding of occupational health and safety and they should be a model to employees. The managers should always use personal protective equipment. However, the commitment of management is usually not adequate. Moreover, the consciousness of workers towards occupational health and safety is often poor. It is known that some small accidents are concealed, and not reported to superiors. The management is also aware of nonconformities but does not take them into consideration.

The effectiveness of the system depends heavily on training. Training does not mean that some people meet in a room and a person explains something to them. External training programs offered by professional institutes may be taken. The supervisor and head of departments should hold the on-site trainings. The people that are involved in the OHSA System should be chosen properly and adequate training must be provided.

The OHSA System integrates with quality and environmental management assessment systems. Therefore, related departments should be more actively involved in the application of OHSAS 18001. Like the Quality and Environmental Management Systems, this system has the principle of “continuous improvement”. The aims of the system improvement process should be defined and announced to all employees. The mechanism of the system has to be reviewed periodically.

The audits and management reviews are the main revision tools and they must not be delayed or discarded. The proposed “Health and Safety Audit Instrument” would serve this purpose. It is also an “early warning system” to help management spot the health and safety threats of the gap in the OHSA system. The system certification would place the enterprise in an elite category of businesses and it would provide the identical level of excellence shared by organizations of all kinds worldwide.

CHAPTER 7

CONCLUSION AND RECOMMENDATIONS

The OHSAS 18000 standard series provides a framework for modern accident prevention techniques. It emphasizes neither individuals nor technology, but rather the organization. In this study, the OHSAS 18001 has been implemented for Bigadiç Boron Work with all aspects. In this context, a series of documents and forms which are given in appendices were prepared. These documents and forms are:

1) Risk Assessment Document
2) Hazard Source Inventory
3) Emergency Plan
4) Procedure for Control of Records
5) Risk Evaluation Form
6) Hazard Identification Checklist
7) Accident Report Form
8) Accident Investigation Form
9) Near Miss Report Form
10) Job Safety Analysis Form
11) Emergency Drill Control and Evaluation Form
12) Job Order Form
13) Personal Protective Equipment Record Form
14) Material Safety Data Sheet
15) Occupational Health and Safety Audit Instrument

As a result, by the application of the system and use of these prepared documents, the following points were realized in the short term:

- Consistency throughout the organization was established by means of created standard documents, procedures and forms.

- The proposed OHSA System lessened dependency on key individuals. It distributed responsibility and accountability across the work force. This also improved participation and motivation.

- Employees were more cautious about the usage of personal protective equipment.

- The preparation and implementation of the system led to establishment of a new department called the “Occupational Health and Safety Department”.

- This OHSA System preparation and application kept the enterprise prepared for external audits and inspections by government institutes.

- This proposed OHSA System transformed the enterprise’s operations from detection mode to prevention mode. Prevention was less work and less expensive than detection.

- The proposed job safety analyses identified previously undetected hazards and increased awareness of employees. The proposed analyses and works formed the basis for regular contact between supervisors and workers.

The system certification would enforce the usage of proper PPE. The continuation of the OHSA System is very important and mainly based on the consciousness of employees. For this purpose, a “Health and Safety Board” should be designed and set up in several places within the organization. Furthermore, posters, phrases, statistical data, rules, newspaper clippings, etc. may also be very useful. It is very important that the staff should be aware of risks in the work environment. Therefore, the figures that show the risks in work environment should be posted in easily visible locations. These risks should be explained to newcomers before they start work.

Encouragement is a useful tool that creates participation and willingness. It helps bring about the integration of employees into the OHSA System. Celebration of accident free months or weeks, and rewarding suggestions and ideas about occupational health and safety can be given as examples of encouragement.

Management should have a proper understanding of occupational health and safety and they should be committed to be a model for all working staff.

The OHSAS 18001 will be a milestone for the Turkish mining industry provided that it is implemented appropriately. This widely used standard needs to be extensively applied to the Turkish mining sector. Mine accidents are not totally unpreventable. Nevertheless, the main goal of a company should be “all accidents and incidents are preventable”, and all mining companies have to aware that management is responsible for health and safety of their employees. As for all phases of life, change and progress are inevitable in mining industry. Therefore, improved OHS management standards or systems must be prepared to adapt these dynamic conditions.

It is well known that “safety begins at the top”. The management of an organization should control the whole process and combine the maximum production methods with the minimum cost. This process should be conveyed with regard to occupational health and safety because it should be kept in mind that safety is not an extra expenditure. On the contrary, it is a money saving process. The general improvement of occupational health and safety constitutes well-being and motivation of workers as well. This will obviously improve efficiency and quality of products. The consciousness of occupational health and safety provides a better way of life for both individuals and society. Health, safety, and the comfort of workers are a prerequisite for quality and efficiency. These primary matters are very important for socio-economic, egalitarian, and sustainable development. As a result, this study shows that for many reasons, nothing in a business is more important than improving health and safety performance, and hereof, the OHSAS 18000 standard series provides great benefits for mining companies.

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APPENDICES

APPENDIX A OHSA SYSTEM MANUAL

ETİ MINE WORKS

GENERAL MANAGEMENT

BİGADİÇ BORON WORK

OCCUPATIONAL HEALTH AND SAFETY ASSESSMENT SYSTEM MANUAL

Document Number	01
Number of Page	21
Publish Date	17.02.2008
Prepared by	Soner GÖKÇEK
Approved by	

Edition	Definition	Date of Change
0	Original	17.02.2008
1		
2		
3		
4		

TABLE OF CONTENT

1.0 AIM and SCOPE

This document aims to define policy, principles and structure of Occupational Health and Safety Assessment System (OHSAS). This document is valid for all departments indicated in organizational structure, social facilities and all sub-contractors of Eti Mine Works General Management – Bigadiç Boron Work

2.0 Information about Bigadiç Boron Works

Bigadiç Boron Work has three open pit mines from which 800.000 tons/year ulexite and Colemanite ores with 29–31% B_2O_3 are produced. The concentrated colemanite and concentrated ulexite are produced by enriching the ore at the concentrator facilities. Ground colemanite and ground ulexite are produced in the grinding facilities, activated in 1998, with the capacity of 90.000 tons/year. The mineral processing plant has been established in 1980 with the capacity of 150.000 tons/year. In 1990, the capacity was increased to 650.000 tons/year. After 2007 its capacity is increased to 975.000 tons/year. The output product of this plant is given below:

Table – 2: The product of Mineral Processing Plant

Product Size (mm)	Ore Type	% B_2O_3
25 – 125	Colemanite	42
3 – 25	Colemanite	36
0.2 – 3	Colemanite	27
+3	Ulexite	37
-3	Ulexite	25

The crushing and grinding plant is working continuously and provides size reduction to -25 mm and ore mixing. The crushing capacity is 50 tons/hour. The outputs of crushing plant are 40% B_2O_3 grade colemanite ore and 37% B_2O_3 grade ulexite ore. These crushed products are grinded to 75 micron size.

Contact Information:

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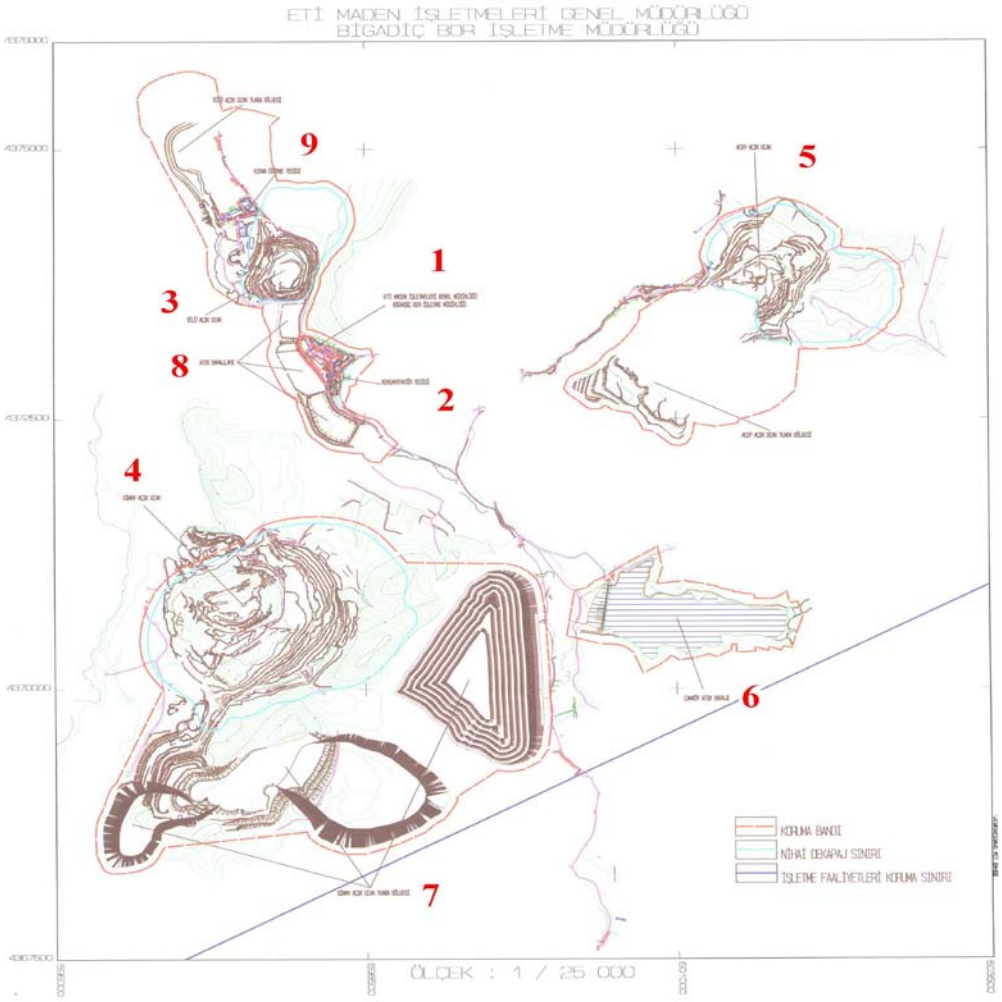
FAX: 0.266. 633 72 23 **E-MAIL:** bigadic@etimaden.gov.tr
ADDRESS: ETİ MADEN İŞLETMELERİ GENEL MÜDÜRLÜĞÜ BİGADİÇ BOR İŞLETME MÜDÜRLÜĞÜ 10441-Bigadiç / BALIKESİR

2.1 General Layout of Bigadiç Boron Work



1) Administrative Buildings and Offices
2) Mineral Processing Plant
3) Tülü Open-pit
4) Simav Open-pit
5) Acep Open-pit
6) Çamköy Tailing pond
7) Overburden Dump Site
8) Tailing ponds
9) Crushing & Grinding Plant

3.0 Definitions

Policy of Assessment System: General intention and aims about OHS performance that is officially signified by top management of enterprise perspicuously.
Document: The written explanations of information that presents OHS system.
OHSA System Manual: Document that defines and summaries the OHSA system process of an enterprise.
Procedure: The way of performing a process. The procedure should answer the questions of "What", "When", "How", "Where" and "Who".
Directive: The documents that describe how a task is performed correctly.
Flow-sheet: The schematic description of a process indicating how is performed stepwise.
Form: The database documents for assessment system.
List: Support document for charts and other documents as an appendix.
Specifications: The document that declare the specifications about products or process.
Record: Document stating results achieved or providing evidence of activities performed.
Inspection: The independently documented process that determine satisfaction of standard criteria.
Nonconformity: Any deviation from work standards, practices, procedures, regulations, management system performance etc. that could either directly or indirectly lead to injury or illness, property damage, damage to the workplace environment, business loss or a combination of these. An undesired event giving rise to an accident or that has the potential to lead to an accident.
Preventive and Corrective actions: The processes performed in order to eliminate existing and potential nonconformities.
Continuous Improvement: Repetitive and ongoing improvement of assessment system depending on the system policy.
Workplace: Any physical location in which work related activities are performed under the control of organization.
Product: The material that is manufactured by means of a process.
Hazard and Hazard Identification: The source or event that may destroy the health of people and the definition of its properties and identification process.

Occupational Health and Safety: The conditions and factors that affect the well-being of employees, temporary workers, contractor personnel, visitors and any other person in the workplace.

Occupational Health and Safety Assessment System: The conditions and factors that affect the well-being of employees, temporary workers, contractor personnel, visitors and any other person in the workplace.

OHS Performance: The measurable indicators of the OH&S management system related to company's control of health and safety risks, based on its OH&S policy and objectives

Risk: Combination of the likelihood of an occurrence of a hazardous event or exposure(s) and the severity of injury or ill health that can be caused by the event or exposure(s).

Risk Evaluation: Process of the evaluating the risk(s) arising form a hazard(s), taking into account the adequacy of any existing controls, and deciding whether or not the risk(s) is acceptable.

Tolerable Risk: Risk that can be reduced to a level that can be tolerated by the organization having regard to its legal obligations and its own OH&S policy.

4.0 OHS Assessment System

Bigadiç Boron Work has established an OHS Assessment System and declared its OHS Policy and aims. This system includes:

- Preparation of procedures and directives within the frame of OHSAS 18001 requirements
- Application of these procedures and directives effectively.

Bigadiç Boron Work applies OHSAS 18001 Model and Principles.

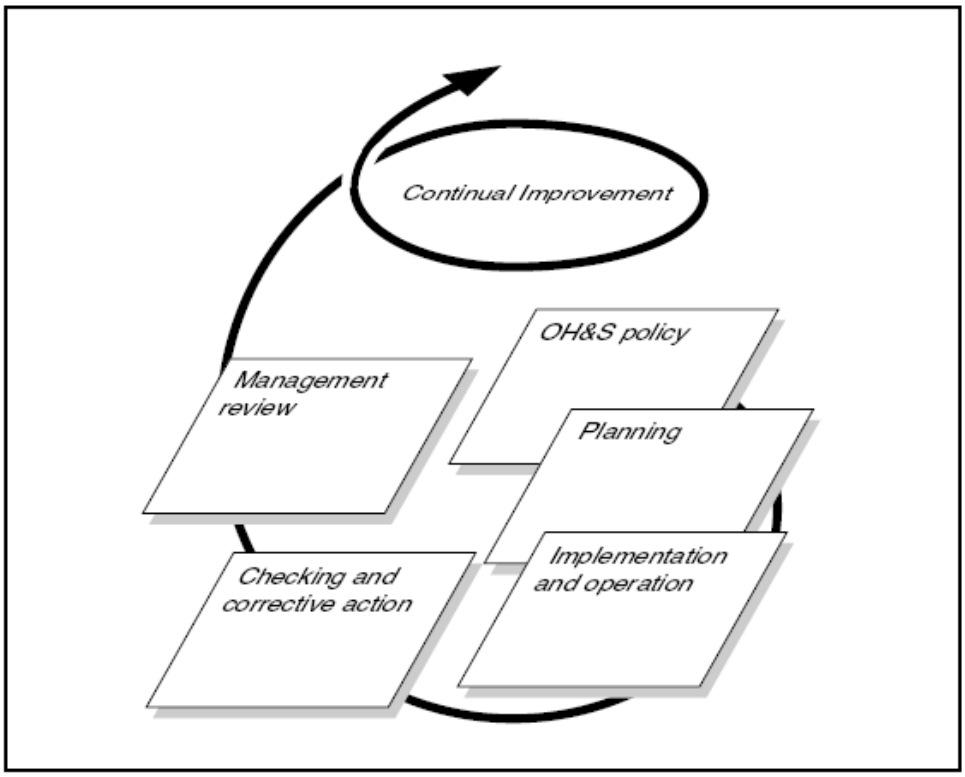


Figure 1: OH&S management system model for OHSAS 18001

4.1 OHS Assessment System Requirements

General Requirements

OHS Assessment System is established to perform good occupational health and safety culture.

OHS ASSESSMENT SYSTEM STRUCTURE

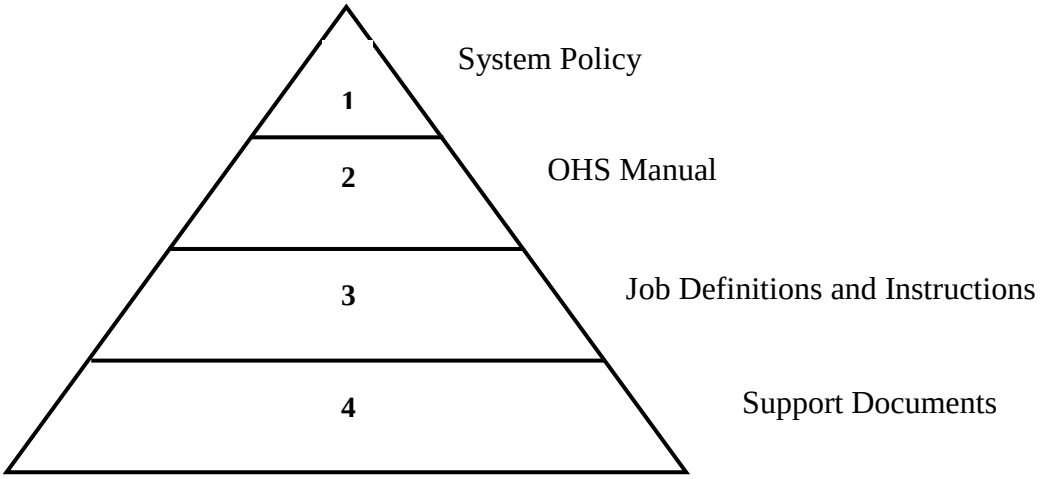


Figure 2: Structure of OHSAS

1 – OHS ASSESSMENT SYSTEM POLICY

An OHS Assessment Policy has been constructed and its policy is a root for all process of Bigadiç Boron Work.

2 – OHS ASSESSMENT SYSTEM MANUAL

It comprises general information about enterprise, history, location, products, OHSAS policy and application of OHSAS 18001 standard to Bigadiç Boron Work.

3 – JOB DEFINITIONS AND INSTRUCTIONS

For all departments short and simple job definitions and instructions has been prepared and written.

4 – SUPPORT DOCUMENTS

To support OHS Assessment System Manual, process schemes, plans, reports, tables and specifications are prepared. The hazard identification and evaluation tables and forms are the most important support document which is very essential to construct a good assessment system. The impacts and possible hazards of all process are evaluated with these forms.

4.2 OHS Assessment System Policy

Opinion of all departments should be taken to contribute this construction work. The policy of enterprise is posted on announcement boards and made it available for all. This system policy may be revised if it is required or proposed. These revisions are made by enterprise itself and Management Review Meetings. The management is responsible to provide resource in order to satisfy enterprise policy.

The OHS Assessment System Policy of Bigadiç Boron Work is:

OCCUPATIONAL HEALTH AND SAFETY ASSESSMENT SYSTEM POLICY

It is the policy of this company to ensure that every employee is allowed to work in safe and productive environment. Due to the nature of our business, it is important to realize the uniqueness of our jobsites and the inherent hazards associated with them. As such, it is important to stress the importance of safety, health preservation, and accident prevention at all times.

To achieve this goal, the Bigadiç Boron Works will do followings:

- Provide support of top management and contribution of all personnel to occupational health culture and creating an awareness of its importance.
- Provide revision and continuous improvement of OHSA System and its aims.
- Inform the subcontractor of enterprise and continuously increase their OHS performance.
- Inform our customer about our products and their impacts to health.

