EDUCATION MODULE ON OCCUPATIONAL HEALTH AND SAFETY IN METAL INDUSTRY DEPARTMENT

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Study material for E-learning

2018

Project Number: 2016-1-TR01-KA202-034976

This project has been funded with support from the European Commission. The present publication reflects the views of the author only, and the Commission cannot be held responsible for any use which may be made of the information contained therein.
PREFACE

The objective of Occupational Safety and Risk Control in Construction and Metal Industry Sectors Project, implemented by a consortium of partners from 4 countries (Turkey, Bulgaria, Italy and Slovakia), is to contribute to vocational education with the aspect of occupational health and safety (OHS), the importance of which is increasing both in Europe and Turkey. In terms of awareness, however, vocational education institutions are not at the desired level in Turkey and thus, This project aims to increase the awareness of occupational health and safety among the students of vocational schools in metal industry department and to increase the implementation capacity of EU Acquis in Turkey. The project is hence based on the motto “Eliminate, if not possible then Minimize, Control”.

This study named “Education Module on Occupational Health and Safety in Metal Industry Department”, has been prepared in order to increase the knowledge and skills of the students studying in the field of Metal Technology of Vocational and Technical Anatolian High School who will start to work at metal Industry Department, to create awareness, and finally to minimize the work accidents occurring at metal industry department.

This study has been generated under the framework of intellectual framework of the Project named “Occupational Safety and Risk Control in Construction and Metal Industry Sectors” conducted in the scope of “KA2 – Cooperation for Innovation and the Exchange of Good Practices, Strategic Partnerships for vocational education and training”, and put into the service of students.
CONTENTS

PREFACE ............................................................................................................................................. 1

1. WORK SAFETY IN THE WELDING WORKSHOPS .......... 3
   1.1. Avoiding the Dangers at Welding Operations ...................... 4
       1.1.1. Avoiding the Electric Danger ................................................ 4
       1.1.2. Avoiding the Danger of Electromagnetic Field .................. 5
       1.1.3. Avoiding the Beam Danger .................................................... 5
       1.1.4. Protecting from the risk of fire and explosion ...................... 6
       1.1.5. Protecting from Hazard of Welding Gas and Fume .............. 6
       1.1.6. Protection from the Hazard Touching the Hot Surfaces ............ 7
       1.1.7. Protection from the Hazards Caused by the Gases Used at Welding Operations .............................................................. 8
       1.1.8. Protection from the Hazards Caused by the Grinding and Cutting Operations .............................................................. 9
       1.1.9. Protection from the Hazards Caused by Penning and Impact Working .............................................................. 10
       1.1.10. Protection from the Ergonomic Forces ................................. 10
       1.1.11. Protection from the Noise .................................................... 10
       1.1.12. Protection from the Hazards Caused by Working in Closed Environment .............................................................. 11
       1.1.13. Protection from the Hazards Caused by the Working High ....... 11

2. WORK SAFETY AT OPERATIONS OF METAL SURFACE ... 15
   2.1. Preparing the surface, cleaning the surfaces ...................... 16
       2.1.1. Cleaning with the wire brushes .............................................. 16
       2.1.2. Cleaning with Corundum ...................................................... 16
       2.1.3. The Work Safety Measures While Sanding with Sanding Machine 17
       2.2. Measures of Work Safety to be Taken While Working at the Fixed and Moving Grinding Machines .............................................. 19
2.3. Cleaning with Sand ................................................................. 20
2.4. Cleaning by Chemical Methods ................................................. 22
2.5. Lining and Puttying ................................................................. 23
2.6. Painting .............................................................................. 23
2.6.1. OHS (Occupational Health and Safety) Measures to Be Taken at Painting Operations ....................................................... 24

3. WORK SAFETY AT HOT AND COLD SHAPING .................... 29
3.1. Mechanical Presses ................................................................. 30
3.2. Hydraulic Presses .................................................................. 30
3.3. OHS Measures to Be Taken While Working by Presses .......... 31
3.4. Safety Measures to Be Taken while Using Rammer (Mechanical Hammer) ................................................................. 35

4. WORK SAFETY AT STEEL CONSTRUCTION ....................... 38
4.1. Preparing the Mounting Place ................................................. 41
4.1.1. Establishment of Scaffold .................................................. 41
4.1.1.1. Steel Tripod Scaffolds ...................................................... 41
4.1.1.2. Steel Bracket Scaffolds .................................................... 42
4.1.1.3. Pipe Scaffolds ............................................................... 42
4.1.1.4. Suspensory Rolling Side Scaffold ........................................ 42
4.1.1.5. Moving Scaffolds ........................................................... 43
4.2. Working Instructions on the Scaffold ...................................... 43
4.3. Assembly Method ................................................................. 46
4.4. Drawbacks of Assembly Welded in the Environment of Building Site ................................................................. 47
4.5. Preparation Before Assembly ................................................ 48
4.5.1. Preparing the Steel Components and Equipments Before Assembly ................................................................. 49

5. WORK SAFETY AT IRON AND ALUMINIUM JOINERY .... 54
5.1. Directions of Upcut Shear ....................................................... 57
5.2. Directions of Using the Bending Presses .............................................................. 58
5.3. Directions of Using Special Metal Clamping Machine ............................. 58
5.4. Directions for Use of Buzz Saw and Bench Profile Cutting .............. 59
5.5. Directions of Using Bench Drill ................................................................. 60
5.6. Directions of Using Spiral (Jet Grinding) .................................................. 61

6. METAL SECTOR OCCUPATIONAL DISEASES AND PROTECTION WAYS .................................................................................................................. 65
6.1. Physical Reasoned Occupational Diseases .............................................. 65
6.2. Chemical Reasoned Occupational Diseases ........................................... 65
6.3. Occupational Diseases Caused by Dusts ................................................ 66
6.4. Occupational Diseases Belonging to Ergonomic Factors ..................... 66

7. REFERENCES ......................................................................................................... 71
8. ANSWER KEY ......................................................................................................... 73
9. NEWSFEED MODULE FOR METAL INDUSTRY ................................. 75
10. WORLD MODULE FOR METAL SECTOR ............................................. 79
11. ANNOTATED RISK TERMS DICTIONARY ............................................. 95
1. WORK SAFETY IN THE WELDING WORKSHOPS

Overview

This chapter covers information on how to prevent health and safety during the welding operation. The several types of danger is described and prevent measures which should be taken explained.

Objectives

In this chapter you will learn:

- What is welding and what types of welding operation are used in metal industry,
- What types of dangerous can be undertaken during welding and how to avoid them.

Introduction

Welding operation is a method of production to connect metal or thermoplastic materials with each other by means of heat. Because of its being stronger and easier compared to the mechanical methods used to combine the metals, welding technology is very commonly used in metal industry. By the widespread usage of welding, number of the people working in this field also increase rapidly, and an increase is observed at number of work accidents happened, too.

The following welding methods are commonly used at metal industry:

A. Electric arc weldings
   1. Covered electric arc weldings
   2. Gas metal electric arc weldings
2.1. Gas metal welding by consumable electrode (MIG-MAG)

2.1.2. MIG: Metal inert gas metal welding (helium)

2.1.3. MAG: Metal active gas metal welding (carbon dioxide)

2.2. Tungsten inert gas metal welding (TIG)

3. Submerged arc welding

4. Spot or tack welding

B. Electron beam welding

C. Laser welding

D. Oxygen gas weldings

- Oxyacetylene gas welding
- Oxyhydrogene gas welding
- Oxyi-LPG gas welding
- Oxy-natural gas welding

1.1. Avoiding the Dangers at Welding Operations

1.1.1. Avoiding the Electric Danger

По време на електродъговото заваряване опасността от електрошок се появява, когато машината е в неутрално положение. По време на заваряване волтажът е 20-30 волта, като се увеличава до 65-100 волта, докато машината е в неутрално положение. За да се предотврати електрическия шок, металната част на скобите и електрода не трябва да бъдат държани с голи ръце, особено с лявата ръка, и не трябва да съществува мост от човешкото тяло между клещите и работния кабел.

Electric cables and welding nippers should be insulated, and its strength must always be checked. Welding machine should be grounded; maintenance and repair service mustn’t be performed in the machine.
without turning off the line voltage. Furthermore, Earth leakage relay should exist in the electric panel.

Welding nippers shouldn’t be held under the armpit, and it must be left on the ground of dry wood when the work is broken off. It should be cared for the welding place not to be wet.

1.1.2. Avoiding the Danger of Electromagnetic Field

Magnetic field constitutes around the cables carrying electric current and around the surfaces. The strongest magnetic field occurs during the resistance welding. Working should be carried out far from the magnetic field as much as possible. It is not suitable for the people having electromagnetic pace maker. These people shouldn’t stand in the places where resistance welding is performed.

1.1.3. Avoiding the Beam Danger

60 % of the rays going out during welding are the infrared rays, the 30 % are the bright looking rays, and 10 % are ultraviolet rays. The infrared rays cause the feeling of sand sting in the eyes, damage in the lenticular and cornea, and burns on the skin.

Bright rays cause light stress, tiredness, and nausea. However, ultraviolet rays cause the serious burns leading to seeing haze at the eyes, cataract, and damage in cornea and iris, and water collection under the skin.

In order to prevent all these dangers:

- Proper PPE (Personal Protective Equipments) should be used. (Welding mask, leather gloves, leather apron, glasses, and overalls made of cotton cloth should be worn)

Watch Video - 1: Electric Arc Welding
• The working place should be surrounded by folding screen not to damage the people around.
• Glasses or mask should be chosen in accordance with the welding type and current strength.
• Mineral oxide ceramics should be used conforming to standards.

1.1.4. Protecting from the risk of fire and explosion

Hot sparks splashes around from the arc constituting during the operation of welding. The sparks spreading round causes the burnable and explosive powder, gas and liquid matters existing in the environment to explode. In addition, the flame used at the oxi-gas welding causes the burnable matters existing round to blaze. Therefore, the operation of welding should be performed at a distance at least 10 meters far away from the burnable and explosive matters. An immediate accessible extinguisher should exist while welding.

1.1.5. Protecting from Hazard of Welding Gas and Fume

While welding, some harmful substances existing in the hull transforms to gas and fume during electron fusion. Inhaling this gas and fume can damage the welding person and the people in the environment. In case of getting exposed to the fume and gases more, the disorders like nauseating, head ache, dizziness and metal fume fever, damages of respiratory system occur.
**Figure 1.1:** Welding light and fume derange the health of the workers.

The best method to prevent from the gas and fume is to eliminate the hazard at the source, that is to say, it is to expel the gas and fume before spreading round by the local aspiration. If it is not possible, environment protection must be performed, and the environment should be ventilated enough by the aspirators. In cases the both protection measures can’t be taken, available PPE’s like mask should be used.

1.1.6. Protection from the Hazard Touching the Hot Surfaces

Heat reaches at 3500°C-4000°C at the electric arc welding. Since the metal materials transmit the heat well, this heat spreads to the welding part and to the metals touching it after a while. Metal materials also reach at the high temperatures at the operations of cutting and welding by oxi-gas welding. Touching the metals reached at the high temperatures by the naked skin will cause the serious burns. Therefore, hot surfaces mustn’t be directly touched, leather gloves, leather apron and leather boot should be worn while working.