- Provide all kind of source for application of assessment system and trying to reduce the consumption of these sources.
- Comply with internal, national and international legislation and performing legal requirements absolutely.
- Announce and explain this assessment system policy to all personnel and keep it available for all customers, suppliers and third parties.

4.3 Planning

Planning covers all current and future targets about occupational health and safety in all plants, and workplaces of Bigadiç Boron Work. The revisions of these targets are also defined by planning.

4.3.1 Risks, Risk Identification and Assessment

To define risks and their potential impacts on workplace several procedures and form has been prepared. It is aimed that to identify all occupational risks and their hazards and keep them under control. In order to do this ***Risk Assessment Chart and Risk Assessment Form*** are prepared in corporation of OHS Supervisor(s), Department Managers, and Head Engineers. ***The Risk Assessment Forms*** are filled and recorded by Head Engineers.
All possible new risks due to process changes, new equipment etc. are need to be get consideration in order to sustain continuous improvement of OHSA System. Similarly, the canceled processes or removed equipment is evaluated by OHS Supervisor and Head Engineers and associated risks and their potential hazards should also be removed from the records of ***Risk Assessment Forms***. The melioration and improvement works are reviewed with Management Review Meetings (MRM) twice a year.
OHS Risk evaluation is made by assigning scores to all risks, identifying possible hazards associated with each risk and proposing good health and safety practices. Risk scoring is based on Kinney Risk Evaluation Method. The scoring methodology is given at Risk Assessment Document in Appendix C.1. Maximum score of the risk can be assigned as 10000 and as minimum 0.1. Prioritization process should be started from the risk that has highest score and Job Safety Analysis should be performed for related tasks.

References:
- Risk Assessment Forms
- Risk Assessment Document

4.3.2 Legal and Other Requirements

Bigadiç Boron Work is responsible to apply current legal requirements of Turkish Republic related to its all working facilities. The tracking of legal changes is made by OHS Supervisor(s), Quality and Management System Head Engineering. Legal changes will be followed from the web-addresses of http://www.bas bakanlık.gov.tr, http://www.casgem.gov.tr, http://www.sgk.gov.tr, http://www. cevreorman.gov.tr etc. Legal convenience is also bringing up in MR Meetings regularly.

4.3.3 Objectives and Program

According to risk evaluation and hazard identification process an objective and program is prepared. While doing this the following points should take into consideration:

- Integrated Management System Policy of Bigadiç Boron Work,
- Important risks and their potential hazards in workplace,
- Objective and Programs of Eti Mine Works General Management,
- Financial, technical restrictions of Bigadiç Boron Work,
- Results of performance indicators,
- Legal and other requirements,
- Reducing source consumption,
- Decreasing the amount of waste

The result of program and objectives is reviewed in MR Meetings and the new ones will be informed to all personnel.

Reference:
- OHS Policy

4.3.4 OHS Assessment System Program

An OHS Assessment Program and Action Plan is prepared in order to:

- Identify required actions and process,
- Assign responsible staff to conduct system,
- Prepare schedules for all projects,
- Determine methodologies for OHS Assessment Program,

OHS Program is reviewed regularly in order to coordinate source and personnel effectively and success of program will be checked in MR Meetings. For short term projects nonconformity and corrective and preventive action procedures applied but for long term big projects a project management approach should be applied.

4.4 Implementation and Operation

4.4.1 Resources, roles, responsibility, accountability and authority

The structure of organization of Bigadiç Boron Work is given on Figure - 3:

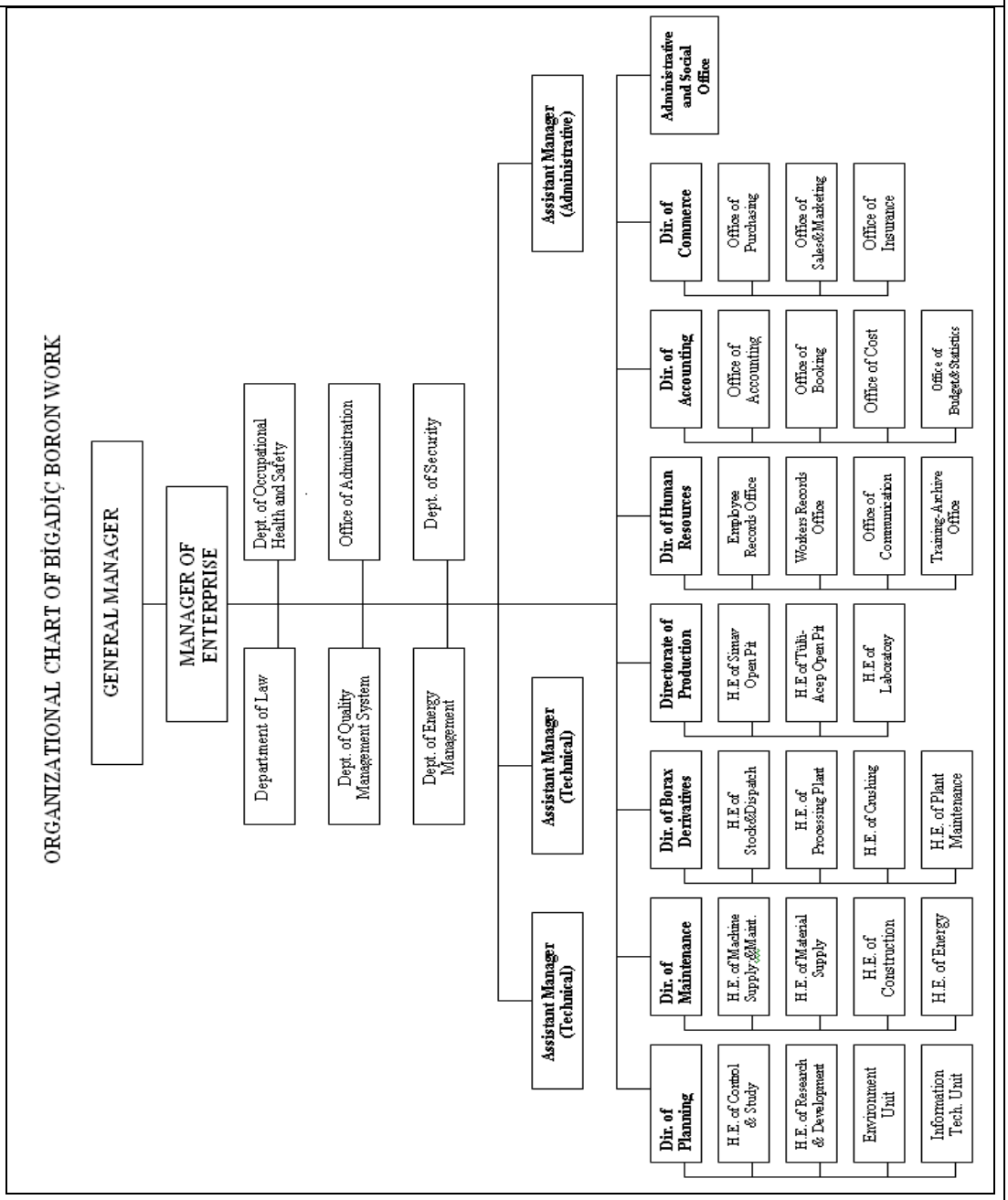


Figure – 3: Organizational Structure of Bigadiç Boron Work

Resources

Management of Bigadiç Boron Work is responsible to provide all required resources in order to maintain OHSA System. These resources include human, money, training etc.

Roles, Responsibility, Accountability and Authority

Roles, responsibilities, accountability and authority of enterprise is given on "TS-EN-ISO 9001:2008 Quality Manual" in detail. In addition to this the key roles and authorities are given below:

Manager of Enterprise:

- Responsible to operate OHSA System seamlessly,
- Represents Bigadiç Boron Work in all organization or events related to assessment system,
- Acts as chairman of Management Review Meetings,
- Identifies goals of integrated management system and realize them.

OHSA System – OHS Supervisor:

- Provides effectiveness and operate the system in accordance with OHSA System Policy
- Acts as chairman of Committee of Department OHS Representatives,
- Follows the legal requirements about occupational health and safety,
- Takes precautions for Emergency Situations

OHS Department Representatives:

- Prepares OHS documents of departments in accordance with OHSA System Policy
- Follows goals of departments and provides continuous improvement,
- Make their departments understand the OHSA system Policy,
- Prepare required documents and studies for Management Review Meetings (MRR) and OHS Meetings,
- Follows the legal requirements about occupational health and safety,
- Tries to reduce risk level and initiates periodic prevention activities,
- Takes precautions for Emergency Situations
- Records and follow occupational accidents and prepares accident reports.

Directory of Human Resources - Office of Training

- Beside the other trainings, provides OHS training programs,
- Keeps all records of training facilities,
- Gathers training proposals from employees.

Directory of Commerce – Office of Purchasing

- Ensures all required documents of purchased products (MSDS forms etc.)

Trade Union Representative

- Gives voice to employees' health and safety expectations and complaints in OHS meetings
- Informs the workers about OHS related topics.

Health and Safety Unit

To fulfill regulations which are published with law no 27320 on official gazette in 15th August 2009.

Head Engineering of Quality Management System

- Establishes and executes TS–EN–ISO 14001:2004 Environmental Assessment System and TS-18001 OHSA System,
- Establishes policies of management or assessment systems and provides coordination,
- Preparing Manuals, Procedures and other documents related to OHSA System,
- Assists and guides to external audits conducted by authorized organizations
- Prepares internal audit plans and executes. Prepares reports about internal audit results.

4.4.2 Competence, Training and Awareness

The employees who may affect OHSA System should take required trainings. Office of Human Resources provides these trainings and keeps the record of them. All training records of employees are stored electronically. In order to get high level of awareness suitable training programs should be provided. Especially new comers must have a special training program. Also, several brochures are provided to employees and OHS posters are posted several places in order to increase awareness.

4.4.3 Communication

Internal correspondence is hold by classical ways. In addition to this a new electronic system called DAYS-Döküman Arşiv Yönetim Sistemi (Document Archive Assessment System) is used for correspondence. The classical way will be abandoned and this electronic system will be used both internal and external (only governmental organizations) correspondences.

In case of emergency the way of communication is given at Emergency Plan.

References

- Emergency Plan

4.4.4 OHS Assessment System Documentation

This manual has been prepared to establish a guide to OHSA System and define its scope and mainlines. It schematizes aim and policy of system and defines the roles and responsibilities.

4.4.5 Document Control

In order to maintain an effective data recording "Procedure for Control of Records" is used. All department and units have to use the Records Index Form for identifying OH&S records, establishing filling and indexing method, and defining the access and retention period of each record. All records should be assigned a unique name and/or number and all employees that have the authority to access to each record, should be registered in this form. All documents prepared, approved, distributed and revised with a certain way. Documents are distributed with:

a) DAYS (electronically) in hierarchical workflow and the system confirmed the sending and reading steps.

b) Hardcopy; this way will be abandoned in the future. The original document is stamped as "original copy" and saved by Head Engineering of Quality Management System. Other copies are immediately wiped out.

4.4.6 Operational Control

Operational control covers all activities of Bigadiç Boron Work. Operational control starts with purchasing stage and continues with production, packaging, stocking, and ends with dispatching. The purchased material should be recyclable, environment friendly and risk-free. Solid-Liquid and gaseous waste treatment rules are indicated Environmental Management System documents.

In addition to this, according to legal requirements noise and dust measurements have been performed and required precautions are taken. The tasks have to be performed in case of an emergency situation are indicated in Emergency Plan. All suppliers and sub-contractors of Bigadiç Boron Work have to be informed about OHSA System by related department supervisors. All machinery and equipment have to be checked regularly and safety operation manuals should be prepared as much as possible.

4.4.7 Emergency Preparedness and Response

Emergency situations, their possible impacts and risks, and the required actions when they happen are identified in Emergency Plan. The responsible people are also indicated in this document.

Emergency Risk Analyses have been prepared and Emergency Preparedness and Response Procedure are constructed based on this analysis. In this scope all departments have to define the actions in case of potential emergency situations and be responsible to perform the prepared Emergency Plan (EP). The emergency tools and important telephone numbers, and important machines or documents that should be saved first in case of an emergency are listed in EP.

All emergency exits of buildings and the place of fire extinguishers are indicated in Emergency Site Plan. Emergency practices should be performed at least once a year and practice report should be prepared.

References:
- Emergency Plan

4.5 Checking

4.5.1 Performance Measurement and Monitoring

Bigadiç Boron Work is prepared several procedures to measure and monitor its performance. All measurement and control subjects are indicated in Performance Measurement and Monitoring Procedure. The measurement tools are calibrated and checked regularly and their data should be recorded.

4.5.2 Evaluation of Compliance

There are several procedures available to evaluate legal and other requirements consistent with the commitment of Bigadiç Boron Work. The compliance audits may be performed to provide assurance that operations are complying with regulatory requirements.

4.5.3 Incident Investigation, Nonconformity, Corrective and Preventive Action

In order to eliminate/solve existent or potential occupational health and safety risks/problems corrective and preventive actions are very vital. The internal and external audits performed by third-parties are the key points of this process. The identified nonconformities by means of these audits are treated carefully. The risk assessment and evaluation processes are the most powerful way of struggling against the risks. According to results of risk evaluation action plans should be prepared for each nonconformity. All corrective and preventive actions are brought up and examined in Management Review Meetings twice a year.

In case of any accident, Accident Report Form is filled by engineers or head engineer. The information about subject, the occurrence of event, and comments of witnesses are indicated in this form. This form should also be signed by filler, witnesses and OHS Supervisor. The injured worker should be treated in health service or should be directly sent to nearest hospital.

In addition to this, Accident Investigation Form is prepared for each accident. More details about victims and accident are given in this form. This form is recorded and used for further evaluation, melioration and statistical studies.

In order to prevent actions the near misses also should be heeded. Near Misses Form is prepared to identify and record these near miss events. This form is available in all departments and hold in many places in order to be filled when a near miss occurs.

In general, the causes of nonconformities are investigated by every department and to prevent them required actions are initiated. The insoluble nonconformities that cause disruption to OHSA System should be examined more comprehensive way and these may be a subject of a new investment proposal.

References:
- Risk Assessment Document
- Risk Assessment Form
- Accident Report Form
- Accident Investigation Form
- Near Miss Form

4.5.4 Control of Records

The control of records is very important for continuous improvement. OHS Supervisor, Managers of Departments, and Head Engineers are the first responsible people to record documents and provide their sustainability. Records should be saved in appropriate form that would resist against damage or lost.

The record keeping time is defined according to legal requirements, but if there is no it should be defined according to its own requirement of enterprise. At the end of record keeping time the documents should be wiped out. The document recording and wiping details should be defined in Procedure for Control of Records.

4.5.5 Internal Audit

In order to track the system operability and effectiveness, it should be audited regularly. The audit program firstly covers the points that affect the system performance directly. All articles of system are audited at least once a year. The period of audits could be increased according to requirements of departments and processes. At least two authorized inspector is assigned from different departments and they performs audits except from their own department. Internal audit plans are prepared at the end of years and approved by manager of enterprise and distributed to all departments. It is definite that the internal audits should be performed on time. The inspectors are prepared an Internal Audit Report that cover s all departments. If there are nonconformities or potential nonconformities detected or prescribed, several preventive actions and suggestions are indicated in Internal Audit Report. OHS Supervisor, Managers of Departments, and Head Engineers are all together responsible to solve the nonconformities or problems. The reports and results of internal audits are put on the agenda of Management review Meetings.

References:
- Occupational Health and Safety Audit Instrument

4.6 Management Review

Management is responsible to continuity and improvement of OHSA System. Manager of Enterprise is the first responsible person to operate, manage, and review the system. He/She is also the chairman of the Management Review Meetings and OHS Meetings. The participants of MR Meetings are OHS Supervisor, Manager of Departments and all Responsible staff of departments.

Before the MR Meetings Quality Management, Environmental Assessment, and OHS Assessment System Supervisors present a pre-report.

Management Review Meetings are designed to ensure that all quality related functions are reviewed at the highest possible level and so that all levels of management affecting quality, environment, and occupational health and safety are made aware of changes, updates, revisions, verification activities and policies.

The Management Review will take the form of a formal, recorded meeting under the Chairmanship of the Manager of Bigadiç Boron Work.

The objectives of the Management Review are:

- To establish that the Quality, Environment, and OHSA System are achieving the expected results, continuing to conform to the standard, and functioning in accordance with the established Operating Procedures.
- To expose irregularities or defects in the Systems, identify weaknesses and make recommendations for continual improvement.
- To review the effectiveness of previous corrective actions including those related to subcontractor and supplier performance.
- To review the adequacy and suitability of the systems for current and future operations.
- To review any complaints received, identify the cause and recommend corrective action if required including customer feedback.
- To review the finding of internal / external audits and identify any areas of recurring problems.
- To review the reports of non-conformities and evaluate trend information.
- To review training requirements. Analyze all the above for trends and make appropriate improvements

OH&S ASSESSMENT SYSTEM SERIES HANDBOOK - REVISIONS

CHANGES	STANDARD ARTICLE NUMBER	EDITOR SIGN / DATE	CONTROLLER SIGN / DATE

B. OHSA SYSTEM DOCUMENTS

B.1 RISK ASSESSMENT DOCUMENT

ETİ MINE WORKS

GENERAL MANAGEMENT

BİGADİÇ BORON WORK

RISK ASSESSMENT DOCUMENT

Document Number	02
Number of Page	2
Publish Date	02.04.2008
Prepared by	Soner GÖKÇEK
Approved by	

Edition	Definition	Date of Change
0	Original	02.04.2008
1		
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Risk Score = Likelihood Score x Exposure Score x Consequence Score

RISK ASSESSMENT CHARTS

LIKELIHOOD SCORE CHART

Likelihood	Score	Qualitative Expression of Likelihood	Quantitative Value of Probability
Highly Unlikely	0.2	Practically Impossible	$P > 10^{-6}$
Unlikely	0.5	Once in fifty years	$10^{-4} > P > 10^{-5}$
Unusual but Possible	1	Once in 3-4 years period	$10^{-3} > P > 10^{-4}$
Possible	3	Tree times or more in a year	$10^{-2} > P > 10^{-3}$
Very Likely	6	Once a month	$10^{-1} > P > 10^{-2}$
Almost Certain	10	Once a week or more	$1 > P > 10^{-1}$

EXPOSURE SCORE CHART

Frequency of Exposure to Risk	Score	Qualitative Expression of Exposure
Very rare	0.5	Once per year or less
Rare	1	A few times per year
Unusual	2	Once per month
Occasional	3	Once per week
Frequent	6	Daily (some hours)
Continuous	10	Constant (during shift)

CONSEQUENCE SCORE CHART

Consequence Category	Score	Qualitative Expression of Hazard Severity
Noticable	1	Will not result in injury, no work hour loss
Minor	3	No workday loss but first aid may required
Major	7	Major injury, workday loss
Serious	15	Severe injury or occupational illness, Permanent partial disability, long term
Fatalilty	40	Fatality
Disaster	100	Number of Fatalities

RISK SCORE CHART

Risk Category	Risk Score	Action
Unimportant Risk	$R < 20$	No attention required. There may be no need for extra risk reduction process but current controls have to be continued and controlled. A long-range study may be initiated.
Low Risk	$20 \leq R < 70$	Attention required. Plan to reduce risk in 30 – 90 days
Moderate Risk	$70 \leq R < 200$	Risk reduction is required. Take precautions within a month
High Risk	$200 \leq R < 400$	Corrective actions required. Stop working and correct within 7 days. Immediate precautions have to be taken
Intolerable Risk	$R \geq 400$	Stop working and correct immediately. If risk reduction is not possible than this operation has to be abandoned.

Note: This document is prepared based upon Kinney, G.F. and Wiruth, A.D. (1976). Practical Risk Analysis for Safety Management. Naval Weapons Center, China Lake, CA, USA and obtained from Taylor, G., Easter, K., Hegney, R., Enhancing Occupational Safety and Health, 2004.

B.2 HAZARD SOURCE INVENTORY

BİGADİÇ BORON WORK	Revision No: 00 Document No: 03	Page: 1/3
	Date: 03/03/2008	
HAZARD SOURCE INVENTORY		
Prepared By (Title/Name):	Mining Engineer / Soner GÖKÇEK	
Approved By (Title/Name):	Manager of Enterprise / ……..	

No	Source of Hazards	Possible Effects
1	Air conditioner gases	Respiratory system disorders
2	Blasting and Dealing with Explosives	Explosion, Injury, death
3	Carry, lift, put, load, force	Joint and waist disconformities, caught in, smash
4	Coal and Coal Dust	Respiration problem, Fire
5	Continuous stand-up or sit down	Joint disconformities, varicose veins, stress
6	Conveyors	Caught in, injury, joint break
7	Crushers	Smash, caught in, joint break, injury, death
8	Detergents	Skin problems, chemical reactions
9	Dumping Site	Fall Down, injury, Death
10	Driving vehicles	Traffic accident, injury, joint break, cut, death
11	Dust	Respiratory system disorders, Eye disorders
12	Dynamic parts of Machines and its Components	Injury, get caught in, smash, death
13	Electrical Shock	Burn, injury, death
14	Entry and Exit	Hit, struck, Caught in
15	Excavating	Vehicle crash, hit, struck, fall, crash, joint brake, injury, death
16	Falling / Flying Objects	Injury , death

17	Fire	Burn, suffocation, death
18	Flammable and explosive environment	Explosion, burn, incidence
19	Flammable gases and materials	Explosion, fire, burn, death
20	Fuel oil and LPG	Explosion, fire, burn, death
21	Haulage of Ore and Overburden	Traffic accident, Overturn of vehicles, slope failure, injury, death
22	Hot and Cold surface / place	Burn, stick, illness, heat strain, death, frostbite
23	Improper illumination	Eye disorders, stress
24	Improper working environment (hot, cold, storm, wind, freeze etc.)	Illness, injury
25	Insufficient notifications	Injury, death
26	Insufficient or improper air conditioning	Disconformity, stress, suffocation, poisoning, death
27	Insufficient working area	Hit, trip, get caught in, evacuation/access difficulties
28	Iterative Movements	Injury, Joint disconformities, stress, alienation and/or abstraction
29	Ladders	Slip, trip, fall, injury, joint break, death
30	Loading	Struck by ore/overburden, vehicle crash, slope failure, joint brake, injury, death
31	Maintenance or construction of Energy lines	Injury, burn, shock, death
32	Mills	Smash, joint break, injury
33	Night Shift	Increases all possible risks

34	Noise	Deafness, loss of hearing, stress
35	Not ergonomic equipment usage	Injury, joint and muscle disconformities
36	Oil and grease	Skin problems, slip, fire
37	Overtime working	Increases all possible risks
38	Pneumatic Systems	Injury, death
39	Slippery area	Injury, fall, slip, trip
40	Stock Area	Smash, hitting by trucks, get caught in, crash, overturn of trucks, injury, death
41	Subcontractors	Increases all possible risks
42	Screens	Hit, caught in, injury
43	Tailing Ponds	Drown, death
44	Tanks	Burn, explosion, fire, injury, death
45	Trash	Microbial illnesses, rodents and vermin
46	Body vibration	Joint disorders, Vibration Sickness
47	Visitors, students	Increases all possible risks
48	Washing Pools	Drown, death
49	Waste oil	Skin problems, slip, fire
50	Welding and Cutting	Respiration and eye damage
51	Working Environment Neatness	Trip, fall, injury
52	Working in high-levels (bench)	Fall, injury, death
53	Working with hand tools	Cut, smash, stroke
54	Working with lifting vehicles	Smash, get caught in, stroke, death
55	Working with visual devices	Eye disorders, wrist, neck, waist disconformities

ETİ MINE WORKS
GENERAL MANAGEMENT

BİGADİÇ BORON WORK

EMERGENCY PLAN

Document Number	04
Number of Page	6
Publish Date	21.12.2008
Prepared by	Soner GÖKÇEK
Approved by	

Edition	Definition	Date of Change
0	Original	21.12.2008
1		
2		
3		
4		

1.0 INTRODUCTION

This Emergency Action Plan provides the management structure, key responsibilities, emergency assignments, and general procedures to follow before, during and immediately after an emergency. In the event of an emergency our first priority will be preserving the safety and health of our employees and contractors on the site and members of the public off-site. Only after that enterprise efforts will be directed to:

• protect the environment,
• help local constituents and the news media focus on known facts and our actions;
• convey accurately our commitment to be a responsible and caring organization;
• maintain public confidence in our ability to effectively manage the emergency.

2.0 AIM AND SCOPE OF EMERGENCY PLAN

The aim of this emergency plan is to prevent loss of life, property and information and provide safety in case of any emergency and natural disasters. If this plan is properly applied, all emergency situations can be escaped without any major loss. The main point is here that this plan should be known, and practiced in emergency drills by all personnel.

3.0 EMERGENCY REPORTING

Anyone who discovers an emergency shall inform the area supervisor about the emergency and warn all other personnel in the area either by activating the alarm if there is one or otherwise by shouting. The department responsible shall assume responsibilities and make an initial attempt to control the problem, if it is within their capability to do so. Otherwise, he/she should inform the coordinator of emergency and OH&S Department. When informing he/she should give the following information:

• Your name and location from which you are calling.
• The nature, location and extent of the emergency.
• If any help is required for controlling the emergency.

If there is no method of control which can be readily initiated, department responsible shall evacuate the area to a safe location and wait for further instructions from the OH&S Department
If the person who discovers the emergency cannot locate the area supervisor, he/she will call security and provide the above information. Security will start to informing process.

4.0 EMERGENCY TEAMS –ROLES AND RESPONSIBILITIES OF EMERGENCY TEAMS

4.1 EMERGENCY CONTROL GROUP

An Emergency Control Group (ECG) is established from the managers and engineers of the Bigadiç Boron Work. The OH&S Department has the active role in ECG. The ECG will be responsible for the on-site management of emergency situations at the operation and direct communications with the corporate crisis team. The EGC execute communication and correspondence with external emergency services (hospitals, fire department, civil defense. It decides the emergency operation and develops suitable security strategy. Communicate and manage the search and rescue teams and give order to transport personnel.

4.2 FIRE AND RESCUE TEAM

Reporting to the Fire and Rescue Station:

Upon notification, all fire and rescue team members shall report to Fire Station and wait for further instructions from the coordinator of emergency and OHS Department.

Fire and Rescue Team Leader Responsibilities:

Fire and Rescue Team Leader shall assess the emergency and by using his judgment he will coordinate and take necessary initial actions. He will implement protective actions to prevent any personal injury and property damage. The Team Leader shall:

• Ensure safety of the team members at all times
• Detect and report hazardous conditions to the ECG
• Monitor Fire and Rescue Team activities
• Communicate with the different teams, if more than one
• Record entry time of team to hot zone and notify team of time limits (breaks).
• Ensure relevant emergency response procedures are followed.
• Ensure that rescue and recovery activities are performed as instructed by coordinator
• Communicate with coordinator regularly and updating him/her.
• Ensure that team members follow Fire and Rescue procedures and maintain team discipline.
• Determine if there is any person that needs immediate help.
• Evacuate the danger area and assist the people who need help.
• Follow the specific protocols to take initial response.
• If not sure what initial actions to be taken wait for the instructions of ECG Chair.
• Team members will take all necessary measures for their safety.

Responsibilities of Teams:

1- In case of emergency, the team leader who will be first responders to the system is responsible for directing the team.
2- In the absence of the team chief, the person after the team leader in the team takes the responsibility.
3- The staff working on units at the time of emergency stops the running machines and cuts the electricity supply from the board in order to disabled the system.
4- After disabling the running systems, staff is evacuated to safe place by the team.
5- Areas that may pose hazard are determined by the teams, and the employees should be removed from the area. While working flammable, combustible or explosive substance, they should be taken to safe places as much as possible.
6- The electricity supply system will be cut off from the main switch outside the factory.
7- In plants, stop feeding into the system and take necessary security measures

After the emergency:

1- The team heads prevent panic and confusion as to ensure that all employees will be calm.
2- Team heads to ensure the evacuation of personnel and staff gathered in a safe place.
3- Exposed personnel are determined and the first aid is provided by the first aid team. Then, with severe and advanced cases should be sent to the first aid center for the sick and wounded will be shipped via ambulance.
4- In case the staffs need to be rescued, the rescue team with the appropriate response will be activated.
5- In case of fire, the fire department will be informed immediately.
6- Receive stretchers, helmets, etc. materials from the crisis center
7- Receive the keys of rooms from crisis center and check locked rooms.
8- Ask for technical equipment by radio from crisis center when it's necessary.
9- Help first aid teams.

4.3 FIRST AID AND EVACUATION TEAMS

1) During the evacuation, they direct all people to be evacuated without panick and running.
2) In the main assembly point (in front of administrative building), team officials interfere woundeds with the first aid supplies.
3) They take the wounded people (able to walk) to the first aid center, and call crisis center for unable to walk woundeds.

4) Receive blankets, sheets and other materials from crisis center and move them to the required area.
5) First aid and evacuation teams deal with the wounded people firstly at place or health unit. If it is required the victims should be transferred to hospital.

4.4 SECURITY TEAMS

1) All the security officers continue to provide services during an emergency.
2) The security staffs prevent the accumulation in front of doors and windows.
3) Stop the people that want to come back to emergency area.
5) Prevent the accumulation in front of the buildings by taking safety strip.
Units in charge: All security personnel

5.0 EVACUATION PROCESS

Administrative and Technical Building, Health Unit, Laboratory, Cafeteria.

If Alarm Sounds;

• Stop work immediately.

• Leave workplace and proceed the safest way to the in front of Administrative building.

• Stay calm, do not run - walk.

• Warn others in the vicinity and on route of travel to Assembly Point.

• Stay at Assembly Area and await further instructions.

Simav Open Pit

• Stop work immediately.

• Leave the work area and proceed the safest way to the in front of Simav Head Engineering office building.

• Stay calm, do not run - walk.

• Warn others in the vicinity and on route of travel to Assembly Point.

Acep and Tülü Open Pits

• Stop work immediately.

• Leave the work area and proceed the safest way to the in front of Head Engineering office buildings.

• Stay calm, do not run - walk.

• Warn others in the vicinity and on route of travel to Assembly Point.

Crushing & Grinding Plant

If Alarm Sounds;

• Stop work immediately.

• Leave workplace and proceed the safest way to the in front of Crushing and Grinding Plant Head Engineering building.

• Stay calm, do not run - walk.

• Warn others in the vicinity and on route of travel to Assembly Point.

• Stay at Assembly Area and await further instructions.

Mineral Processing Plant

If Alarm Sounds;

• Stop work immediately.

• Leave workplace and proceed the safest way to the in front of Mineral Processing Plant Head Engineering building.

• Stay calm, do not run - walk.

• Warn others in the vicinity and on route of travel to Assembly Point.

• Stay at Assembly Area and await further instructions.

6.0 EMERGENCY COMMAND CENTER

The Bigadiç Boron Work Emergency Command Centre (or crisis center) will be located in the training hall near the guesthouse. Alternate Emergency Command Center is the main conference room at administrative building. The center will be established and managed by the Emergency Coordinator. The Emergency Control Group will meet here. The followings are key components and materials that are part of the centre.

Essential Documents and equipments

• Emergency Plan

• Maps of area adjacent to operations

• Telephones with external direct telephone lines into the command center and conference call capabilities

• Radio

• Television

• Spare batteries and tapes light lamps

• 3 Megaphones

• Emergency phone numbers

• Emergency team list

• Empty papers

7.0 EMERGENCY PHONE NUMBERS

Ambulance: 112
Traffic: 154
Fire Department: 110
Police: 155
Gendarmerie: 156
Town Disaster Management Center: 0 266 614 10 01
Civil Protection: 102
Enterprise Fire Fighting Dept: 298

HOSPITALS	TELEFON	FAKS
Balıkesir State Hospital	(0266) 245 90 20	(0266) 243 71 50
Balıkesir Atatürk State Hospital	(0266) 221 35 10	(0266) 221 35 16
Balıkesir University Hospital	(0266) 612 14 54	(0266) 612 14 59
Balıkesir Military Hospital	(0266) 239 60 00	(0266) 249 67 39
Balıkesir Pulmonary Diseases Hospital	(0266) 221 25 10	(0266) 221 25 14
Bigadiç State Hospital	(0266) 614 13 00	(0266) 614 14 17
Sındırgı State Hospital	(0266) 516 41 01	(0266) 516 41 02
Kepsut State Hospital	(0266) 576 10 65	(0266) 576 33 07
Private Balıkesir Hospital	(0266) 241 10 88	(0266) 241 41 31

ETI MINE WORKS GENERAL MANAGEMENT

BİGADİÇ BORON WORK

PROCEDURE FOR CONTROL OF RECORDS

Prepared by

Soner GÖKÇEK

Date of Issue	**23.04.2008**
Approved by	
Revision No	**00**
Document No	**05**

Edition	Definition	Date of Revision
0	Original	23.04.2008
1		
2		
3		
4		

1. PURPOSE

This procedure describes the method of generation and control of records used at Eti Mine Works General Management Bigadiç Boron Work. It is designed to ensure that all such records are identified, collected, completed, filed, stored, maintained, managed and disposed in a consistent manner.

2. SCOPE

This procedure applies to all records identified within Bigadiç Boron Work OHSA System.

3. DEFINITIONS&ABBREVIATIONS

Record: Document or data stating results achieved or providing evidence of activities performed

Retention Period: The time period up to which the record shall be kept at enterprise before it is either discarded or destroyed.

MR: Management Representative

OHSA: Occupational Health and Safety Assessment

OHSAS: Occupational Health and Safety Assessment System

5. RESPONSIBILITY

The General Manager, Division Managers, Head of Departments, Head of Sections, and all personnel who prepare and/or process an OHSAS record are responsible for controlling these records. The records shall be listed in “Records Index Form” (See attachment) for each Directorate, Department, Section or Unit of Bigadiç Boron Work.

The MR is responsible for preparation of the records providing evidence of the implementation and effectiveness of the OHSAS.

All employees who are responsible for keeping records are listed in the Records Index form.

6. PROCESS

6.1 Records of Index

6.1.1 The Management Representative shall coordinate with Department Managers, Head Engineers, OHSA Supervisor, departments and units for identifying the OHSA records related to their Department, Section and Units with using Records Index Form as a reference, establishing the filing, the indexing method, defining the access and retention period of each record.

6.1.2 The Records Index Form shall be approved by the Department Managers.

6.1.3 Management Representative shall distribute the approved OHSA Records Index to all Department Managers, Head Engineers and other personnel who are responsible for controlling any OHSA records.

6.1.4 The Records Index Form must also be applied for all contractors and sub-contractors.

6.2 IDENTIFICATION

6.2.1 The identification of records and files related to enterprise OHSA System will be done according to this procedure.

6.2.2 All records shall be appropriately identified by a descriptive title clearly labeling the record.

6.2.3 All records should be clear, understandable.

6.2.4 External origin documents which are a part of enterprise OHSA System are identified and their distribution controlled.

6.3 INDEXING

6.3.1 The specific indexing method of each OHSA record shall be as per the Record Index

6.3.2 All records shall be assigned a unique name or number or date to distinguish them from other OHSA records with the same identification.

6.4 ACCESS

6.4.1 All employees that have the authority to access to each record, shall be registered in the Records Index Form.

6.4.2 Copies to outside parties shall only be provided after consent of the Bigadiç Boron Work Director of Planning.

6.5 FILLING

6.5.1 All records should be filed in a specified location as per Records Index Form.

6.5.2 Filing is considered the location where active records are kept. All OHSA records shall be physically or electronically filed by a method which enhances accessibility and retrieval by a user. Records Index Form shall define the location where OHSA records are filed.

6.5.3 All records should be filled electronically as much as possible together with physical filling in case of a data lost.

6.6 RETENTION

Retention period of each record shall be defined and recorded in Records Index Form. The responsible employee shall ensure that each record is maintained in Bigadiç Boron Work, up to the retention period mentioned in Records Index.

6.7 STORAGE

6.7.1 During the storage period, all records and files shall be protected from damage, loss and deterioration due to environmental conditions or any other factors. The OHSA records should be protected in case of an emergency.

6.7.2 Each box or folder shall be affixed with an archive record, noting the box number, contents and destruction dates.

6.7.3 The end of the nominated retention time, the archived records shall be destroyed by suitable methods as specified in the index of records.

6.7.4 The Director of Planning shall inform all concerned personnel in writing of any variation to the retention period after considering, enterprise requirements, regulation requirements, specific contract requirements, protection against liabilities, common law, trade practices etc.

6.8 DISPOSITION

At the beginning of each year, all records and files should be reviewed to see if they have exceeded the said time, by either stamping it obsolete.

6.9 MAINTENANCE

All OHSA records shall be filed and stored in an office environment unless specific media and or special environmental control is specified to prevent damage, deterioration, or loss.