[Watch Video - 2: Working by Oxi – Gas Welding](#)
1.1.7. Protection from the Hazards Caused by the Gases Used at Welding Operations

Burnable (acetylene, LPG) and burning gases (oxygen) are used together at the welding operations. These gases are kept at high temperature in the cylindrical tubes. By any reason, when the valve is broken on the tube, the compressed gas in it discharges very fast, and it makes the effect of rocket. Therefore, the tubes of the welding gases should be carried by the available transportation vehicles carefully, and they must be fixed to the wall not to overturn.

Because of the tubes getting extremely heated, tube explosions occur as the result of the gas expanded inside. Collection of the burnable gases in a covered environment also causes fire and explosions. Consequently, the tubes full of burnable and burning gases should be kept at desperate places and far from the heat source, the direct Sun light and the places where fire danger can occur. Fire can also happen by the touch of oxygen and oil. Therefore, valves of tube shouldn’t get touched with the oily hands or oily oakum.

While the operations of cutting and heating performed by the welding torch, the events of flareback occur by not adjusting the gas pressure well or while cutting a material having oil on the surface. Against the fire and explosion, working should be carried out at least 10 m far from the burnable and explosive natters. Furthermore, heat work procedures must be practiced, and flareback valve should be definitely used separately behind the welding torch for the burnable and burning gases. Any tubes undefined and the periodic control of which isn’t done shouldn’t be used.

Watch Video-3: Oxi- Acetylene Welding
1.1.8. Protection from the Hazards Caused by the Grinding and Cutting Operations

Grinding motors (spiral grinding) should be used while cutting and grinding the metal parts or smoothing the welded surfaces. During the grinding and cutting operations, the pieces broken from the corroded surfaces cause the eye injury at high level. The hot pieces rushed out also cause fires. While cutting and grinding, hewn stone explosion occurs when the it is squeezed, and it causes very serious injuries and even death.

Grinding operation shouldn’t be done by ashlar. Ashler guard must absolutely be mounted.

Motor cycle and the hewn stone should be compatible. Protective glasses must be used against the pieces rushed out. Cables and connecting cables, plugs and plug sockets should be strong. Residual current device ought to be used in the electric circuit (in the main and secondary panels)
1.1.9. **Protection from the Hazards Caused by Penning and Impact Working**

Accidents occur when the handles the equipments used during penning and impact working are broken or the broken parts rush out. The handles of the sledge hammer and hammer used should be strong and the pieces (superization) leading to leave on the metal surface ought to besmoothed by grinding.

1.1.10. **Protection from the Ergonomic Forces**

Ergonomic forces while lifting the parts or caused by the working position are discussed. Welder can have to work at a body forced position belonging to the place of welding. So, it causes the healthy problems like waist and cervical disc hernia.

In accordance with the place of welding and position, the designs must be carried out to make the posture steady, and it shouldn’t be worked at the forced position for a long time. Exercises that strengthen the waist muscles should be practiced, trainings ought to be given on the true position and using the body accurately.

**Figure 1.3:** Forced Position of Welding

1.1.11. **Protection from the Noise**

During the welding, level of noise exceeds frequently 80 dB, and it exceeds 85 dB while grinding and peening. Therefore, the noise level of the environment and individual effecting date should be measured, so ear protector should be used accordingly.
1.1.12. Protection from the Hazards Caused by Working in Closed Environment

The welding performed in the closed environments, apneas occur because of the welding gases. Before entering the closed area to weld, the level of the possible pollutant gases and oxygen existing in the closed area should be measured. The level of oxygen must be between 19,5 % - 23,5 %. In the closed areas, at the welding works with oxyacetylene or oxygen-LPG, the tubes should definitely be out of the closed area, necessary precaution must be taken against the gas leaks, and mas measurement should often be performed. At the welding operations carried out in the closed area, the polluted gases constituted inside ought to be expelled, and clean air must be given inside.

1.1.13. Protection from the Hazards Caused by the Working High

The welders work high while producing silo, tank, boiler, etc. which are used at the industrial plants, and during the construction of the steel buildings. At the workings carried out high, accidents of falling from high occur because of mostly not establishing the systems avoiding falling from high or not using the equipments of working high. Everybody who works high should be given “training to work high”.

Watch Video- 6: Training to work high

In order to be able to avoid these accidents, it requires to constitute scaffold, working platforms or anchoring points or life lines to which the person can tie the safety belt to stop falling down from the height according to the designs of the production varied out.
Figure 1.4: Welding Operation Carried out High
**Self-control questions**

1. What are the types of welding in metal industry?
2. What can be cause by infrared rays?
3. Can you use plastic gloves, leather apron and leather boot during welding?
4. How you can protect yourself during using grinding motors?
5. What do you need to constitute if you want carried out welding operation in heights?

**Exercise**

1. During the operation of electric arc welding, which of the followings should be done in order to avoid electric shock?
   A) Nippers should be grounded.  
   B) Machine must be grounded.  
   C) Flame arrester must be used.  
   D) Nippers insulation must be robbed.

2. Which of the followings **shouldn’t be done** for using the oxygen tubes in security?
   A) It should be fixed well to the wall.  
   B) Its valve should often be oiled.  
   C) Valve head must be carried as mounted.  
   D) Branded tubes must be used.

3. How much dB must the level of noise be maximum in the working environment?
   A) 100  
   B) 110  
   C) 80  
   D) 90
4. Which of the followings isn’t one of the PPE’s that must be used at oxy-gas welding?
A) Rubber gloves          B) Leather gloves
C) Leather overall        D) Welding glasses

The correct answer can be found at page 73.