7. REFERENCES

- OHSAS 18001: 2007 Standard
- OHSA System Manual

8. ATTACHMENTS

- Records Index Form

ATTACHMENT

	BİGADİÇ BORON WORK	**RECORDS INDEX FORM**

Prepared by: Soner GÖKÇEK	Date of Issue:	Date of Revision: -
Approved by:	Form No: 12	Revision No: 00

Doc. No	Document Title	Responsible Personnel	Location	Filling Method	Indexing Method	Access	Retention Period

C. OHSA SYSTEM FORMS

C.1 RISK EVALUATION FORM

	Date	…/…/20…	**RISK EVALUATION FORM**	**Assessment Number**	…..
	Department			**Prepared by**	Soner GÖKÇEK
	Process			**Approved by**	
Sub-system				**Rev. Number & Date**	… & …/…/20…
				Form No 01	**Page No:** … of …

No	Hazard	Who may harm	L	E	C	Risk Score	Result	Completion Date
1								
2								
3								

No	Consequence	Risk Score	Prevention / Recommendation	Present situation	Responsible people
1					
2					
3					
4					

L: Likelihood Score **E: Exposure Score** **C: Consequence Score** **A: Available** **NA: Not Available**

C.2 HAZARD IDENTIFICATION CHECKLIST

BİGADİÇ BORON WORK		HAZARD IDENTIFICATION CHECKLIST	
Prepared by: Soner GÖKÇEK	Approved by:	Form No: 02	Revision No: 00
Name of Inspector:	Title of Inspector:	Date of Inspection:	

Legend – (record in results column)	✓ = Standard Met	X = Action required	N/A = Not applicable to this site

Item	Observation	Result	Actions / Comments
1.0	**BUILDINGS AND STRUCTURES**		
1.1	Buildings and Floors No building damage No floors and stairs damage/dirty Aisles width, safe & free from obstruction		
1.2	Lighting No lights out/broken Sufficient lighting No glare Windows clean and undamaged		
1.3	Ventilation and Air Conditioning Natural air flow and air extraction Mechanical (include air conditioners, fans etc) Filters clean/inspected		
1.4	Amenities Hygienic toilets/kitchen/crib room Cleanliness of fridge and cooking appliances Hygienic showers/change rooms Adequate and clean supply of drinking water		

Item	Observation	Result	Actions / Comments
1.5	Emergency Exits identified Exit doors and equipment unobstructed Evacuation plan in place Fire extinguishers Emergency lighting		
2.0	**HOUSEKEEPING**		
2.1	Pollution (eg oil waste, scrap steel etc) Adequate disposal/collection Bunding/storage of container area Other		
2.2	Aisles and Storage Good demarcation/ not worn Not cluttered/obstructed Access to emergency equipment and exits		
2.3	Stacking and Storage Neat & tidy Segregated or labeled Heavy items on lower level Adequate shelving Doesn’t obstruct flow and services Sufficient racks/areas for storage Odd shaped items stored safely No redundant material		
2.4	Scrap Removal System Sufficient bins Adequate removal/emptied		

Item	Observation	Result	Actions / Comments
3.0	**ELECTRICAL SAFEGUARDING**		
3.1	Portable Electrical Equipment Identified and on register No damaged cables/plugs Earthing Inspection tag Appropriate storage No visible damaged to tools or electrical leads		
3.2	Earth Leakage Complete coverage Tested regularly by competent person Documentation Inspection tag		
3.3	Electrical Installations Safe Electrical equipment safe Wiring safe Unauthorized access to switch gear/substations restricted Earthing and polarity correct No exposed wires No damage to protective sheath/cable guide or conduit All welders have hazard reduction devices		
3.4	High Voltage Power Lines Identified by signs on all approach roads Material not stock-piled under power lines		

Item	Observation	Result	Actions / Comments
4.0	**MECHANICAL SAFEGUARDING**		
4.1	Machine Guarding Machines comply with appropriate standards Guards in place All nip points guarded Not loose, broken or inadequate		
4.2	Lock-out System and Usage Written procedure Covers all sources of energy Switches lockable Tags/locks available		
4.3	Switches, Isolators, Valves & Controls Labeled No labels missing Emergency stop buttons (red)		
4.4	Ladders, Handrails and Walkways Comply with standard Stairways/landings toe-boards fitted Stairways at least one handrail Portable ladders inspected/tested		
4.5	Lifting Gear and Machinery Identified and on register No defective items Safe working load marked Safety latches in place Regular inspections		

Item	Observation	Result	Actions / Comments
4.6	Conveyor Gears, pulley, shaft and nip points guarded Drop guards to catch falling material Emergency stop Adequate access Adequate crossovers Lanyards on all conveyors		
5.0	**GAS CYLINDERS AND PRESSURE VESSELS**		
5.1	Pressure Vessels Pressure vessel register Inspections/tests to standard and labeled Relief (safety) valve operational Drained & free of moisture Red line on pressure gauges Remote isolation		
5.2	Gas Cylinders Cylinders correctly stored vertically Segregation distance Equipment safe condition Correct gas arresters used		
5.3	Connecting pipes fitting and hoses In good condition, no leaks Connecting pipes and lines labeled. Safety clips used		

Item	Observation	Result	Actions / Comments
6.0	**HAZARDOUS SUBTANCES**		
6.1	Chemicals and Substances Chemical register Manifest and emergency plan Products labeled MSDS sheets Stored appropriately, bunding & containment Segregation distances		
6.2	Explosives Storage, transport and usage to standard and regulations Appropriate licenses No ignition sources Register of stored items		
7.0	**MOBILE PLANT AND MACHINES**		
7.1	Condition of Vehicles/Plant Daily check/documentation No defective items Operator competent Isolated when unattended Seat belts Overhead guards where applicable Fire Extinguisher Flashing light/reversing alarm Maintenance records		

Item	Observation	Result	Actions / Comments
8.0	**HANDTOOLS**		
8.1	Hand tools Condition and Storage Routine check No damaged or defective tools No sharp edges, mushroomed ends No split handles Stored correctly Clean of oil & grease		
9.0	**ERGONOMICS**		
9.1	Operators Comfortable Body posture No lifting and twisting Standard color coding Accessibility (switches, levers, ladders) Seats/chair/workstations condition Adequate lighting Walkway width is adequate		
10.0	**PERSONAL PROTECTIVE EQUIPMENTS**		
10.1	Head Protection Hard hats provided Area identified –signs Being worn		
10.2	Footwear Provided Correct for task Being worn		

Item	Observation	Result	Actions / Comments
10.3	Protective Clothing Suitable clothing for task Provided and maintained		
10.4	Eye and Face Protection Equipment provided Area identified –signs Worn correctly Prescription glasses to standard		
10.5	Hearing Protection Area identified –signs Equipment provided Worn correctly		
10.6	Other PPE Safety harness & lanyards Hand protection (gloves etc) Welding PPE		
11.0	**NOTICES AND SIGNS**		
11.1	Signs Posted Appropriate signs displayed Visible and correctly located Good condition		
11.2	Notice boards and Displays Conspicuous position Up to date		
11.3	Warning Signs Procedure in case of fire Procedure in case of electric shock		

Item	Observation	Result	Actions / Comments
12.0	**NOTICES AND SIGNS**		
12.1	Extinguishing Equipment Adequate number provided Correct types for fire risks		
12.2	Fire Equipment Locations Location accessible Signs and demarcated areas Signs indicated type of equipment Signs to standard No equipment obstructed		
12.3	Maintenance of Equipment All equipment on register Inspection/service to standard Tags/seals in place Condition good		
12.4	Fire Fighting Adequate persons trained Available number of people on all shifts Training and competency records		
13.0	**CONTROL OF PEOPLE**		
13.1	Control of Entry and Exit Control signs (eg. person to report to office) Secure fences and locked gates Security checkpoint Visitor record (time in/out)		

Item	Observation	Result	Actions / Comments
14.0	**EMERGENCY PLANING**		
14.1	Emergency Action Plan Written emergency plan Contact names/phone numbers Site Plan		
14.2	First Aider and Facilities Current first aider Adequate first aid equipment First-aid kits checked regularly Stock items within use by date Locations marked		
14.3	Accident / Injury Recording Record of fatalities Monthly record of accidents Record of minor injuries Record of near misses		
14.4	Reporting of Accident/Emergency Oral notification procedure Forms completed/sent (accident report forms)		
15.0	**JOB SAFETY TRAINING**		
15.1	Job/Task Training Safety aspects of job included with each task Instruction Regular training sessions Recording Up-to-date context		

Item	Observation	Result	Actions / Comments
16.0	**SUPERVISION**		
16.1	Adequate supervision Supervisor on the job Supervisor demonstrates competence Use Procedure or Risk Assessment for task Communicates effectively with employee Provide adequate resources for task/job Conducts regular task/job inspection Takes appropriate action to identified hazards		
16.2	Employee Selection Competent operator and workers (experience & training) Use a Safe Work Method Statement (or JSA) for task Follow procedures, rules instructions Check contractor competency		
16.3	Communication Conduct workplace inspections Pre-start briefing provided On the job instruction Discussion of identified hazards and controls Communication/Meeting records Employee participation Record of contractor briefing		

Item	Observation	Result	Actions / Comments
17.0	**OPEN-PIT ACCESS ROAD**		
17.1	Road Condition Wide enough for vehicles Adequate passing areas Graded surface, no spillage, pot holes Camber 2-3%		
17.2	Signage Access to site adequately sign posted Mining/open pit hazard identified Speed limits		
18.0	**ROADS, RAMPS, DUMPS**		
18.1	Go Line Graded and free of obstructions Vehicles parked at safe distance apart		
18.2	Berm Axle height of the largest tyred vehicle Sufficiently wide enough to stop vehicle Delineators clearly visible and reflectors clean		
18.3	Surface Adequate width, passing areas Well graded and free of spillage and pot holes Free of standing water No signs of cracking or collapse of edges Dust suppression No oil/diesel spillage Traffic movement in accordance to procedures Camber 2-3%		

Item	Observation	Result	Actions / Comments
19.0	**DRILL & BLAST**		
19.1	Patterns Access restricted with signs, windrow or cones Windrows in place around the face. No unauthorized vehicles or personnel Pattern marked Dust control for drill rig Drill rig orientation to face		
20.0	**OPEN-PIT**		
20.1	Walls To designed angle Scaled down No cracks or over hangs No loose material/fretting Water seepage Access ramp away from working face		
20.2	Bench Adequate width ratio to wall height Stable surface, no cracks Drainage adequate		
20.3	Pit Surrounds Drainage away from pit No environmental damage		

C.3 ACCIDENT INVESTIGATION FORM

BİGADİÇ BORON WORK	ACCIDENT INVESTIGATION FORM		
Prepared by: Soner GÖKÇEK	Approved by:	Form No: 03	Revision No: 00

VICTIM INFORMATION

Name: _____ Sex: _ _ Male / _ _ Female

Age: _____ Job classification: _____

Experience at the job classification: _____

Total Job Experience: _____

What activity was being performed at time of accident? _____

_____

Victim's experience at this activity: _____

Was the victim trained about this task: _____

Is there Victim' training record is available? _____

SUPERVISOR INFORMATION

Supervisor's Name: _____

Experience of Supervisor: _____

Total Job Experience: _____

When was he/she last present at the accident location? _____

What did the supervisor do? _____

Were instructions issued relative to the accident? _____

When was the last time the supervisor contacted the victim? _____

Did the supervisor see any unsafe acts or conditions? _____

ACCIDENT INFORMATION

Date of accident:_____ Time of accident: _____ Shift: _____

Type of Injury: _____ Part of Body: _____

Number of people injured in same accident: _____ Equipment damaged: _____

Location of accident: _____

Description of accident:_____

_____

_____

Cause of accident: _____

_____

Recommendations for prevention: _____

_____

_____

Disciplinary action taken: _____

_____

Estimate disability: _____ days Property damage: _____ TL

Witnesses Name: _____ _____

Signs: _____ _____

Prepared by _____ Title: _____

Department: _____ Date / Signature: _____ / _____

C.4 NEAR MISS REPORT FORM

BİGADİÇ BORON WORK	Prepared by:	Soner GÖKÇEK	
NEAR MISS REPORT FORM		Form No:	04

Employee Reporting Hazard or Near Miss to Complete

Description of Hazard or Near-Miss: ……..……..
……..……
……..……..
……..
.....
.....
Department: …….. Process/Building/etc: ……..……
Precise Location: ……..……..
Date of Report: ……../……../…… Name of Person Reporting: ……..

Enterprise OHS Supervisor to Complete

Name of Enterprise OHS Supervisor: ……

Corrective Action for Hazard or Near Miss Reported	Person Responsible	Completion Date

Signature of Reporting Employee: …… Date: …./…./……..
Signature of H&S Representative: …… Date: …./…./……..
Signature of Management Representative: …….. Date: …./…./……..

C.5 JOB SAFETY ANALYSIS FORM

JOB SAFETY ANALYSIS FORM

Date: …./…./20…. New: Revised: Form No: 05 Revision No: 00 Revision Date: …./…./20… Page: 1/….

Title of Job/Operation:	Position/Title of Responsible for the Job: ……
Directorate:	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department:	Approved By (Title/Name): Manager of Enterprise / ……

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
1				
2				
3				
4				
5				
6				
7				

C.6 EMERGENCY DRILL CONTROL AND EVALUATION FORM

BİGADİÇ BORON WORK	EMERGENCY DRILL CONTROL AND EVALUATION FORM	Prepared by: Soner GÖKÇEK Approved by:	Revision No: 00
		Control performed by:	Form No: 06

#	ACTIONS	YES	NO	INADEQUATE	EXPLAINATIONS
1	Have copies of the building floor plan for all floors been obtained?				
2	Have building areas that may be high-hazard been identified?				
3	Are exit routes posted and illuminated? Are Emergency exit signs adequate?				
4	Is fire equipment accessible? Is fire equipment in good condition?				
5	Are exits clear and unblocked?				
6	Does the building have emergency lighting?				
7	Have evacuation procedures been disseminated to all staff?				
8	Do the emergency teams present at venue and all personnel obey with the order of team leader?				
9	Do team leaders control their teams?				
10	Do department responsible move the Emergency Teams to venue?				
11	Does the messenger inform the authorities and staff?				
12	Does fire watcher inform correctly about emergency?				
13	Do the electricians know the place of power panels? Can they cut off power when it is ordered?				
14	Does Rescue Team carry the important documents and/or equipments away?				
15	Does security aid staff to exit and calm down?				
16	Does security move unassigned people away from the venue?				
17	Does department responsible reports the missing staff to supervisor?				
18	Does First aid team reach to venue on time with required medical equipments?				
19	Does First aid team perform proper medical attention?				
20	Does fire fighting team use proper fire extinguishers?				
21	Have all emergency teams been used proper personal protective tools and cloths?				
22	Do personnel follow emergency exit signs and can they exit?				

C.7 JOB ORDER FORM

<table>
<tr><td colspan="2">BİGADİÇ
BORON WORK</td><td colspan="2">JOB ORDER FORM</td><td>Prepared by:
Soner GÖKÇEK</td><td>Form No: 07</td></tr>
<tr><td colspan="4"></td><td>Approved by:</td><td>Rev. No: 00</td></tr>
<tr><td>EMPLOYEE</td><td colspan="2">Name</td><td colspan="2"></td><td>Title</td><td></td></tr>
<tr><td rowspan="4">SERVICE</td><td colspan="2">Department</td><td colspan="4"></td></tr>
<tr><td colspan="2">Job Title</td><td colspan="4"></td></tr>
<tr><td colspan="2">Job Description</td><td colspan="4"></td></tr>
<tr><td colspan="2">Equipment /
Material Used</td><td colspan="4"></td></tr>
<tr><td rowspan="3">JOB</td><td colspan="2">Location</td><td colspan="4"></td></tr>
<tr><td colspan="2">Date</td><td colspan="2">.... /..../ 20...</td><td>Shift</td><td></td></tr>
<tr><td colspan="2">Time Departed</td><td>.... : ....</td><td>Time Returned</td><td colspan="2">.... : ....</td></tr>
<tr><td>APPROVAL</td><td colspan="3">Job Order Approved by

.....</td><td colspan="3">Employee

.....</td></tr>
</table>

C.8 PERSONAL PROTECTIVE EQUIPMENT RECORD FORM

BİGADİÇ BORON WORK PERSONAL PROTECTIVE EQUIPMENT RECORD FORM

Prepared by: Soner GÖKÇEK	Approved by:	Form No: 08	Revision No: 00

Hereby I declare that I have received the personal protective equipments in good and healthy condition that I have to use in my workplace according to occupational health and safety legal requirements. The name and specifications of these equipments are indicated below. I have informed about the usage of these equipments and where I need to use them. All possible hazards that I might be encountered were explained to me unless I use these equipments. I shall save these equipments properly.

#	Equipment Type	Specification	Amount	Date of delivery	Signature of Employee
1	Head Protection				
2	Ear Protection				
3	Eye Protection				
4	Respiratory				
5	Face Protection				
6	Hand Protection				
7	Arm Protection				
8	Leg Protection				
9	Foot Protection				
10	Skin Protection				
11	Body Protection				

Department	Mission	Name & Surname	Signature of Employee	Approval	Date

ETI MINE WORKS GENERAL MANAGEMENT

BİGADİÇ BORON WORK

HEALTH AND SAFETY DATA SHEET

Prepared by

Soner GÖKÇEK

Date of Issue	**18.12.2009**
Approved by	
Revision No	**00**
Form No	**09**

Edition	Definition	Date of Revision
0	Original	18.12.2009
1		
2		
3		
4		

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION/COMPANY

1.1 Identification of Substance or Preparation

1.2 Chemical Name/Synonyms

1.2. Use of the substance / Preparation

1.3. Company identification

1.4. Emergency phone numbers:

2. HAZARDS IDENTIFICATION

Potential Health Effects:

Primary Route(s) of Exposure:
Inhalation:
Eye Contact:
Skin Contact:
Ingestion:

3. COMPOSITION / INFORMATION ON INGREDIENTS

3.1. Chemical composition:

4. FIRST AID MEASURES

Inhalation:
Eye Contact:
Skin Contact:
Ingestion:

5. FIRE FIGHTING MEASURES

Flash Point and Method:
Flammability Limits (%):
Auto Ignition Temperature:

Extinguishing Media:
Unusual Fire and Explosion Hazards:
Fire Fighting Instructions:
Hazardous Combustion Products:

6. ACCIDENTAL MEASURES

Land Spill:
Water Spill:
Air Release:

7. HANDLING AND STORAGE

Storage Temperature:
Storage Pressure:
General:

8. EXPOSURE CONTROLS/PERSONAL–ENVIRONMENTAL PROTECTION

8.1. Exposure limit values

8.2. Exposure controls

Personal protection:

Respiratory Protection:
Skin Protection:
Eye Protection:
Other Information:
Engineering Controls:

Environmental protection:

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1. General information

Appearance:
Odor:

9.2. Important health, safety and environmental information

pH:
Boiling point:
Flash point:
Flammability:

Explosive properties:
Oxidizing properties:
Vapor Pressure:
Density:
Solubility in water:
Viscosity:
Vapor density (Air=1) :
Evaporation Rate:
Bulk density:
Freezing point:
Melting point: 9
Chemical formula:
Molecular weight:
Physical state:

10. STABILITY AND REACTIVITY

Stability:
Incompatible Materials and Conditions to avoid:
Hazardous Decomposition Products:
Hazardous Polymerization:
Thermal Decomposition:

11. ABBREVIATIONS

12. SOURCES

C.10 OCCUPATIONAL HEALTH AND SAFETY AUDIT INSTRUMENT

ETİ MINE WORKS GENERAL MANAGEMENT

BİGADİÇ BORON WORK

OCCUPATIONAL HEALTH AND SAFETY AUDIT INSTRUMENT

Form Number	10
Number of Page	12
Publish Date	20.05.2009
Prepared by	Soner GÖKÇEK
Approved by	

Edition	Definition	Date of Change
0	Original	20.05.2009
1		
2		
3		
4		

PREFACE

This audit instrument is by no means all-inclusive and constructed for Eti Mine Works General Management Bigadiç Boron Work. Its scope can be expanded continuously. Please carefully consider each item as you come to it and then make your decision.

COMPRESSED GAS CYLINDERS (CGCs)

Are CGCs kept away from sources of heat?		
Are CGCs stored in well-ventilated, dry locations at least 5 m. away from materials such as oil, grease, excelsior, reserve stocks of carbide, acetylene, or other fuels as they are likely to cause acceleration of fires?		
Are CGCs stored only in assigned areas?		
Are CGCs stored away from elevators, stairs, and gangways?		
Are CGCs stored in areas where they will not be dropped, knocked over, or tampered with?		
Are CGCs stored in areas with poor ventilation?		
Are storage areas marked with signs such as: "OXYGEN," "NO SMOKING," or "NO OPEN FLAMES"?		
Are CGCs not stored outside generator houses?		
Do storage areas have wood and grass cut back within 4.5 meter?		
Are CGCs secured to prevent falling?		
Are stored CGCs in a vertical position?		
Are protective caps in place at all times except when in use?		
Are threads on cap or cylinder lubricated?		
Are all CGCs legibly marked for the purpose of identifying the gas content with the chemical or trade name of the gas?		
Are the markings on CGCs by stenciling, stamping, or labeling?		
Are markings located on the slanted area directly below the cap?		
Does each employee determine that CGCs are in a safe condition by means of a visual inspection?		
Are all portable tanks and all piping, valves, and accessories visually inspected at intervals not to exceed 2 1/2 years?		
Are inspections conducted by the owner, agent, or approved agency?		
On insulated tanks, is the insulation not removed if, in the opinion of the person performing the visual inspection, external corrosion is likely to be negligible?		
If evidence of any unsafe condition is discovered, is the portable tank not returned to service until it meets all corrective standards?		

BUILDINGS AND STRUCTURES

Are all impellers, agitators, crushers, mills or other moving parts and equipment inside confined spaces locked out if they present a hazard?		
Is there any air conditioning provided for working areas?		
Is adequate illumination provided for the work to be performed in the confined space?		
Is all portable electrical equipment used inside buildings both grounded and insulated?		
Are the fire extinguishers of the appropriate size and type in the buildings at all times?		
Are all walking surfaces the non-slip type?		
Do all stairs, and emergency exits comply with the requirements of the regulations?		

ELECTRICAL

Are all employees required to report as soon as practicable any obvious hazard to life or property observed in connection with electrical equipment or lines?		
Are employees instructed to make preliminary inspections and/or appropriate tests to determine what conditions exist before starting work on electrical equipment or lines?		
When electrical equipment or lines are to be serviced, maintained or adjusted, are necessary switches opened, locked out and tagged whenever possible?		
Are portable electrical tools and equipment grounded?		
Do extension cords being used have a grounding conductor?		
Are all temporary circuits protected by suitable disconnecting switches or plug connectors at the junction with permanent wiring?		
Are exposed wiring and cords with frayed or deteriorated insulation repaired or replaced promptly?		
Are flexible cords and cables free of splices or taps?		
In wet or damp locations, are electrical tools and equipment appropriate for the use or location or otherwise protected?		
Is the location of electrical power lines and cables (overhead, underground, underfloor, other side of walls) determined before digging, drilling or similar work is begun?		
Are metal measuring tapes, ropes, handlines or similar devices with metallic thread woven into the fabric prohibited where they could come in contact with energized parts of equipment or circuit conductors?		
Are all disconnecting switches and circuit breakers labeled to indicate their use or equipment served?		
Is the use of metal ladders prohibited in areas where the ladder or the person using the ladder could come in contact with energized parts of equipment, fixtures or circuit conductors?		
Do all interior wiring systems include provisions for grounding metal parts of electrical raceways, equipment and enclosures?		
Are all electrical raceways and enclosures securely fastened in place?		
Are all energized parts of electrical circuits and equipment guarded against accidental contact by approved cabinets or enclosures?		
Are sufficient access and working space provided and maintained about all electrical equipment to permit ready and safe operations and maintenance?		
Are electrical enclosures such as switches, receptacles, and junction boxes, provided with tightfitting covers or plates?		
Is each motor disconnecting switch or circuit breaker located within sight of the motor control device?		
Is each motor located within sight of its controller or the controller disconnecting means capable of being locked in the open position or is a separate disconnecting means installed in the circuit within sight of the motor?		

EMERGENCY

Is there a written emergency response planning which is available to all employees?		
Is there an established procedure specifically outlining the steps to be taken by all employees including route of evacuation, place to meet outside building and designation of person responsible for verifying		

that employees are all accounted for?		
Have proper evacuation procedures been communicated to everyone prior to the need for an actual evacuation, and have those procedures been actively practiced in a mock evacuation situation?		
Is there an established protocol for determining the need for evacuation?		
Is there a designated person responsible for making an evacuation decision?		
Is the need for evacuation communicated to employees in such a way that everyone (other than those designated as the initial contacts) receives the same information at the same time?		
In the event of electrical failure, is there a back-up system for both broadcasting of messages and lighting of escape routes?		
Are established escape routes clearly marked, and are maps posted outlining the entire route?		
Are escape routes determined to be the shortest safe route possible, allowing adequate room and number of routes for the number of employees?		
Are all emergency exits clearly marked and functioning properly?		
Are all escape routes free of clutter and tripping hazards?		
Is there adequate emergency lighting along the routes?		
Is emergency equipment such as fire extinguishers and flashlights located at predetermined sites along escape routes and is this equipment routinely tested for proper operation?		
In the event that employees are required to remain within hallways/stairways of escape route for longer than expected, is there adequate ventilation, temperature control and some type of communication equipment?		
Are all established meeting places outside of the building a reasonably safe distance away?		
Is there an established method for verification that all employees have left the building, and a way to communicate to emergency personnel the identities and possible locations of those who have not?		
Are the emergency teams available or not?		
Are all emergency team know their duty and trained?		
Are emergency telephone numbers easily reachable?		
Does every exit have an illuminated sign above it that states, "EXIT"?		
Under no circumstances are exits locked while the building is occupied.		
Are all emergency exit doors equipped with panic bars?		
Do all emergency exit doors designated for fire escape lead to a safe area of refuge?		
Do all emergency exit doors or passageways have emergency illumination in case of power loss?		
Is there access to exits that are unobstructed at all times?		
Are all floor areas around exits clean and dry at all times?		
Is an inspection from a fire marshal done at least once a year?		
Is a general inspection of exit signs, exit doors, exit accesses, and alarm systems conducted by a trained person who has the authority to rectify any problems?		
Is training done on the identification of all exits and their locations?		
Whom to contact and what to do in an emergency?		

ERGONOMICS

Manual Material Handling

Is there lifting of loads, tools, or pans?		
Is there lowering of tools, loads, or parts?		
Is there overhead reaching for tools, loads, or parts?		
Is there bending at the waist to handle tools, loads, or parts?		
Is there twisting at the waist to handle tools, loads, or parts?		

Physical Energy Demands

Do tools and parts weigh more than 5 kg.?		
Is bending, stooping, or squatting a primary task activity?		
Is lifting or lowering loads a primary task activity?		
Is walking or carrying loads a primary task activity?		
Is stair or ladder climbing with loads a primary task activity?		
Is pushing or pulling loads a primary task activity?		
Is reaching overhead a primary task activity?		
Do workers complain that rest breaks and fatigue allowances are insufficient?		

Other Musculoskeletal Demands

Do manual jobs require frequent, repetitive motions?		
Do work postures require frequent bending of the neck, shoulder, elbow, wrist, or finger joints?		
For seated work, do reaches for tools and materials exceed 40 cm. from the worker's position?		
Is the worker unable to change his or her position often?		
Does the work involve forceful, quick, or sudden motions?		
Does the work involve shock or rapid buildup of forces?		
Is finger-pinch gripping used?		
Do job postures involve sustained muscle contraction of any limb?		

Offices and Computer Work

Do operators use computer workstations for more than five hours a day?		
Are there complaints of discomfort from those working at these stations?		
Is the chair or desk nonadjustable?		
Is the display monitor, keyboard, or document holder nonadjustable?		
Does lighting cause glare or make the monitor screen hard to read?		
Is the room temperature too hot or too cold?		
Is there irritating vibration or noise?		

Environment

Is the temperature too hot or too cold?		
Are the worker's hands exposed to temperatures less than 70° Fahrenheit?		
Is the workplace poorly lit?		
Is there glare?		
Is there excessive noise that is annoying, distracting, or producing hearing loss?		
Is there upper extremity or whole body vibration?		
Is air circulation too high or too low?		

General Workplace

Are walkways uneven, slippery, or obstructed?		
Is housekeeping poor?		
Is there inadequate clearance or accessibility for performing tasks?		
Are stairs cluttered or lacking railings?		
Is proper footwear worn?		

Tools

Is the handle too small or too large?		
Does the handle shape cause the operator to bend the wrist in order to use the tool?		
Is the tool hard to access?		
Does the tool weigh more than 4 kg?		
Does the tool vibrate excessively?		
Does the tool cause excessive kickback to the operator?		
Does the tool become too hot or too cold?		

Gloves

Do the gloves require the worker to use more force when performing job tasks?		
Do the gloves provide inadequate protection?		
Do the gloves present a hazard of catch points on the tool or in the workplace?		

Administration

Is there little worker control over the work process?		
Is the task highly repetitive and monotonous?		
Is there inadequate clearance or accessibility for performing tasks?		
Does the job involve critical tasks with high accountability and little or no tolerance for error?		
Are work hours and breaks poorly organized?		

FIRE PROTECTION AND PREVENTION

Does the employer provide portable fire extinguishers for small fires?		
Are all fire extinguishers clearly marked with symbols that distinctly reflect the type of fire hazard for which they are intended?		
Are portable fire extinguishers located where they are readily accessible to employees without subjecting them to possible injury?		
Are fire extinguishers fully charged and operable at all times?		
Are all fire extinguishers clearly marked with symbols that distinctly reflect the type of fire hazard for which they are intended?		
Is protective clothing worn to protect the entire body including respiratory, head, hand, foot, leg, eye, and face?		
Are fixed extinguishing systems used on specific fire hazards?		
Is an alarm with a delay in place to warn employees before a fixed extinguisher is to be discharged?		
Are fire detection systems installed and maintained to assure best detection of a fire?		
Is an employee alarm system installed that is capable of warning every employee of an emergency?		
Is the alarm system such that can be heard above the sound level of the work area?		
Are warning lights installed, if there are hearing impaired employees?		
Is all fire fighting equipment inspected at least annually, and records kept?		
Are portable fire extinguishers inspected at least monthly, and records kept?		
Is any damaged equipment removed immediately from service and replaced?		
Are fixed extinguishing systems inspected annually by a qualified person?		
Are fire detection systems tested monthly if they are battery operated?		
Is training on the use of portable fire extinguishers conducted, and records of attending employees kept?		
Is training provided to employees designated to inspect, maintain, operate, or repair fixed extinguishing systems?		
Is an annual review training required to keep them up to date?		
Are all employees trained to recognize the alarm signals for each emergency?		
Are employees trained in how to report an emergency, where the alarms are, and how to sound them?		
Is training provided on evacuation procedures?		
Are drills performed periodically to ensure employees are aware of their duties?		
Is all training conducted by a qualified/competent person?		
Is training of the duties provided by the employer before the employee is asked to do any emergency response duties?		
Are all fire brigade members trained at least annually, and interior structural fire fighters provided with an education session or training at least quarterly?		

FLAMMABLE AND COMBUSTIBLE MATERIALS

Are combustible scrap, debris, and waste materials (oily rags, etc.) stored in covered metal receptacles and removed from the worksite promptly?		
Is proper storage practiced to minimize the risk of fire including spontaneous combustion?		
Are approved containers and tanks used for the storage and handling of flammable and combustible liquids?		
Are all connections on drums and combustible liquid piping tight?		
Are all flammable liquids kept in closed containers when not in use?		
Do storage rooms for flammable and combustible liquids have explosion-proof lights?		
Do storage rooms for flammable and combustible liquids have ventilation?		
Is liquefied petroleum gas stored, handled, and used in accordance with safe practices and standards?		
Are "NO SMOKING" signs posted on liquefied petroleum gas tanks?		
Are liquefied petroleum storage tanks guarded to prevent damage from vehicles?		
Are all solvent wastes and flammable liquids kept in fire-resistant, covered containers until they are removed from the worksite?		
Are fuel gas cylinders and oxygen cylinders separated by distance, and fire-resistant barriers, while in storage?		
Are fire extinguishers selected and provided for the types of materials in areas where they are to be used?		
Are appropriate fire extinguishers mounted within areas containing flammable liquids?		
Are extinguishers free from obstructions or blockage? Are all extinguishers serviced, maintained and tagged at intervals not to exceed one year?		
Are all extinguishers fully charged and in their designated places? Where sprinkler systems are permanently installed, are the nozzle heads so directed or arranged that water will not be sprayed into operating electrical switch boards and equipment?		
Are "NO SMOKING" signs posted where appropriate in areas where flammable or combustible materials are used or stored?		

FORKLIFTS

If a forklift that needs repair is defective or unsafe, is it removed from service?		
Are all repairs done by trained, authorized personnel?		
Is a copy of the maintenance report kept on file?		
Are only properly licensed operators allowed to operate forklifts?		
Is refresher training conducted yearly?		
Does proper ventilation exist in areas in which exhaust-releasing forklifts will be operated?		
Are forklifts turned off, controls in neutral, fork lowered, and brakes set when the driver is not in the driver's seat?		
Do all forklifts have an overhead guard in place?		
Are traffic regulations posted in forklift areas and compliance ensured?		

Are only safely arranged loads lifted with a forklift?		
Is the forklift operated within its rated capacity?		
Are forklifts fueled while running?		
Is the forklift maintained clean at all times?		
Are only licensed operators allowed to operate forklifts?		

HAND AND PORTABLE POWERED TOOLS

Hand Tools and Equipment

Are all tools and equipment (both company and employee owned) used by employees at their workplace in good condition?		
Are hand tools such as chisels and punches, which develop mushroomed heads during use, reconditioned or replaced as necessary?		
Are broken or fractured handles on hammers, axes and similar equipment replaced promptly?		
Are worn or bent wrenches replaced regularly?		
Are appropriate handles used on files and similar tools?		
Are employees made aware of the hazards caused by faulty or improperly used hand tools?		
Are appropriate safety glasses, face shields, etc. used while using hand tools or equipment which might produce flying materials or be subject to breakage?		
Are jacks checked periodically to ensure they are in good operating condition?		
Are tool handles wedged tightly in the head of all tools?		
Are tool cutting edges kept sharp so the tool will move smoothly without binding or skipping?		
Are tools stored in dry, secure locations where they won't be tampered with?		
Is eye and face protection used when driving hardened or tempered spuds or nails?		

Portable (Power Operated) Tools and Equipment

Are grinders, saws and similar equipment provided with appropriate safety guards?		
Are power tools used with the correct shield, guard, or attachment recommended by the manufacturer?		
Are portable circular saws equipped with guards above and below the base shoe? Are circular saw guards checked to assure they are not wedged up, thus leaving the lower portion of the blade unguarded?		
Are rotating or moving parts of equipment guarded to prevent physical contact?		
Are all cord-connected, electrically operated tools and equipment effectively grounded or of the approved double insulated type?		
Are effective guards in place over belts, pulleys, chains, sprockets, on		

equipment such as concrete mixers, and air compressors?		
Are pneumatic and hydraulic hoses on power operated tools checked regularly for deterioration or damage?		

Blasting Tools and Materials

Are employees who operate blasting tools trained in their use and do they carry a valid operator's card?		
Is each blasting tool and material stored in its own container at the locked storage building when not being used?		
Is a sign bold face type reading the warning conspicuously posted and the area cleared free of people when the blasting takes place?		
Are holes left unloaded until they are actually ready to be used?		
Are blasting tools and blasting holes inspected for obstructions or defects before blasting?		
Do blasting operators have and use appropriate personal protective equipment such as hard hats, safety goggles, safety shoes and ear protectors?		
Are all cellular phones devices shut down before going to blasting site?		
Is the weather condition suitable for blasting?		

HAZARD COMMUNICATION

Is there a list of hazardous substances used in your workplace?		
Is there a written hazard communication program dealing with Material Safety Data Sheets (MSDSs), labeling, and employee training?		
Is each container for a hazardous substance (i.e., vats, bottles, storage tanks, etc.) labeled with product identity and a hazard warning (communication of the specific health hazards and physical hazards)?		
Is there a Material Safety Data Sheet readily available for each hazardous substance used?		
Is there an employee training program for hazardous substances? Does this program include:		
an explanation of what an MSDS is and how to use and obtain one?		
MSDS contents for each hazardous substance or class of substances?		
explanation of "Right to Know?"		
the physical and health hazards of substances in the work area, and specific protective measures to be used?		
Are employees trained in the following:		
how to recognize tasks that might result in occupational exposure?		
how to use work practice and engineering controls and personal protective equipment and to know their limitations?		

MACHINE GUARDING AND SAFETY

Do the safeguards provided meet the minimum OSHA requirements?		
Do the safeguards prevent workers' hands, arms and other body parts from making contact with dangerous moving parts?		
Are the safeguards firmly secured and not easily removable?		
Do the safeguards ensure that no objects will fall into the moving parts?		
Do the safeguards permit safe, comfortable, and relatively easy operation of the machine?		
Can the machine be oiled without removing the safeguard?		
Is there a system for shutting down the machinery before safeguards are removed?		
Does it keep the operator's hands, fingers, body out of the danger area?		
Is there evidence that the safeguards have been tampered with or removed?		
Are there any unguarded gears, sprockets, pulleys, or flywheels on the apparatus?		
Are there any exposed belts or chain drives?		
Are there any exposed set screws, key ways, collars, etc.?		
Are starting and stopping controls within easy reach of the operator?		
Are safeguards provided for all hazardous moving parts of the machine including auxiliary parts?		
Have special guards, enclosures, or personal protective equipment been provided, where necessary, to protect workers from exposure to harmful substances used in machine operation?		
Are there loose conduit fittings?		
Is the machine properly grounded?		
Is the power supply correctly fused and protected?		
Have operators and maintenance workers been trained in where the safeguards are located, how they provide protection, and what hazards they protect against?		
Have operators and maintenance workers been trained in how and under what circumstances guards can be removed?'		
If protective equipment is required, is it appropriate for the job? Is it in good condition, kept clean and sanitary, and stored carefully when not in use?		
Is the operator dressed safely for the job (i.e., no loose-fitting clothing or jewelry)?		
Have maintenance workers received up-to-date instruction on the machines they service?		
Do maintenance workers lock out the machine from its power sources before beginning repairs?		
Do maintenance persons use appropriate and safe equipment in their repair work?		

MATERIAL HANDLING

Are all drivers of trucks equipment trained and have a required license?		
Are all operators of forklifts trained by a certified instructor?		
Is all material handling equipment kept in good repair, and maintained by trained personnel?		

Is all material handling equipment properly marked with load ratings?		
Are grading or ramps installed between two working levels for safe vehicle movement?		
Is material handling equipment that poses a danger to equipment or personnel guarded to prevent access within a safe distance?		

MEDICAL SERVICES AND FIRST-AID

Are medical facilities and medically trained personnel on-site if possible?		
In the absence of a medical facility that is close and available, are adequately trained personnel readily available to render first aid?		
Are doctor-approved first aid supplies readily available?		
Is a first aid log kept on employees?		
Is an inventory checklist kept of all first aid supplies?		
Are all employees trained on basic first aid techniques and procedures?		
Are all employees trained on usage of personal protective equipment while first aid is being performed?		