Conclusion

In this chapter you have learned how the welding can hurt your health. You are able to describe different types of welding and you are also aware of preventive measures which should you apply in order to minimalize risk of accident or health damage.

Further reading

• Metal Technology Area, Arc Welding Technics Course Modules, SVET, 2011.
• Metal Technology Area, Advanced Arc Welding Techniques Course Modules, SVET, 2011.
• Metal Technology Area, Oxy-Gas Welding Modules, SVET, 2011.
2. WORK SAFETY AT OPERATIONS OF METAL SURFACE

Overview

This chapter provides information on metal surface operation. The different types of metal surface cleaning are described and working safety measures explained.

Objectives

In this chapter you will learn:

- What are the steps in order to paint surface of metal,
- What are the materials surface cleaning methods,
- How to protect workers during metal surface operations.

Introduction

For the metal products not to get rusted, eroded, spoiled, and to seem better or to shine, their surfaces are processed in some ways. When the use of the metal product increase, some sort of varieties are observed at the surface operations in order to meet the demands of consumers. The surface operations applied on the metal surfaces increase the strength of the products, ease their usage, and make the appearance aesthetical. The most important protection method of metals is to dye them against getting rusted. Almost every industrial work place has got painting unit.

The sequence of operations to paint the surface of metal is generally as follows:

- Preparing the surface, cleaning the surfaces.
- Lining, puttying.
• Painting.

2.1. Preparing the surface, cleaning the surfaces

2.1.1. Cleaning with the wire brushes

Cleaning the material surfaces is analyzed in two groups: by hand and by motor. Being the parts to be cleaned in the fabrication production a lot requires working with motor, but having a few parts in the small enterprises requires using the wire brushes. There are three types of wire brushes consisting of manual brushes, fixed engine, and moving engine brushes. While working with the wire brush, stable gloves must be worn for the brush not to damage the hand, and glasses and mask should be used for the dust spreading from the material sawdust not to insert into eyes and respiratory tract.

2.1.2. Cleaning with Corundum

The first method to be used for cleaning the surface and smoothing it is the grinding paper consisting of the materials like paper or cloth covered by corrosives, or the machine application of the corundum bands supported by engine.

Sorts of Sanders:

Sanders according to their shapes are named as roller, plate, disc, brush and profile sanders. They are divided into two groups according to usage named as hand sanders and machine sanders.
Sanding operation can be carried out by hand or by machine. In case of sanding by hand, dust mask should be worn not to breathe the saw dusts spreading from the metal surfaces, and protective gloves must be worn not to wear the hands. Furthermore, the environment where sanding operation is performed should be lighted and ventilated sufficiently. At the operation by machine, the basic risk in terms of work health and safety is that the sanding part moving at the high speed tangles the dresses and hair of the workers or damages them due to touching the moving equipment directly. Therefore, the protector of sanding machines shouldn’t be removed and it requires to leave an area open only as much as necessary.

2.1.3. The Work Safety Measures While Sanding with Sanding Machine

- The machine which is broken and can’t function completely or don’t have protector shouldn’t be used definitely.
- Working area should be clean and well lighted.
- Before starting to sand, the foreign objects like nails, screws, etc. existing on the material that will get sanded should be cleaned.
• The machines the on – off switch of which doesn’t operate mustn’t be used.
• Before plugging the machine, you should be sure that the machine button must be off.
• Burnable liquids and the easily flashing materials shouldn’t exist at the working area.
• Protective glasses and gloves should be worn while working.
• Suitable dust mask ought to be used while working.
• Tight dress must be worn and the sleeves should be turned inside.
• Machines should only be used relevantly.
• The operating machines shouldn’t be left given rein.
• The moving grinding wheel mustn’t be touched.
• The metal parts of machine shouldn’t be touched after a long period operation.
• While replacing the grinding wheel or disc, you must be sure that sanding machine is turned off, and it is disconnected with the power supply.
• The protectors removed during maintenance and repair working should be mounted before starting to work.
• Machines should never be abandoned while operating during breaks and rests, and they must be turned off and you must wait for the sand to stop completely.
• In case the machine breaks down, it should be stopped immediately and the maintaining supervisor must be informed.
• Safety of the ones around are as important as the workers.
• When a situation opposite to work health and safety happens, manager or the team of work safety should be informed.
2.2. Measures of Work Safety to be Taken While Working at the Fixed and Moving Grinding Machines

There should exist proper grinding and cutting disc protector at all the moving and fixed grinding and cutting machines. The grinding mouth mustn’t be more than 180 degrees at the moving ones, and more than 90 degrees at the fixed ones. Using these tools is definitely forbidden without protector.

The persons grinding and cutting should use suitable grinding glasses or face shields in order to protect their eyes from the dashing sawdust, burrs and dusts. These glasses must be the glasses either completely covered with plastic frames or having side covers with celluloid frames. The original characteristics of the glasses and face shields shouldn’t be spoiled, if they have got, their heat transfer plates and the side covers mustn’t be removed. In addition, if there is a problem concerning the hot sparkles, glove, overall, and dust mask should be worn. While working with the moving tools in a covered place for a long time, suitable mechanical filtered dust masks must be used.

Figure 2.2: Grinding Machine

- An adjustable piece plank should exist on the fixed benches in front of the grinding to put the part to get grinded on it and to work in safety, and
the distance between this plank and grinding should be adjusted to be maximum 3 mm.

- On the fixed benches, an aspiration equipment should exist in order to absorb the dusts and gases that can appear during the grinding and cutting operation from their outlet, collect them and throw out. Machine shouldn’t be used without operating this apparatus.
- It mustn’t be operated at a higher speed than written on the disk.
- You shouldn’t try to reach at something over or around the moving discs.
- Disk grinder should have the necessary durableness, and it must be taken into a suitable protector against the pieces that can rush out of the grinder.
- The disk grinders to be tied onto the bench must be suitable to the characteristics of the work and bench, the cycle number of the grinder shouldn’t be higher than the bench’s.
- These tools shouldn’t be used near the easily inflammable matters like paper, sawdust, burnable fibers, and the burnable and flaming liquids and gases. Otherwise, fire danger can occur.

2.3. Cleaning with Sand

Sanding is another method which is used for preparing the surface for the painting operation. While using the grinding operation for the small and a few parts, sanding method is used for the large size plain surfaces and for many small parts. Basically, sanding is to throw by means of the high pressure air onto the part (steel grit, basalt, silica sand, quartz, etc.), and to erode the layer on the part (rust, dirt, etc.).

Watch Video-7: Cleaning the Metal Surfaces by Sanding
Sanding operation is usually carried out by the sanding machines. The workers complete the sanding operation for the places where the sanding machine can’t reach at by the hand gun.

![Image of sanding operation](image)

**Figure 2.3:** Method of cleaning with Sand

When the sanding operation is considered in terms of work health and safety, it requires to be careful for especially a few basic subjects. Ground becomes slippery due to the sands thrown away by the sanding machine. Therefore, the places where sand spread around should be closed, and warning signs must be put for the possible slippery ground. At the machines by which the large size parts are sanded, the part is moving, but the platform of the machine is moving while sanding the small size parts. When it is considered in terms of work health and safety, it can be mentioned that the turning tray of some sanding machines have got the touching risk with the machine. However, the matter to be careful the most is that the necessary measures should be taken not to open the cover during the operation of the machine. Portable sanding is performed in the work places where the sand of machine can’t reach, or where there isn’t sanding machine. At the portable sanding operation, it is inevitable for the sand to spread around. Therefore, it is very important to insulate the area where sanding is carried out, and to carry out the environment cleaning after the
working in term of work safety. The personnel who will perform portable sanding should wear a full body protector and be trained on the work done.

2.4. Cleaning by Chemical Methods

It is a very effective surface cleaning method especially to clean the rust on the metal surfaces. If the parts the surface of which will be cleaned are the elaborated ones, and if they have got spaces according to their design, since grinding and sanding method can’t be used for cleaning, these parts are inserted in to the acid solutions having suitable concentrations, and the dirt and rust on their surface are removed. Furthermore, the adherence power of paint on the surface is increased by opening micron level pores on the metal surface by this method.

Nowadays, many products have been developed for cleaning the metal surfaces by chemical way. Application is performed with hand by means of a piece of cloth cleaning the metal surface and with immersion method in the metal cleaning bathrooms. This method is commonly used at the sectors where visuality stands out more, especially at the automotive sector.

In the chemical cleaning method, gloves, overall, and mask should be worn against acid vapour, and the environment where you work should be ventilated as much as possible. At the immersion operation, the pools used are generally hot, and the chemicals used evaporate and spread into the environment. When it is considered in terms of work health and safety, the first priority is to prevent falling into the immersion pools. For this reason, double lane (as main and intermediate) railings which are produced high enough must be used. Maintaining the cranes performing the loading and unloading operation to the pools should be noticed, their hooks, safety catches must be checked before starting the work. Furthermore, using the necessary warning and caution signs in the working environment is one of the subjects which must be noticed the most.
2.5. Lining and Puttying

While painting the metals, the second stage is the operation of priming and puttying in order to precipice for eliminating the roughness’s and painting the last layer. This stage is usually used at the productions where visuality isn’t very important. Objectives of the primer operation is to eliminate the surface roughness’s occurred during production, to prepare the surface for the last layer paint, to assure a good connection, to give brightness for the top coat paint, to prevent the oxidation. It extends the usage life of paint and the applied material.

If it is wanted for the metal surface to be more beautiful and bright from the aesthetical aspect, priming isn’t sufficient to close the deep burs on the metal surface, the roughness’s caused by the method of grinding and sanding. In this case, puttying operation requires to apply in order to provide a good under surface before the painting operation. At the puttying operation, spatula org'un is used according to the method to putty.

When it is considered in terms of work health and safety, the most basic matter is to ventilate the environment where puttying is carried out. Since the ignition temperatures of the chemicals used while puttying are low, there mustn’t exist any igniter factors (portable heater, cigarettes, plug socket combination making arc) around. The employers should be presented the necessary trainings about the risks concerning them, and warning signs must be hung. Especially the polyester putties and hardener react, and cause fire. If these types of putties are used, putty and hardener shouldn’t be kept in the same container.

2.6. Painting

Painting is to cover the metal surfaces with the chemicals in order to save or make them aesthetical. Many metal products are put through painting operation at the final stages of their production. Blasting,
immersion, and applying with brush are the painting methods intensively used at industry.

Watch Video-8: Painting the Metals Serially Untouched by Human Hands.

2.6.1. OHS (Occupational Health and Safety) Measures to Be Taken at Painting Operations

The chemicals used should be examined in accordance with the explosion, flaming, fire hazards, and the information in the material safety knowledge forms. The workers must be informed on the hazards that the paints can cause. Fire can start due to the igniting sources like electricity, working with fire, cigarettes / lighter flame, static electricity, and the hot surfaces. At the fires caused by paint, the extinguishers having dry chemical powder, alcohol resistant chemical foam, and carbon dioxide should be used.

In case of using water, fire isn’t put out, contrarily it spreads. In order to protect from fire, the pointing guns must have static electrical grounding. The walls of the work places where workers work with flammable, explosive, and burnable materials should be resistant against fire.