PERSONAL PROTECTIVE EQUIPMENT

Are employers assessing the workplace to determine if hazards that require the use of personal protective equipment (for example, head, eye, face, hand, or foot protection) are present or are likely to be present?		
If hazards, or the likelihood of hazards are found, are employers selecting and having affected employees use properly fitted personal protective equipment suitable for protection from these hazards?		
Have employees been trained on PPE procedures, that is, what PPE is necessary for a job task, when they need it, and how to properly adjust it?		
Are protective goggles or face shields provided and worn where there is any danger of flying particles or corrosive materials?		
Are approved safety glasses required to be worn at all times in areas where there is a risk of eye injuries such as punctures, abrasions, contusions or burns?		
Are protective gloves, aprons, shields, or other means provided and required where employees could be cut or where there is reasonably anticipated exposure to corrosive liquids, chemicals, blood, or other potentially infectious materials?		
Are hard hats provided and worn where danger of falling objects exists?		
Are hard hats inspected periodically for damage to the shell and suspension system?		
Is appropriate foot protection required where there is the risk of foot injuries from hot, corrosive, falling objects, crushing or penetrating actions?		
Is all protective equipment maintained in a sanitary condition and ready for use?		
Is protection against the effects of occupational noise exposure provided when sound levels exceed those of the OSHA noise standard?		

WELDING AND CUTTING

Are areas established for welding and cutting equipment based on fire potentials?		
Are there designated individuals responsible for authorizing cutting or welding in non-welding areas?		
Are all cutters, welders and supervisors trained in the safe operation and use of equipment and processes?		
Are combustible materials removed or protected from ignition?		
Are fire protections and extinguishing equipment properly located and available?		
Are welding curtains used where needed?		
Are welding cables in good condition and properly insulated?		
Are manual electrode holders designed and insulated for arc welding and cutting?		
Are welding cables and connectors insulated and capable of handling maximum current?		
Are frames of arc welding and cutting machines grounded?		
Are workers assigned to arc welding or gas-shielded arc welding instructed and qualified?		
Are arc welding and cutting operations shielded by flameproof screens or located in bays or booths to protect from direct rays of the arc?		
Are operators specially protected from high intensities of ultra-violet radiation by screening or filter lenses?		
Is skin protected by clothing or other devices?		

Name and position of inspectors	Date	Signature
/		
/		
/		

C.11 ACCIDENT REPORT FORM

BİGADİÇ BORON WORK ▌ ACCIDENT REPORT FORM ▐

| Prepared by: Soner Gökçek | Approved by: | Form No: 11 | Revision No: 0 |

DEPARTMENT: _____ EMPLOYEE NAME: _____ DATE OF ACCIDENT:_____
LOCATION OF ACCIDENT: _____ EMPLOYEE AGE: _____ TIME OF ACCIDENT: _____
ACCCIDENT TYPE: _____EMPLOYEE OCCUPATION: _____

DESCRIPTION OF ACCIDENT/INCIDENT: _____
_____
Itemize Personal Injury Involved : _____
Itemize Property Damage Involved : _____
Itemize Tools/Equipments Involved : _____

	DIRECT		INDIRECT		BASIC	
CAUSES	Energy Sources	Hazardous Materials	Unsafe Acts	Unsafe Conditions	Inadequate Policy and/or Decisions	Environmental and/or Personal Factors
	_____	_____	_____	_____	_____	_____
	_____	_____	_____	_____	_____	_____
	_____	_____	_____	_____	_____	_____
	_____	_____	_____	_____	_____	_____
	_____	_____	_____	_____	_____	_____
RECOMENDATIONS	DIRECT LEVEL		INDIRECT LEVEL		BASIC LEVEL	
	_____	_____	_____	_____	_____	_____
	_____	_____	_____	_____	_____	_____
	_____	_____	_____	_____	_____	_____
	_____	_____	_____	_____	_____	_____
	_____	_____	_____	_____	_____	_____
	_____	_____	_____	_____	_____	_____

APPENDIX D. FILLED SAMPLES OF OHSA SYSTEM FORMS

D.1 RISK EVALUATIONS

	Date	18/07/2008	**RISK EVALUATION FORM**	**Assessment Number**	1
	Department	Simav; Tülü & Acep Open-pits Head Eng.		**Prepared by**	Soner GÖKÇEK
	Process	Open-pit Mining		**Approved by**	
Sub-system		Drilling		**Revision Number & Date**	0 & …/…/20…
				Form No 01	**Page No:** 1 of 3

No	Hazard	Who may be harmed	L	E	C	Risk Score	Result	Completion Date
1	Traffic accident	Drivers	1	3	100	300	High	A week
2	Struck by	Workers	1	3	7	21	Low	Three months
3	Electrocution	Operator	0.2	3	40	24	Low	Three months

No	Consequence	Risk Score	Prevention / Recommendation	Present situation	Responsible people
1	Fatality and/or serious injury	300	Drilling machine should move during the shift breaks	A	Dept. Head Engineer
2	Serious Injury	21	All equipment, augers, rods and tools will be properly secured during transport. Stay away from the augers when rotating. Prevent shovel from lodging into the augers and kicking out. Do not wear loose clothing when working	A	Dept. Head Engineer
3	Fatality and/or serious injury	24	Inspect for buried and overhead utilities in the vicinity of the drilling location. Never start drilling if there is no permission granted	NA	Dept. Head Engineer

L: Likelihood Score **E: Exposure Score** **C: Consequence Score** **A: Available** **NA: Not Available**

	Date	18/07/2008	**RISK EVALUATION FORM**	**Assessment Number**	1
	Department	Simav; Tülü & Acep Open-pits Head Eng.		**Prepared by**	Soner GÖKÇEK
	Process	Open-pit Mining		**Approved by**	
Sub-system		Drilling		**Revision Number & Date**	0 & …/…/20…
				Form No 01	**Page No:** 2 of 3

No	Hazard	Who may be harmed	L	E	C	Risk Score	Result	Completion Date
4	Fall same level	Workers	1	3	3	9	Unimportant	No Priority
5	Hit by vehicle	Workers	1	3	40	120	Moderate	A month
6	Tip over the vehicle	Workers	0.5	3	40	60	Low	Three months

No	Consequence	Risk Score	Prevention / Recommendation	Present situation	Responsible people
4	Injury	9	Keep the site clear of obstructions. Wear appropriate foot and head protection.	A	Dept. Head Engineer
5	Fatality and/or serious injury	120	Never leave the brake unattended when engaged. Use a ground guide along with a functioning back-up alarm during equipment backing.	A	Dept. Head Engineer
6	Fatality and/or serious injury	60	Never move the drilling rig with the mast upright. Set hydraulic leveling jacks before raising the mast. Ensure the drilling site foundation is stable and as level as possible.	A	Dept. Head Engineer

L: Likelihood Score **E: Exposure Score** **C: Consequence Score** **A: Available** **NA: Not Available**

	Date	18/07/2008	**RISK EVALUATION FORM**	**Assessment Number**	1
	Department	Simav; Tülü & Acep Open-pits Head Eng.		**Prepared by**	Soner GÖKÇEK
	Process	Open-pit Mining		**Approved by**	
Sub-system		Drilling		**Revision Number & Date**	0 & …/…/20…
				Form No 01	**Page No:** 3 of 3

No	Hazard	Who may be harmed	L	E	C	Risk Score	Result	Completion Date
7	Overexertion while Improper lifting	Workers	0.5	3	3	4.5	Unimportant	No Priority
8	Caught between	Repairman	0.5	3	3	4.5	Unimportant	No Priority
9	Fire	All Maintenance Staff	0.5	3	100	150	Moderate	A month

No	Consequence	Risk Score	Prevention / Recommendation	Present situation	Responsible people
7	Joint disconformities	4.5	Train workers to show proper lifting techniques when manually handling rods, augers and tools. Use mechanical equipment during lifting whenever possible.	NA	Management
8	Injury	4.5	All motors must be shut off and electrical, mechanical and hydraulic components locked out of service when making repairs.	A	Dept. Head Engineer
9	Fatality and/or serious injury	150	All motors must be shut off during refueling. Smoking in the vicinity of the drilling is not permitted	A	Dept. Head Engineer

L: Likelihood Score **E: Exposure Score** **C: Consequence Score** **A: Available** **NA: Not Available**

	Date	24/07/2008	**RISK EVALUATION FORM**	**Assessment Number**	2
	Department	H.E. of Machine Supply & Maintenance		**Prepared by**	Soner GÖKÇEK
	Process	Maintenance		**Approved by**	
Sub-system		Changing Truck Tire		**Revision Number & Date**	0 & …/…/20…
				Form No 01	**Page No:** 1 of 3

No	Hazard	Who may be harmed	L	E	C	Risk Score	Result	Completion Date
1	Struck by vehicle	Workers	0.5	2	40	40	Low	Three months
2	Fall-same-level	Workers	1	2	3	6	Unimportant	No Priority
3	Overexertion while Improper lifting or carrying	Workers	1	2	3	6	Unimportant	No Priority

No	Consequence	Risk Score	Prevention / Recommendation	Present situation	Responsible people
1	Death and/or serious injury	40	The training about using jack must be given to worker	NA	Management
			Chocking always must be used	A	Dept. Head Engineer
2	Injury	6	Personal Protecting Tools must be used and clean and tidy environment should be provided as much as possible	NA	Management
3	Joint disconformities	6	The training about lifting and carrying safely should be given to workers	NA	Management
			There must be machine or tools used to lift or carry the heavy objects which may create hazard to workers	A	Management

L: Likelihood Score **E: Exposure Score** **C: Consequence Score** **A: Available** **NA: Not Available**

	Date	24/07/2008	**RISK EVALUATION FORM**	**Assessment Number**	2
	Department	H.E. of Machine Supply & Maintenance		**Prepared by**	Soner GÖKÇEK
	Process	Maintenance		**Approved by**	
Sub-system		Changing Truck Tire		**Revision Number & Date**	0 & …/…/20…
				Form No 01	**Page No:** 2 of 3

No	Hazard	Who may be harmed	L	E	C	Risk Score	Result	Completion Date
4	Exposure to cold/hot surface	Workers	3	2	3	18	Unimportant	No Priority
5	Caught-between	Workers	3	2	40	240	High	A week
6	Traffic Accident	Drivers & Workers	0.5	2	100	100	Moderate	A month

No	Consequence	Risk Score	Prevention / Recommendation	Present situation	Responsible people
4	Burn, Frostbite	18	This point should be considered in training about changing tire	NA	Management
			Personal Protecting Tools must be used (Gloves)	NA	Management
			Personal Protecting Tools must be used (Hard cap, Safety Shoes)	A	Management
5	Death and/or serious injury	240	Training about service truck's boom and tire change must be given.	NA	Management
			Personal Protecting Tools must be used (Hard cap, Safety Shoes)	NA	Management
6	Death and/or serious injury	100	Improper warn of other vehicles may cause accident	A	Management
			Be always sure about to get the tools back and do not leave anything in the field	A	Dept. Head Engineer

L: Likelihood Score **E: Exposure Score** **C: Consequence Score** **A: Available** **NA: Not Available**

	Date	24/07/2008	**RISK EVALUATION FORM**	**Assessment Number**		2
	Department	H.E. of Machine Supply & Maintenance		**Prepared by**		Soner GÖKÇEK
	Process	Maintenance		**Approved by**		
Sub-system		Changing Truck Tire		**Revision Number & Date**		0 & …/…/20…
				Form No	01	**Page No:** 3 of 3

No	Hazard	Who may be harmed	L	E	C	Risk Score	Result	Completion Date
7	Struck by	Workers	0.5	2	7	7	Unimportant	No Priority

No	Consequence	Risk Score	Prevention / Recommendation	Present situation	Responsible people
7	Serious Injury	7	Personal Protecting Tools must be used and clean and tidy environment should be provided as much as possible	A	Management

L: Likelihood Score **E: Exposure Score** **C: Consequence Score** **A: Available** **NA: Not Available**

	Date	05/08/2008	**RISK EVALUATION FORM**	**Assessment Number**	3
	Department	Simav; Tülü & Acep Open-pits Head Eng.		**Prepared by**	Soner GÖKÇEK
	Process	Open-pit Mining		**Approved by**	
Sub-system		Blasting		**Revision Number & Date**	0 & …/…/20…
				Form No: 01	**Page No:** 1 of 2

No	Hazard	Who may be harmed	L	E	C	Risk Score	Result	Completion Date
1	Fall-to-below	Blasting team	0.5	3	40	60	Low	Three months
2	Fall-to-same level	Blasting team	0.5	3	3	4.5	Unimportant	No priority
3	Hit by	Workers	0.5	3	40	60	Low	Three months

No	Consequence	Risk Score	Prevention / Recommendation	Present situation	Responsible people
1	Fatality and/or serious injury	60	Do not close to benches and do not enter cracked and fractured areas. Wear appropriate foot and head protection.	NA	Dept. Head Engineer
2	Injury	4.5	Keep the site clear of obstructions. Wear appropriate foot and head protection.	A	Management
3	Fatality and/or serious injury	60	Overload of drills may cause fly rock. Use proper head protection equipment	NA	Dept. Head Engineer

L: Likelihood Score **E: Exposure Score** **C: Consequence Score** **A: Available** **NA: Not Available**

	Date	05/08/2008	**RISK EVALUATION FORM**	**Assessment Number**	3
	Department	Simav; Tülü & Acep Open-pits Head Eng.		**Prepared by**	Soner GÖKÇEK
	Process	Open-pit Mining		**Approved by**	
Sub-system		Blasting		**Revision Number & Date**	0 & …/…/20…
				Form No: 01	**Page No:** 2 of 2

No	Hazard	Who may be harmed	L	E	C	Risk Score	Result	Completion Date
4	Traffic accident	Drivers	0.2	3	40	24	Low	Three months
5	Explosion	Workers	0.5	3	100	150	Moderate	A month

No	Consequence	Risk Score	Prevention / Recommendation	Present situation	Responsible people
4	Fatality and/or serious injury	24	All traffic must be stopped before blasting	A	Dept. Head Engineer
5	Many Fatalities and/or serious injuries	150	Always use warning system before blasting and clear the area. Watch the area for trespassing. Close cell phones to avoid unplanned explosion	A	Dept. Head Engineer

L: Likelihood Score **E: Exposure Score** **C: Consequence Score** **A: Available** **NA: Not Available**

	Date	12/08/2008	**RISK EVALUATION FORM**	**Assessment Number**	4
	Department	Simav; Tülü & Acep Open-pits Head Eng.		**Prepared by**	Soner GÖKÇEK
	Process	Open-pit Mining		**Approved by**	
Sub-system		Operating excavator		**Revision Number & Date**	0 & …/…/20…
				Form No 01	**Page No:** 1 of 2

No	Hazard	Who may be harmed	L	E	C	Risk Score	Result	Completion Date
1	Fall-to-below	Blasting team	1	10	3	30	Low	Three months
2	Frostbite	Blasting team	1	10	3	30	Low	Three months
3	Hit by	Workers	1	10	40	400	Intolerable	Immediately

No	Consequence	Risk Score	Prevention / Recommendation	Present situation	Responsible people
1	Injury	30	Place both hand on rail of operator's compartment and foot on step of track frame. Make sure shoes are free of mud. Use head and foot protection	NA	Dept. Head Engineer
2	Frostbite	30	Wear gloves and other appropriate clothing	NA	Management
3	Fatality and/or serious injury	400	While loading trucks do not close. Rocks may fall and hit. Use proper head protection equipment	NA	Dept. Head Engineer

L: Likelihood Score **E: Exposure Score** **C: Consequence Score** **A: Available** **NA: Not Available**

	Date	12/08/2008	**RISK EVALUATION FORM**	**Assessment Number**	4
	Department	Simav; Tülü&Acep Open-pits Head Eng.		**Prepared by**	Soner GÖKÇEK
	Process	Open-pit Mining		**Approved by**	
Sub-system		Operating excavator		**Revision Number & Date**	0 & …/…/20…
				Form No 01	**Page No:** 2 of 2

No	Hazard	Who may be harmed	L	E	C	Risk Score	Result	Completion Date
4	Traffic accident	Drivers	0.5	10	40	200	High	A week
5	Engine failure	Workers	1	10	1	150	Unimportant	A month

No	Consequence	Risk Score	Prevention / Recommendation	Present situation	Responsible people
4	Fatality and/or serious injury	200	Do not forget operator cabinet unlocked. Don't allow unauthorized use	A	Shift engineer
			Do not use excavator with broken mirrors and malfunctioned lights	NA	Shift engineer
			Do not doze or sleep. If you are sleepy inform to engineers.	A	Shift engineer
5	Engine failure, money loss	10	Do not use excavator with low hydraulic or oil	A	Shift engineer
			Check fluid leaks from broken hoses or loose fittings always before start to operate	NA	Shift engineer

L: Likelihood Score **E: Exposure Score** **C: Consequence Score** **A: Available** **NA: Not Available**

	Date	18/08/2008	**RISK EVALUATION FORM**	**Assessment Number**	5
	Department	H.E of Control & Study		**Prepared by**	Soner GÖKÇEK
	Process	Topographic Surveying		**Approved by**	
Sub-system		-		**Revision Number & Date**	0 & …/…/20…
				Form No 01	**Page No:** 1 of 2

No	Hazard	Who may be harmed	L	E	C	Risk Score	Result	Completion Date
1	Fall-to-below	Workers	3	2	40	240	High	A week
2	Fall-to-same level	Workers	6	2	3	36	Low	Three months
3	Electrocution	All surveying team	0.5	2	40	40	Low	Three months

No	Consequence	Risk Score	Prevention / Recommendation	Present situation	Responsible people
1	Fatality and/or serious injury	240	Do not close to benches and do not enter cracked and fractured areas	NA	Dept. Head Engineer
2	Injury	36	Keep the site clear of obstructions. Wear appropriate foot and head protection.	A	Management
3	Fatality and/or serious injury	40	Inspect for buried and overhead cable utilities in the vicinity of the surveying location. Never start surveying if there is no permission granted	NA	Dept. Head Engineer

L: Likelihood Score **E: Exposure Score** **C: Consequence Score** **A: Available** **NA: Not Available**

	Date	18/08/2008	**RISK EVALUATION FORM**	**Assessment Number**	5
	Department	H.E of Control & Study		**Prepared by**	Soner GÖKÇEK
	Process	Topographic Surveying		**Approved by**	
Sub-system		-		**Revision Number & Date**	0 & …/…/20…
				Form No 01	**Page No:** 2 of 2

No	Hazard	Who may be harmed	L	E	C	Risk Score	Result	Completion Date
1	Traffic accident	Drivers	1	2	100	200	High	A week
2	Explosion	Workers	1	2	100	200	High	A week
3	Heat Stress	Workers	6	2	3	36	Low	Three months

No	Consequence	Risk Score	Prevention / Recommendation	Present situation	Responsible people
1	Many Fatalities and/or serious injuries	300	If the topographic surveying is performed in haulage or transportation roads then the traffic must be stopped before	NA	Dept. Head Engineer
2	Many Fatalities and/or serious injuries	21	Always use warning system before blasting and clear the area. Be aware of warning signs	A	Dept. Head Engineer
3	Discomfort, heat stress, faint	36	Use hard cap to avoid sun light. Carry water while surveying. Give breaks occasionally.	NA	Dept. Head Engineer

L: Likelihood Score **E: Exposure Score** **C: Consequence Score** **A: Available** **NA: Not Available**

D.2 JOB SAFETY ANALYSES

JOB SAFETY ANALYSIS FORM

Date: 02/09/2009 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: …/…/20… Page: 1/3

Title of Job/Operation: Drilling	Position/Name of Responsible for the Job: Operator / ……
Directorate: Directorate of Production	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: Simav Open-pit Mine Chief Engineering	Approved By (Title/Name): Manager of Enterprise / ……

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
1	Drive the drilling machine to the site	Traffic accident	Death and/or serious injury	Plan the move machine before the shift begins (during shift breaks) and keep the machine as close as possible to the new possible drilling place.
2	Set up the machine	Struck By	Serious injury	All equipment, augers, rods and tools will be properly secured during transport.
		Tip Over	Death and/or serious injury	Never move the drilling rig with the mast upright. Set hydraulic leveling jacks before raising the mast. Ensure the drilling site foundation is stable and as level as possible.
		Hit by vehicle when backing	Death and/or serious injury	Use a ground guide along with a functioning back-up alarm during equipment backing.
		Electrocution	Death and/or serious injury	Inspect for buried and overhead utilities in the vicinity of the drilling location. A drilling clearance permit shall be obtained from base personnel prior to initiating.
		Slips, Trips, Falls	Injury	Clear trees, roots, weeds, limbs and other ground hazards from the drilling location. Practice good housekeeping to keep the ground around the drilling site clear of obstructions. Wear appropriate PPEs.