On order to be able to prevent the employees’ breathing solvent (dissolver) vapours, suitable ventilating systems should exist in the places where paining is done. Solvent vapours accumulate on the ground as they are heavier than air. Therefore, the basement and ground floors which are more difficult to ventilate, shouldn’t be used as a paint store. Ventilating the work place must be carried out by considering this situation.
Ventilating systems should be operated as long as painting is carried out, and its periodical checks must be done. In order to be able to extinguish the hazard of explosion, ventilating systems must be established in the work places which can dilute the solvent vapours in the way to be less than 25% of the Lower Explosion Limit (LEL).

**Figure 2.4: Painting Operation**

In the work places where the hot parts are painted, water based paints should be preferred. Since the solvents touching the hot surface in the paint are evaporated in a short time, it constitutes higher hazard in terms of employees. In such circumstances, using the water based prevents the employees to breathe the harmful vapours.

The employees working in the work places where painting is performed continuously are exposed to solvent vapour for long periods. In cases ventilating system isn’t sufficient, rotation should be carried out amongst the employees in order to shorten the breathing period of the employees.

The respiratory tract of the employee who applies painting, his skin and eyes can damage from solvent vapour, corrosive chemicals, and harmful paint additive agents. In cases this harm can’t be prevented, the employee should get used the personnel protective equipment’s like rubber gloves, long sleeve overall, glasses, and mask.

In the areas where paint materials are stored, arrangement must be done considering the safety information forms of the materials. While painting, the materials to be used should be taken from the store as
sufficient as to be used. Thus, the bigness of a possible fire will have been
decreased. This solution can also be thought as a measure against the
pouring.

The pieces of paint must be collected, and the chain, ropes, and the
lifting vehicles belonging to them in the work places where painting
operation is carried out should be controlled periodically. The chains and
ropes which got old and deformed must be replaced.

![Figure 2.5: Eye shower station](image1)
![Figure 2.6: Eye shower station](image2)
![Figure 2.7: Eye shower plate](image3)

Paints should be kept in the containers made of the convenient
materials against leakage and pour, which are leak-proof and suitable to the
content of paint. Containers should be labelled in the way they show the
matter inside and its dangers. In order to use in cases of leakage and pour,
the sucker materials like lime, sand must be ready in the work place.

Having an eye shower in the workplace to be used in case of paint
splashing in the eyes of employees will be helpful for early intervention.
Self-control questions

1. Do you need to etch metal before painting?
2. What speed will you choose for grinding machine operation?
3. How you can prevent falling into the immersion pools?
4. When do you need to use ventilating systems?
5. At the fires caused by paint, what should the extinguishers to have?
6. What safety measures do you need to take during portable sanding?

Exercise

1. Which of the surface operations is carried out to prevent the metal materials’ rusting?
   A) Filing          B) Brushing
   C) Grinding       D) Painting

2. How many mm should the distance be maximum between the part pier put on the part to get grinded and grinding spiral at the fixed benches?
   A) 3              B) 5       C) 7       D) 10

The correct answer can be found at page 73
Conclusion

In this chapter you have learned about different types of working with metal surface. You know what is a danger during working with metal surface. The basic safety precautions and rules were explained as well.

Further reading

- Metal Technology Field, Metal Surface Processing Course Modules, SVET, 2011.
3. WORK SAFETY AT HOT AND COLD SHAPING

Overview

This chapter provides information on how the shaping can be done. Two types of presses are described. It points out the importance of OHS measures at the working site during pressing. The proper measures to be taken in order to avoid accidents are explained as well.

Objectives

In this chapter you will learn:

• What are the operations performed by presses,
• What are the parts of mechanical press,
• What kind of measure can be applied at site in order to prevent injuries during using presses,
• How to work safely with rammer.

Introduction

Nowadays, shaping the metals as hot and cold is usually made presses. In general, presses are the machines producing force between jaws and practising it.

We can list some of the operations performed by presses as follows:

• Cutting and slicing
• Cutting as stamp or shape
• Punching
• Smoothing surface
• Bending
• Lapping
• Coining
• Folding
• Mouth Bending
• Ironing
• Forging in the open or closed mould, etc. operations can be carried out.

Presses are divided into two groups named mechanical presses and hydraulic presses according to their propulsion systems.

3.1. Mechanical Presses

There are different methods at the mechanical presses to transfer the force to the moving jaw. The type we met the most in the mechanical presses is the eccentric press.

![Eccentric press and its parts](image)

1-Body
2-Engine
3-Flywheel
4-Clutches and brakes
5-Motion transmission system
6-Camshaft
7-Coach head
8-Table

Figure 3.1: Eccentric press and its parts

3.2. Hydraulic Presses

Hydraulic presses are the presses which can operate by a back and forth moving hydraulic cylinder at the capacity of cylinder. Pressure oil is
sent to the system by the oil pumps operated by electrical energy. The cylinders moving back and forth by means of the pressure oil have constituted mechanical energy in this way. On the other side, the moving jaw which is connected to the cylinder moves in this way up and down.

3.3. OHS Measures to Be Taken While Working by Presses

Presses are the leading machines used in the entire metal sector including ship building, producing automotive, white goods, kitchen tools, and defense industry. In terms of work health and safety, it is one of the most dangerous work equipment’s at this sector. Work accidents occurring during the working carried out by these machines result in loss of limb and even in death.

For that reason, the following OHS measures should be taken at the workings carried out by the presses:

1) Engine must be turned off before connecting mould at the presses operating with motor, but at the hydraulic and pneumatic presses, pressure must disconnected be before connecting mould, and the strong enough wedges should be put between press head and flange.

2) In accordance with the work, the working space of the down and up mould must be adjusted, and mechanical protectors must be done at the presses working with open mould.

3) Hand and finger protectors should be made in the way to give the necessary warning before the danger by hitting and pushing, or in the way to prevent the motion of the press head before decreased down a certain level.

4) At the presses not having automatic feeding apparatus or the protector of which wasn’t established according to the work, it should have double hand control attachment, and one of them shouldn’t be able to prompt the press alone.

Watch Video-9: Double hand Control System
5) In cases there doesn’t exist the possibility to protect the hand and arms, suitable individual protectors should be made, the workers should be given the tools like cramp or tong, and the mechanical or pneumatic apparatus to output work or to cast. Robots can also be used for these works.

6) At the heavy presses in which big parts are processed and at the presses of injection and enjeksiyon ve gun, photocell apparatus should be established. Instead of it, unless it is completely closed, mechanical handicapped covers can be made preventing the motion with slide and contact.

7) Suitable shields must be attached onto the presses against part rushing while working.

8) At the presses operating by pedal, a suitable foot protector must be put on the pedal.

Figure 3.2: Foot Pedal with protector

9) At the presses operating by hydrolc or air pressure, a manometer or a safety valve in a prominent place of the pressure pipe.
10) Other than the hydraulic presses, there must be brake mechanism to keep the motion of the press head in the place demanded, and a separate control attachment in an easily accessible place of every press.

11) The edges and corners of the press moulds shouldn’t be left sharp.

12) Emergency stop button should exist on the presses that can stop the system completely which is easily accessible and noticeable.

![Emergency stop button](image1)

**Figure 3.3:** Emergency stop button

13) At the presses where more than one operator work, a working environment (visual coordination) must be provided where operators can see one another, and if necessary they can contact each other.

In addition, in order to avoid the work accidents occurring at the presses, some safety measures like working with the more safety presses, existing light barriers, field scanning sensor, conditioner, press safety valve, and safety PLC (Programmable Logic Control Unit) should also be the reason for preference.

![Visual Coordination](image2)

**Figure 3.4:** Visual Coordination
14) Railing should exist on the stairs providing to go up the presses and on the upper platform in order to prevent falling off. Circular railing must start at the height of 220 cm from the ground according to the standards. Upper platform railing should be minimum 90 cm high and have the solidity to be able to bear minimum 100 kg load that can come from any direction.

15) The height of operator seat and the place of the work part case should be chosen accurately. The blood flowing into the legs of the operator working on the seat which was chosen smaller than it had to be is hindered, the pressure occurs in the sitting place more than normal, and it causes pressure in his internal organs.

For this reason, the seat having minimum five legs should be chosen, and height of seat can be adjusted in the way the elbow part of arms and the knee part of legs can do a 90 degree angle. The back side of the seat must be as large as it involves al the back including waist.

16) The average noise level of the presses in the working area is between 90-110 dB. Therefore, primarily noise level must be lower as collective protective method, and less noisy presses should be chosen, or the other engineering methods must be applied. As individual protector, the decibel (dB) step-down earbuds should be used.

It is known that noise causes irreversible hearing loss. At hearing loss, the table referring to the level of exposition and its period has been given as follows.
<table>
<thead>
<tr>
<th>Level of noise dB</th>
<th>Loss of hearing skill %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 Years later</td>
</tr>
<tr>
<td>80</td>
<td>0</td>
</tr>
<tr>
<td>90</td>
<td>4</td>
</tr>
<tr>
<td>100</td>
<td>12</td>
</tr>
<tr>
<td>110</td>
<td>26</td>
</tr>
</tbody>
</table>

**Figure 3.7:** Working with Decibel Lowering Earlaps

### 3.4. Safety Measures to Be Taken while Using Rammer (Mechanical Hammer)

- The pedal arms of the device must be closed suitably.
- While working, portable fronts should be used against the part jumps around the rammer.
- During mould connection, a wedge must be put between the piston and pleyt that can prevent the sudden motion.
• At the rammers operating with vapor and air pressure, there must exist the safety valve operating continuously, stop valve and pressure lowering valves.

• At the rammers, while working, in cases of holding the part with one hand and the other hand’s staying free, teach pendant should be made instead of foot pedal.

Watch Video-12: Dangerous Working at Rammer

Self-control questions

1. Is the mechanical presses part of the eccentric press?
2. In which heights the circular railing must start?
3. What must exists at rammers operating with vapour and air pressure?
4. What should have the presses not having automatic feeding apparatus or the protector?
5. What is average noise level of the presses in the working area?

Exercise

1. Which safety measure should be taken to decrease the loss of limb occurring at the hand-operated presses where you work with open mold?
   A) Protective foot switch must be used.
   B) Its button must be used at emergency.
   C) Double hand control attachment must be used.
   D) Gloves must be worn.
2. Which of the following security measure should be taken at the presses operating with pedal?

A) Double hand control attachment must be used.
B) Foot protecting should be done.
C) Railing should be mounted.
D) Its button must be used at emergency.

3. Which of the following isn’t needed to use for a safe working at the rammers operating with compressed air?

A) Security valve       B) Stop valve
C) Holding valve       D) Pressure reducing valve

The correct answer can be found at page 73.

Conclusion

In this chapter you have learned why the prevention for working with rammer and presses have to be taken into account at the working site. You will be able to apply appropriate measures in order to prevent the accident caused due to not suitable working conditions during the hot and cold shaping.

Further reading

• Metal Technology Area, Heat Treatment Techniques Course Modules, SVET, 2011.
• Metal Technology Area, Hot Shaping Course Modules, SVET, 2011.
• Metal Technology Area, Cold Forming Course Modules, SVET, 2011.
4. WORK SAFETY AT STEEL CONSTRUCTION

Overview

This chapter provides basic information on the steel industry and steel buildings and how and where to focus safety measures. The assembly and safe work on scaffold are explained in a very detailed way.