JOB SAFETY ANALYSIS FORM

Date: 02/09/2009 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: …/…/20… Page: 2/3

Title of Job/Operation: Drilling	Position/Name of Responsible for the Job: Operator / ……
Directorate: Directorate of Production	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: Simav Open-pit Mine Chief Engineering	Approved By (Title/Name): Manager of Enterprise / ……

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
3	Drill Rod / Auger / Tool Handling	Struck By	Serious Injury	Drill rods and augers stored and transported in racks shall be blocked to prevent shifting. Unload drill rods and augers layer by layer. Be prepared for sudden shifting when tailing rod sections.
		Overexertion while Improper lifting	Joint disconformities	Use proper lifting techniques when manually handling rods, augers and tools. Use mechanical equipment during lifting whenever possible. Use the buddy system when lifting tools and supplies.
4	Hoisting Operations	Struck By	Serious Injury	Never engage the rotary clutch until all personnel and equipment are clear. Never leave the brake unattended when engaged. Drill rods and auger sections should not be picked up or dropped suddenly. Do not lift more than 3 m. of augers or one joint of pipe between tool breaks. Test the brakes daily. Suspend drilling activities if moisture comprises the performance of the braking mechanism.
5	Auger Operations	Struck By	Serious Injury	Use a long handled flat head shovel when removing auger cuttings. Stay away from the augers when rotating. Prevent shovel from lodging into the augers and kicking out. Do not wear loose clothing when working with augers.

JOB SAFETY ANALYSIS FORM

Date: 02/09/2010 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: …/…/20… Page: 3/3

Title of Job/Operation: Drilling	Position/Name of Responsible for the Job: Operator / ……
Directorate: Directorate of Production	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: Simav Open-pit Mine Chief Engineering	Approved By (Title/Name): Manager of Enterprise / ……

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
6	Maintenance	Caught between	Injury	The drilling rig and associated equipment must be maintained in a proper functioning condition. All motors must be shut off and electrical, mechanical and hydraulic components locked out of service when making repairs. Bleed off pressure on hydraulic lines before undoing fittings. Do not leave tools or parts loose on the rig after maintenance has been performed.
		Fire	Death and/or serious injury	All motors must be shut off during refueling. Smoking in the vicinity of the drilling rig is not permitted. An A-B-C fire extinguisher must be maintained on the drilling machine.

JOB SAFETY ANALYSIS FORM

Date: 05/09/2009 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: …/…/20… Page: 1/4

Title of Job/Operation: Blasting	Position/Title of Responsible for the Job: Foreman
Directorate: Directorate of Production	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: Simav Open-pit Mine Chief Engineering	Approved By (Title/Name): Manager of Enterprise / …….

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
1	Check weather conditions	Unplanned detonation of explosives	Death and/or serious injury	If the weather is cloudy, rainy or flashing blasting operation has to be aborted
2	Turn all electronic devices off.	Premature detonation	Death and/or serious injury	Leave the cellular phone etc before starting operation
3	Face the highwall	Stepping over edge	Death and/or serious injury	Training should indicate this point
4	Fill the Blasting Form about explosives and materials taken from explosive warehouse	Explosives has been lost or steal	Death and/or serious injury	Explosive warehouse must be locked and only authorized staff may excess in order to prevent stolen explosives
5	Deliver stemming materials to blast site (front end loader operator)	Time lost	-	Request made by blaster or supervisor
6	Locate or place blaster's shed behind or to the side of shot	Blaster may hit by fly rocks	Death and/or serious injury	Blaster shed must be constructed of hard steel; place 300-500 m. away from blasting area.
7	Place and/or check for proper signage	Unauthorized people or staff entry	Death and/or serious injury	Signs are for general public and employees to warn of blast dangers

JOB SAFETY ANALYSIS FORM

Date: 05/09/2010 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: …/…/20… Page: 2/4

Title of Job/Operation: Blasting	Position/Title of Responsible for the Job: Foreman
Directorate: Directorate of Production	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: Simav Open-pit Mine Chief Engineering	Approved By (Title/Name): Manager of Enterprise / …….

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
8	Load holes closest to the face and work your way back	Unplanned detonation of explosives	Time and property loss	To assure all holes are loaded and in case of problem
9	Slide detonator cord through booster and fasten in second hole in the booster	May cause misfire	Death and/or serious injury	Training, On-site training
10	Lower detonator and booster into the hole	-	-	On-site training
11	Pour ANFO into hole	Overload may cause fly rock hazards	Death and/or serious injury	On-site training
12	Measure depth of anfo with wooden pole	Measurement is not made and fly rock or insufficient blasting	Death and/or serious injury	On-site training
13	Stop adding anfo at 25 cm from top of hole or maximum of 3 bags for a 9 cm hole	Overload, inadequate load	Death and/or serious injury	On-site training
14	Place stemming into hole	Deficient stemming may cause excessive fly rock	Death and/or serious injury	Place one shovel of coarse and one shovel of fine. Stemming must be level with top of hole

JOB SAFETY ANALYSIS FORM

Date: 05/09/2009 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: …/…/20… Page: 3/4

Title of Job/Operation: Blasting	Position/Title of Responsible for the Job: Foreman
Directorate: Directorate of Production	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: Simav Open-pit Mine Chief Engineering	Approved By (Title/Name): Manager of Enterprise / …….

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
15	Repeat process for each hole	-	-	-
16	Never leave blast site unattended	Unauthorized access may happen	Death and/or serious injury	Training and punishment
17	Clear area except for authorized personnel	Other personnel may be unaware of process when the blasting takes place	Death and/or serious injury	To control blast site
18	Run detonating cord to blasters shed	The cord is not reached to shed	Death and/or serious injury	Shed is used as protection for blaster.
19	Make primer cord and blast hole connections	There may be improper connections	Time and property loss	Refer to blasters chart
20	Walk the blast site and check connections after all connections are made	There may be connections that are made improperly	Time and property loss	To prevent misfires and identify any additional hazards; make sure all connections have been made properly
21	Notify all equipment operators with radios to barricade roads	Unauthorized entry to blast area	Death and/or serious injury	To prevent unauthorized persons in blast area

JOB SAFETY ANALYSIS FORM

Date: 05/09/2010 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: …/…/20… Page: 4/4

Title of Job/Operation: Blasting	Position/Title of Responsible for the Job: Foreman
Directorate: Directorate of Production	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: Simav Open-pit Mine Chief Engineering	Approved By (Title/Name): Manager of Enterprise / …….

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
22	Remove all personnel from blast area	There may be a personnel is left in blast area	Death and/or serious injury, property damage	Communicate with all staff
23	Radio each check point for final confirmation	There may be sudden and unplanned entry to blast area	Death and/or serious injury	Communicate with all staff
24	Initiate blast	-	-	Licensed blaster must make the blasting
25	Prohibit entrance to site for 30 minutes	Dust clouds may cause health hazards	Occupational disease	To prevent safety and health hazards
26	Release access roads	-	-	-
27	Resume business activities as normal	-	-	-
28	Return to blast area after 30 minutes	-	-	-
29	Look for cap to be blown	There may be misfired shots	Death and/or serious injury	To locate possible misfired shots. Will be opened up with black powder;

JOB SAFETY ANALYSIS FORM

Date: 09/09/2009 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: …/…/20… Page: 1/6

Title of Job/Operation: Changing Tire of Truck	Position/Title of Responsible for the Job: Repairman
Directorate: Directorate of Maintenance-Repair Works	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: Machinery Maintenance-Repair and Supply Chief Eng.	Approved By (Title/Name): Manager of Enterprise / ……

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
1	Prepare materials to change tire	Struck by vehicle	Death and/or serious injury	Engine must be shut off
		Slip and fall	Injury	Observe area. Remove tripping or stumbling hazards or move vehicle to better location
		Exposure to cold, frostbite	Freeze and frostbite	Wear gloves and other appropriate clothing
		Overexertion removing spare tire from carrier	Injury	Follow instructions in owner's manual or posted near jack
		Overexertion loosening lug nuts	Injury	Use tire tool provided or large four-way wrench. Use leg muscles to break lug nuts
2	Put warning signs near the vehicle	Struck by other vehicles	Death and/or serious injury	Required sign tools must always be kept in vehicle. Set the flashers also. Make sure that the vehicle's park brake is set

JOB SAFETY ANALYSIS WOKSHEET

Date: 09/09/2009 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: …/…/20… Page: 2/6

Title of Job/Operation: Changing Tire of Truck	Position/Title of Responsible for the Job: Repairman
Directorate: Directorate of Maintenance-Repair Works	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: Machinery Maintenance-Repair and Supply Chief Eng.	Approved By (Title/Name): Manager of Enterprise / ……

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
3	Build jacking crib to within height of jack	Improper cribbing may cause fall of vehicle	Death and/or serious injury	Cribbing procedures may change depending on the design of equipment being serviced. If jack starts to tilt you need to reposition cribbing
		Struck by jack	Injury	-
		Contact with hot exhaust	Burn	Do not touch exhaust system
		Exposure to cold, frostbite	Freeze and frostbite	Wear gloves and other appropriate clothing
4	Raise jack enough to insert the final support crib	Insufficient height may create problems. Worker may apply excessive force	Joint disconformities	Must be high enough to remove old tire, take into consideration the tread depth on new tire
5	Lower jack until equipment rests on support crib	Jacks can kick out and cribbing can collapse causing the equipment to slide toward you	Death and/or serious injury	Leave jack in place but equipment must rest on support crib

JOB SAFETY ANALYSIS FORM

Date: 09/09/2009 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: …/…/20… Page: 3/6

Title of Job/Operation: Changing Tire of Truck	Position/Title of Responsible for the Job: Repairman
Directorate: Directorate of Maintenance-Repair Works	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: Machinery Maintenance-Repair and Supply Chief Eng.	Approved By (Title/Name): Manager of Enterprise / ……

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
6	Gently nudge the equipment with your boom arm and observe cribbing from movement	Cribbing becomes unstable and vehicle fall or slide down	Death and/or serious injury	This is a final test to ensure the cribbing is stable and will support the equipment
7	Use bead breaker tool to remove bead seat band from front bead	If bead breaker tool is not installed properly, could kick out	Serious injury	When using bead breaker tool operator must stay out of trajectory of tool
8	Remove new tire from service truck utilizing boom	Boom is not used	Death and/or serious injury, Joint disconformities	Do not even try to carry or to lift the tire.
9	Place sling on service truck's boom	Sling is not used and the tire slip down	Death and/or serious injury	Examine sling for defects
		Exposure to cold, frostbite	Freeze and frostbite	Wear gloves and other appropriate clothing
10	Move service truck's boom and sling over center of tire	Sling not adjusted correctly could slip causing tire to fall	Death and/or serious injury	Adjust sling snugly around tire. Caution: You may not always be able to use a sling on all equipment.

JOB SAFETY ANALYSIS FORM

Date: 09/09/2009 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: …/…/20… Page: 4/6

Title of Job/Operation: Changing Tire of Truck	Position/Title of Responsible for the Job: Repairman
Directorate: Directorate of Maintenance-Repair Works	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: Machinery Maintenance-Repair and Supply Chief Eng.	Approved By (Title/Name): Manager of Enterprise / ……

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
11	Lift the tire with boom	Boom is not used	Death and/or serious injury, Joint disconformities	Do not even try to carry or to lift the tire.
		Sling is broken and tire is slip down. Caught between tire and ground	Death and/or serious injury	Always examine sling for defects before start
12	Using boom to move tire to wheel	Boom is not used	Death and/or serious injury, Joint disconformities	Do not even try to carry or to lift the tire.
		Sling is broken and tire is slip down. Caught between tire and ground	Death and/or serious injury	Always examine sling for defects before start

JOB SAFETY ANALYSIS FORM

Date: 09/09/2010 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: …/…/20… Page: 5/6

Title of Job/Operation: Changing Tire of Truck	Position/Title of Responsible for the Job: Repairman
Directorate: Directorate of Maintenance-Repair Works	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: Machinery Maintenance-Repair and Supply Chief Eng.	Approved By (Title/Name): Manager of Enterprise / ……

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
13	Center tire and proceed to boom out and push tire on rim	Tire is not placed correctly. This may cause bigger problems	Death and/or serious injury	Always check whether the tire is placed correctly
		Contact with hot hub wheel or lug nuts	Burn	Wear gloves when removing tire. Wheel and lug nuts may be hot
		Exposure to cold, frostbite	Freeze and frostbite	Wear gloves and other appropriate clothing
14	Remove sling	-	-	-
15	Inflate tire to recommended pressure	Improper inflation could make equipment unstable or cause tire failure	Death and/or serious injury	Don’t guess, use a calibrated gauge, look-up in owner’s manual
16	Lower equipment in reverse manner from raising equipment	Same as Step 3	Same as Step 3	Same as Step 3

JOB SAFETY ANALYSIS FORM

Date: 09/09/2009 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: …/…/20… Page: 6/6

Title of Job/Operation: Changing Tire of Truck	Position/Title of Responsible for the Job: Repairman
Directorate: Directorate of Maintenance-Repair Works	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: Machinery Maintenance-Repair and Supply Chief Eng.	Approved By (Title/Name): Manager of Enterprise / ……

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
17	Clean all tools and return all tools and materials to proper place on service truck	Forgotten parts may cause traffic accident	Death and/or serious injury	Be always sure about to get the tools back and do not leave anything in the field
18	Load and secure old tire to bed of service truck with boom	Same as Step 9,10,11,12,14	Same as Step 9,10,11,12,14	Same as Step 9,10,11,12,14
19	Return service truck's boom to stow position and tie down if necessary	Boom may be forgotten to put stow position and hit to vehicles or person	Death and/or serious injury	An electronic warning tool may be developed for boom.
20	Get warning sign tools to vehicle back	Improper warn of other vehicles may cause accident	Death and/or serious injury	Be always sure about to get the tools back and do not leave anything in the field

JOB SAFETY ANALYSIS FORM

Date: 11/09/2009 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: …/…/20… Page: 1/4

Title of Job/Operation: Service Truck Use	Position/Title of Responsible for the Job: Driver
Directorate: Directorate of Production, Directorate of Maintenance	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: Simav Open-pit Mine Chief Engineering	Approved By (Title/Name): Manager of Enterprise / …….

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
1	Get location of the job	Create unwanted traffic and may cause accident	Loss of time and productivity, death or injury	Always communicate and know where you are going
2	Prepare materials needed	Lack of supply	Loss of time and productivity	Always communicate and know what you need specifically and always check for all tools, hydraulics, hoses, air, and fluids etc.
3	Travel to equipment requiring service	Traffic accident	Death and/or serious injury	Obey all traffic and driving rules
4	Park the Service Truck	Traffic accident	Death and/or serious injury	Stop the engine and always set park brake. Keep service truck as far away as practical. This eliminates pinch points and possible injury and more escape room
		Crushed or hit by truck	Death and/or serious injury	
5	Engage flashers and warning tools	Struck by other vehicles	Death and/or serious injury	Required sign tools must always be kept in vehicle

JOB SAFETY ANALYSIS FORM

Date: 11/09/2009 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: …/…/20… Page: 2/4

Title of Job/Operation: Service Truck Use	Position/Title of Responsible for the Job: Driver/ ……..
Directorate: Directorate of Production, Directorate of Maintenance	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: Simav Open-pit Mine Chief Engineering	Approved By (Title/Name): Manager of Enterprise / ……..

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
6	Choke the equipment to be serviced (if applicable)	Park brake is loosen and traffic accident may happen	Death and/or serious injury	Get the choke tools from vehicle (always carry one extra pair of chock tool)
		Crushed or hit by truck	Death and/or serious injury	
7	Determine if equipment can be serviced at this location	The vehicle may stand on critical place (for ex: main ways of haulage) and cause traffic accident	Death and/or serious injury	If there is any safety issues then move the equipment. Do not position yourself between the highwall and equipment to be serviced.
8	Perform the required service task	Incorrect treatment to problem may cause bigger problems.	Death and/or serious injury	If you are not familiar with or have not been trained on this particular type of equipment or assembly type Do Not Proceed any Further. Contact Your Supervisor
			Death and/or serious injury	

JOB SAFETY ANALYSIS FORM

Date: 11/09/2010 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: …/…/20… Page: 3/4

Title of Job/Operation: Service Truck Use	Position/Title of Responsible for the Job: Driver/ ……..
Directorate: Directorate of Production, Directorate of Maintenance	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: Simav Open-pit Mine Chief Engineering	Approved By (Title/Name): Manager of Enterprise / ……

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
9	Utilize boom of service truck when heavy equipments needed to be carried.	Force the joints	Joint disconformities	Don't even try to lift heavy objects. Always use safety boats and hard cap.
		Caught in something	Injury	
		Fall of heavy parts	Injury	
10	Clean all tools and return all tools and materials to proper place on service truck	Left equipment in the field may cause traffic accident	Death and/or serious injury	Be always sure about to get the tools back and do not leave anything in the field
11	Return boom to stow position and tie down if necessary	Boom may be forgotten to put stow position and hit to vehicles or person	Death and/or serious injury	An electronic warning tool may be developed for boom.
12	Remove chock from customer's equipment	-	-	-

JOB SAFETY ANALYSIS FORM

Date: 11/09/2009 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: …/…/20… Page: 4/4

Title of Job/Operation: Service Truck Use	Position/Title of Responsible for the Job: Driver/ ……..
Directorate: Directorate of Production, Directorate of Maintenance	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: Simav Open-pit Mine Chief Engineering	Approved By (Title/Name): Manager of Enterprise / ……..

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
13	Drive back to Service Garage	Traffic accident	Death and/or serious injury	Obey all traffic rules and procedures
14	Complete paper work	The record is not taken	Loss of productivity	Hours, position, unit number, make of machine, check tread depth, customer signature, mileage
15	Replenish service supplies	Supply is not replaced	Time loss	There may be delay to prepare supply when needed. Therefore, replenish service supplies as soon as possible

JOB SAFETY ANALYSIS FORM

Date: 20/09/2009 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: …/…/20… Page: 1/3

Title of Job/Operation: Operating Excavator	Position/Title of Responsible for the Job: Operator
Directorate: Directorate of Production	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: Simav Open-pit Mine Chief Engineering	Approved By (Title/Name): Manager of Enterprise / …….

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
1	Climb onto engine compartment	Slip or trip and fall	Injury	Place both hand on rail of operator's compartment and foot on step of track frame. Gently pull yourself up. Make sure shoes are free of mud.
		Frostbite	Frostbite	Wear gloves and other appropriate clothing
2	Unlock engine compartment and check all fluids	Using low fluid levels	Loss of productivity, Injury	Put vehicle in gear or park. Set parking brake. Chock wheel on opposite end of vehicle (both sides)
3	Climb into operator's seat	Slip or trip and fall	Injury	Place both hand on rail of operator's compartment and foot on step of track frame. Gently pull yourself up. Make sure shoes are free of mud.
		Frostbite	Injury	Wear gloves and other appropriate clothing
4	Check ground for possible fluid leaks	Fluid leaks from broken hoses or loose fittings	Engine or component failure	If a leak is spotted, stop the engine and contact mechanic for repairs

JOB SAFETY ANALYSIS FORM

Date: 20/09/2009 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: …/…/20… Page: 2/3

Title of Job/Operation: Operating Excavator	Position/Title of Responsible for the Job: Operator
Directorate: Directorate of Production	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: Simav Open-pit Mine Chief Engineering	Approved By (Title/Name): Manager of Enterprise / …….

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
5	Start Engine	Not activating engine preheat	Battery failure	Turn the ignition key to the left for thirty second for engine preheat.
6	Check oil, hydraulic, all other warnings, horn and lights	Use excavator with low hydraulic or oil	Engine or component failure	Stop the engine and contact mechanic to make it ready to operate
		Use excavation with malfunctioned lights	Accident, Serious injury, fatality	Stop the engine and contact mechanic to repair lights
7	Check for mirrors	Use excavator with broken mirrors and hit to vehicle or human	Accident, Serious injury, fatality	Stop the engine and contact mechanic to repair mirrors
8	Operate machine	Doze and hit to truck	Injury, fatality	Operate machine while staying aware of all personnel and vehicles

JOB SAFETY ANALYSIS FORM

Date: 20/09/2009 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: .../.../20... Page: 3/3

Title of Job/Operation: Operating Excavator	Position/Title of Responsible for the Job: Operator
Directorate: Directorate of Production	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: Simav Open-pit Mine Chief Engineering	Approved By (Title/Name): Manager of Enterprise / .....

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
9	Put boom dipper perpendicular to the ground	-	-	This allows the machine to rest with the least amount of stress on the steel
10	Stop engine and lock machine and secure	Forgetting operator cabinet unlocked	Injury, fatality	A locked and secure machine will prevent people from gaining entry and possibly hurting and damaging themselves or others.
11	Check the parking area	Failure of the parking ground	Injury, fatality	Check the parking area of excavator before leave it.

JOB SAFETY ANALYSIS FORM

Date: 22/09/2010 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: …/…/20… Page: 1/9

Title of Job/Operation: Hand tools usage	Position/Title of Responsible for the Job: ……..
Directorate: All	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: All	Approved By (Title/Name): Manager of Enterprise / …….

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
1	Hammer Use	Hit by debris becoming airborne projectile	Eye injury	Wear safety glasses or face shield
		Hand/finger caught in due to improperly striking or missing area to be struck	Contusion, injury	Keep opposite hand at a safe distance from area to be struck. Use vise or other holding device as necessary. Do not raise the hammer excessively and strike using massive blows. Strike a hammer blow squarely with the striking face parallel to the surface being struck.
		Hit by hammer head due to defective and/or damaged hammer	Injury	Visually inspect hammer before each use. Do not use a hammer with a loose or damaged handle or head.
		Struck by due to misuse of hammer	Injury	Hold the hammer with your wrist straight and hand tightly wrapped around the handle. Look behind and above before swinging a hammer. Do not strike with side of the hammer.
		Struck by due to using incorrect hammer for intended task	Injury	Select and use a hammer according to its intended use

JOB SAFETY ANALYSIS FORM

Date: 22/09/2009	New: ✓	Revised:	Form No: 05	Revision No: 0	Revision Date: …/…/20…	Page: 2/9

Title of Job/Operation: Hand tools usage	Position/Title of Responsible for the Job: ……
Directorate: All	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: All	Approved By (Title/Name): Manager of Enterprise / …….

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
2	Screwdriver Use	Struck by due to screwdriver slipping	Injury, cut	Keep screwdriver handle clean. Do not hold workpiece in one hand while using the screwdriver in the other. Do not lean or push on a screwdriver with any more force than necessary to keep contact with screw. Keep the shank directly over the screw being driven
		Use of defective and/or damaged screwdriver	Cut	Do not use a screwdriver with rounded edges or tips, split or broken handle
		Misuse of screwdriver	Cut, contusion	Do not use a screwdriver for prying, punching, chiselling, scoring or scraping
		Struck by using incorrect screwdriver for intended task	Injury	Select and use a screwdriver according to its intended use

JOB SAFETY ANALYSIS FORM

Date: 22/09/2009 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: …/…/20… Page: 3/9

Title of Job/Operation: Hand tools usage	Position/Title of Responsible for the Job: ……
Directorate: All	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: All	Approved By (Title/Name): Manager of Enterprise / ……

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
3	Wrench Use	Using wrench incorrectly	Overexertion	Pull on wrench and do not push. Face an adjustable wrench forward and turn wrench so pressure is against the permanent jaw
		Struck by due to using incorrect wrench for intended task	Injury	Select and use a wrench according to its intended use
		Caught in or between due to wrench slippage	Hand/finger contusion, Injury	Grip wrench so that it does not endanger oneself in case of slippage. Use correct jaw and ensure wrench is adjusted properly and secure to nut/bolt. Wear recommended gloves
		Caught in, hit by due to misuse of wrench	Injury, contusion	Do not increase the leverage by adding sleeved additions to increase wrench length or strike a wrench with a hammer to gain more force. Do not use wrench on moving machinery. Do not insert a shim in a wrench for better fit
		Struck by due to defective and/or damaged wrench	Injury	Visually inspect wrench before each use. Do not use worn adjustable wrenches.

JOB SAFETY ANALYSIS FORM

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Title of Job/Operation: Hand tools usage	Position/Title of Responsible for the Job: ……..
Directorate: All	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: All	Approved By (Title/Name): Manager of Enterprise / …….

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
4	Punch / Chisel Use	Hit by debris becoming airborne projectile	Eye injury	Wear safety glasses or face shield
		Caught between due to improperly striking or missing head of punch/chisel with hammer	Hand/finger contusion	Watch the area you are hitting. Provide hand protection by wearing glove on hand holding punch/chisel. Do not raise hammer excessively and strike using massive blows. Use punch/chisel holder as necessary. Avoid glancing blows over and under strikes
		Improper use of chisel for shearing and chipping hammer head	Injury	Hold the chisel at an angle which permits the bevel of the cutting edge to lie flat against the shearing plane. Hold the chisel at an angle pointing away from self
		Use of defective and/or damaged punch/chisel	Injury, cut	Visually inspect punch/chisel before each use. Discard punch/chisel that is bent, cracked, chipped. Redress punch/chisel with burred or mushroomed heads. Ensure punch/chisel point or cutting edge is properly dressed
		Using incorrect punch/chisel for intended task	Injury	Select and use a punch/chisel according to its intended use
		Exposure to sound	Hearing loss	Wear hearing protection

JOB SAFETY ANALYSIS FORM

Date: 22/09/2009 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: …/…/20… Page: 5/9

Title of Job/Operation: Hand tools usage	Position/Title of Responsible for the Job: ……..
Directorate: All	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: All	Approved By (Title/Name): Manager of Enterprise / …….

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
5	Hand Saw Use	Hit by debris becoming airborne projectile	Eye injury, eye irritation	Wear safety glasses or face shield
		Improper sawing technique or experience	Cut	Start cut carefully and slowly to prevent blade from jumping. Pull upward until blade bites. Start with partial cut. Apply pressure on the down stroke only. Use entire length of blade in each cutting stroke. Use a co-worker, a supporting bench or vise to secure and/or support workpiece if required
		Defective or damaged saw and/or blade usage	Injury, cut	Visually inspect saw and blade before each use. Never use saws with bent, buckled, twisted or cracked blades.
		Using wrong saw and/or blade for intended task	Injury	Select and use a saw and blade according to its intended use. Keep saws sharp, clean and oiled
		Contact with saw blade during working	Hand/finger amputation/cut	Keep hand/fingers at a safe distance from cutting line
		Saw blade overheating and breaking	Cut, injury, contusion	Use machine oil on blade if necessary

JOB SAFETY ANALYSIS FORM

Date: 22/09/2009 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: …/…/20… Page: 6/9

Title of Job/Operation: Hand tools usage	Position/Title of Responsible for the Job: ……..
Directorate: All	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: All	Approved By (Title/Name): Manager of Enterprise / …….

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
6	Clamp Use	Use of defective and/or damaged clamp	Injury	Visually inspect clamps and ensure that the swivel at the end of the screw turns freely before each use. Do not use any clamp that has a bent frame or bent spindle
		Misuse of clamp	Serious Injury	Use clamps only as temporary holding devices. Do not use pliers, pipes or hammers to tighten clamps
		Personal injury from using incorrect clamp for intended task	Injury, contusion	Select and use the right size and type of clamp for the intended task
		Struck by workpiece falling due to insecure and/or defective clamp	Foot injury, contusion, break	Wear recommended footwear. Ensure workpiece is secure in clamp
		Struck by workpiece being clamped discharging debris becoming airborne projectile	Eye injury, contusion	Wear safety glasses or face shield

JOB SAFETY ANALYSIS FORM

Date: 22/09/2009 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: …/…/20… Page: 7/9

Title of Job/Operation: Hand tools usage	Position/Title of Responsible for the Job: ……..
Directorate: All	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: All	Approved By (Title/Name): Manager of Enterprise / …….

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
7	Plier Use	Using pliers incorrectly	Injury, cut	Cut at right angles. Never rock from side to side or bend wire back and forth against the cutting edges of pliers. Pull on pliers, do not push
		Using incorrect pliers for intended task	Injury	Select and use pliers according to their intended use
		Misuse of pliers	Injury, contusion	Do not use pliers on nuts/bolts. Do not hammer on pliers to cut wire or bolts

JOB SAFETY ANALYSIS FORM

Date: 22/09/2009 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: …/…/20… Page: 8/9

Title of Job/Operation: Hand tools usage	Position/Title of Responsible for the Job: ……
Directorate: All	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: All	Approved By (Title/Name): Manager of Enterprise / ……

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
8	Pneumatic / Electric Hand Drill Operation	Hit by debris discharged during drilling	Eye injury, contusion	Wear safety glasses or a face shield
		Drill bit slipping, grabbing or snapping	Serious injury	Ensure that the bit or attachments are properly seated and tightened in the chuck. Do not use a dull or bent drill bit. Keep drill bit clean and oiled.
		Struck by workpiece twisting/spinning	Injury, contusion	Secure workpiece being drilled using clamp/vise. Do not drill with one hand while securing the workpiece with the other
		Running drill accidentally while changing drill bit	Cut, serious injury	Disconnect power supply before exchanging or adjusting drill bit
		Misuse of hand drill	Injury	Do not exceed the hand drill manufacturers recommended drilling capabilities
		Improper drilling technique	Injury, overexertion	Do not overreach or reach under or around stock being drilled. Do not lean or push on hand drill with any more force than necessary.
		Electric shock	Death, Injury	Keep electrical cords clear of drilling area
		Exposure to sound too much	Hearing loss	Wear hearing protection

JOB SAFETY ANALYSIS FORM

Date: 22/09/2009 New: ✓ Revised: Form No: 05 Revision No: 0 Revision Date: …/…/20… Page: 9/9

Title of Job/Operation: Hand tools usage	Position/Title of Responsible for the Job: ……
Directorate: All	Analysis Made By (Title/Name): Mining Engineer / Soner GÖKÇEK
Department: All	Approved By (Title/Name): Manager of Enterprise / ……

No	Job Steps	Potential Accidents or Unwanted Events	Potential Hazards	Control Hazards (Notes/Comments)
9	Pneumatic Shear Notcher Operation	Hit by debris discharged during shearing	Eye injury	Wear safety glasses or a face shield
		Contact with blade of shear notcher or sharp edge of workpiece	Hand, finger laceration or amputation	Keep hands/fingers at a safe distance from shear notcher point of operation. Wear recommended gloves.
		Cut stock falling	Foot injury, contusion	Wear recommended footwear
		Exposure to sound	Hearing loss	Wear recommended hearing protection
		Misuse of shear notcher	Injury	Do not exceed the shear notcher manufacturers recommended maximum cutting capabilities

ETI MINE WORKS GENERAL MANAGEMENT

BİGADİÇ BORON WORK

BİGADİÇ COLEMANITE

HEALTH AND SAFETY DATA SHEET

Prepared by

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Edition	Definition	Date of Revision
0	Original	10.12.2009
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2		
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1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION/COMPANY

1.1 Identification of Substance or Preparation

Bigadiç Kolemanite (Granulate)

1.2 Chemical Name/Synonyms

Colemanite, Calcium Borate, Di-calcium Hexaborate Pentahydrate

1.2. Use of the substance / Preparation

The product is used in industrial manufacturing, in particular in:

- Textile grade fiberglass
- Metallurgical Fluxing
- Boron additive
- Borosilicate glass

1.3. Company identification

Manufacturer:
Name: ETİ MINE WORKS GENERAL MANAGEMENT
Address: Sıhhiye, Cihan Sok. No:2, 06430, Ankara, Turkiye.
Phone: 00 90 312 294 23 42 Fax: 00 90 312 232 59 10

1.4. Emergency phone numbers:

00 90 312 294 23 45 (Available office hours)
00 90 312 232 59 10 (Available office hours)

2. HAZARDS IDENTIFICATION

Potential Health Effects:

Primary Route(s) of Exposure: Inhalation, skin, eyes.
Inhalation: Occasional mild irritation effects to the nose and throat may occur from inhalation of borate dusts at levels greater than 10 mg/m3.
Eye Contact: May irritate the eyes upon contact.
Skin Contact: None known but may irritate the skin upon contact.
Ingestion: Colemanite is not intended for ingestion. Inorganic borate salts have low acute toxicity.

3. COMPOSITION / INFORMATION ON INGREDIENTS

3.1. Chemical composition:

Chemical Nature of the Substance:

Name	Chemical Name	Wt %
Colemanite	Di-calcium Hexaborate Pentahydrate	65-95
Calcite/Dolomite	Dolomitic Limestone	10-20
Ulexite	Sodium-Calcium Pentaborate Octahydrate	2-6
Moisture	Water	2-7
Realgar/Orpiment	Arsenic Sulphide / Arsenic Trisulphide	as As2O3 max. 50 ppm

4. FIRST AID MEASURES

Inhalation: Move person to fresh air. Seek medical attention if irritation persists.
Eye Contact: Flush eyes with running water for at least 15 minutes. Seek medical attention if irritation persists.
Skin Contact: Wash with running water for at least 15 minutes. Seek medical Attention if irritation continues.
Ingestion: Observe individual; if large quantity is consumed and symptoms develop, seek medical attention. Drink water to dilute material in stomach.

5. FIRE FIGHTING MEASURES

Flash Point and Method: Not applicable
Flammability Limits (%): Not applicable
Auto Ignition Temperature: Not applicable
Extinguishing Media: Water, foam, CO_2 or dry chemical.
Unusual Fire and Explosion Hazards: None
Fire Fighting Instructions: None
Hazardous Combustion Products: None

6. ACCIDENTAL MEASURES

Land Spill: Sweep up and take to officially authorized dump.
Water Spill: This material will dissolve in water. See section 9.
Air Release: This material will settle out of the air. It can then be scooped up for disposal as a non-hazardous waste.

7. HANDLING AND STORAGE

Storage Temperature: Store in dry, covered warehouse.
Storage Pressure: Not applicable
General: No special storage or handling procedures are required for this material.

8. EXPOSURE CONTROLS/PERSONAL–ENVIRONMENTAL PROTECTION

8.1. Exposure limit values

More commonly encountered colemanite and its respective acute toxicity data are shown in the following table:

Acute Toxicity of Colemanite (Calcium Borate)
---------- = Toxicity Rating
LD50 in Rats, Oral Dosage[a] (milligrams per kilogram)

Colemanite (Calcium Borate)	5.600	Practically nontoxic

a. Lethal dose killing 50% of the population

SOURCE: Registry of Toxic Effects of Chemical Substances (RTECS), U.S. National Library of Medicine, Toxicology Data Network (TOXNET), National Institute for Occupational Safety and Health (NIOSH).

8.2. Exposure controls

Personal protection:

Respiratory Protection: Not required unless there is heavy dust occurrence in which case a protective mask is recommended.
Skin Protection: Use of gloves recommended.
Eye Protection: Safety goggles recommended in dusty areas.
Other Information: Not absorbed when in contact with healthy skin or eye, wash with plenty of water.
Engineering Controls: General dilution ventilation and/or local exhaust ventilation should be provided as necessary to maintain exposures below regulatory limits. Dust collection systems may be necessary in some operations.

Environmental protection:

No special requirement. Borates are naturally occurring and are widely spread on earth.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1. General information

Appearance: Light grey to tan stones granulate (25-125 mm, 3-25 mm, 0,2-3 mm)
Odor: Odorless

9.2. Important health, safety and environmental information

pH: 9.1
Boiling point: Not applicable
Flash point: Not applicable
Flammability: Not applicable
Explosive properties: Not applicable
Oxidizing properties: Not applicable
Vapor Pressure: Not applicable
Density: 2400 kg/m^3 at (20 ^oC)
Solubility in water: 0.81 g/l (25 ^oC)
Viscosity: Not applicable
Vapor density (Air=1) : Not applicable
Evaporation Rate: Not applicable
Bulk density: 1460-1520 kg/m^3 at (20^oC)
Freezing point: Not applicable
Melting point: 986 ^oC
Chemical formula: $Ca_2B_6O_{11}$.5H2O,(2CaO.3B_2O_3.5H_2O)
Molecular weight: 411.084
Physical state: Granular

10. STABILITY AND REACTIVITY

Stability: Stable under ordinary conditions of use and storage.
Incompatible Materials and Conditions to avoid: None.
Hazardous Decomposition Products: None.
Hazardous Polymerization: Will not occur.
Thermal Decomposition: When heated above 260 ^oC in the oven, it starts loosing water of hydration. On continued heating, dehydration proceeds until all the water is removed at around 415 ^oC.

11. ABBREVIATIONS

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12. SOURCES

1. Merck Catalogue, http://www.merck-chemicals.com
2. Colemanite Healthy and Safety Data Sheet, Etibank Boron Research Centre, Menderes, İzmir, February 1994.
3. The Economics of Boron, Eleventh Ed., 2006 Roskill Information Services Ltd.