Objectives

In this chapter you will learn:

- Why the steel buildings require special attention;
- The production stages ate the steel buildings;
- How to prepare the mounting place;
- How to work with the different types of scaffolds;
- Working instructions of scaffolds.

Introduction

Steel construction involves the production process of every sort of steel construction including the steel buildings. Steel stores, silos, boilers, roofs, bridges, and buildings are the topic of steel construction. Many of these productions and the productions performed in the factory have the similar risks met at the operations of metal. In the 1st, 2nd, and 3rd parts of the module, the measures that can be taken to decrease these risks are mentioned.

However, this situation is different for the steel buildings which are amongst the productions to be performed on the construction site. It requires to work far from the conditions of workplace, by the heavy duty machines high, and on the difficult conditions. Therefore, the work safety measures will be focused on the steel buildings existing amongst the steel construction.
productions in this part. Steel building is one of the building blocks of the large construction projects in our country and in the world. For the steel building production to become a large sector according to workplace and number of employees causes many work accidents and occupational diseases together to occur. This situation makes the measures to be taken concerning work health and safety at steel building production more important. In this part, OHS, which should be regarded at producing steel buildings, will be discoursed.

![Figure 4.1: Example of Steel Building](image)

By the development of technologies used at the production of elements of steel building, the quality and productivity of at the sector of steel building have reached at a very advanced level. Steel building producers invest in the machines providing technological advantage seriously in order to meet the needs of our structural steel sector. By means of the production projects drawn by computer and very low share of mistake, the steel productions each element of which can be designed in
detail can be produced by the counters of in the environment of factory, but only their montage is carried out in the field of building.

Watch Video-13: Production of Steel Building Elements

Production of steel buildings has got a work flow having more than one operation within. A diagram of work flow including all the production operations of the construction exists in the figure above.

We had learnt the OHS measures that should be obeyed at the stage of the steel building elements in the previous subjects of the module. In this part, we will discuss the OHS precautions to be obeyed while assembling the building elements at the construction field used at the production of steel buildings.

Figure 4.2: Production Stages of Steel Buildings

Although constructing the steel building resembles the construction of reinforced concrete, carcass and wooden buildings, the big scale steel building elements produced in the factory have also got differences including the difficult stages like lifting, carrying, and montaging at the construction site. Lifting these materials in their places, carrying and montaging them should be performed by the experts having experience on these subjects.
4.1. Preparing the Mounting Place

4.1.1. Establishment of Scaffold

While constructing the buildings, the working places made for the workers to work in safety at the parts exceeding the normal working height in order to use temporarily are called scaffold. Scaffolds are divided into two groups as wooden and metal scaffolds according to the type of material built. On the other hand, they are named as tripod scaffold, post scaffold, pipe scaffold, hanging scaffold, moving scaffold, and supporting scaffold according to their using purpose.

Scaffolds are usually used, struck down, and erected again while constructing building short-time. Therefore, it is demanded to strike it down easily, and erect it, for the materials to get used strong, to use it again at the same and similar works. Steel scaffolds are divided into three types between one another.

![Tripod Scaffolds](image)

**Figure 4.3:** Tripod Scaffolds

4.1.1.1. Steel Tripod Scaffolds

It is used to perform, repair, mortar, cover the single – floor buildings, and to carry out the operations of installation works. The heights of tripods made of pipe or different shapes can be 80–100 cm, 80–150 cm if they are with adjusted heading, and their lengths can be between 100–200 cm.
4.1.1.2. Steel Bracket Scaffolds

The scaffold that can be easily set and disassembled are preferred to build, repair the multi floor buildings and at the operations of external wall covering.

Figure 4.4: Bracket Scaffold

Figure 4.5: Pipe Scaffold

4.1.1.3. Pipe Scaffolds

The pipe scaffolds made of the steel pipes are used to mount the side combining elements at the steel buildings, to mortar the external sides of the multi floor buildings, to paint them, to cover them, etc. Since they can be easily erected and stroke down in short time, safe, and as the material loss is little, they are preferred a lot nowadays.

4.1.1.4. Suspensory Rolling Side Scaffold

These scaffolds are usually used at the maintaining and repairing operations on the completed buildings. Its installation is short term and economic. In this system, there is a platform where the workers can work comfortably, and there exist the motors which lower and lift this platform by the steel ropes around the buildings and move horizontally. The rail system having motor on that moves horizontally is set up on the terrace of the building. The most important characteristics of the scaffold is that it enables to work on the demanded level of floor.
4.1.1.5. Moving Scaffolds

At the simple works thinking that making scaffold takes long time and takes up space, moving scaffolds can be used as a practical solution way. All the workers have to obey the working instructions on the scaffold for a safe working, regardless of which scaffold type is chosen according to the steel building.

4.2. Working Instructions on the Scaffold

- Before the workers who work on the scaffold start to work, they have to control the timbers, rods, and the steel profiles. When there exist a problem on the scaffold, the concerned ones should be informed absolutely, and they shouldn’t work till the problem is solved.

- While mounting the scaffold, dissembling it, and working on the scaffold, the necessary personal protectors (helmet, glasses, safety belt, life lines, work shoes, gloves) must be absolutely used.

- It mustn’t be definitely worked high without tying the safety belts to the life lines.
• Life lines should be tied strongly to the independent places from the scaffold.

• Scaffold should never be climbed, and passing must be performed through the scaffold stairs or the available windows.

• Scaffold equipments (rods, safety clips, crosses) should never be removed.

• Working shouldn’t be performed on the timber, the hooked original metal platforms of the scaffold should be used.

• Materials must never be thrown down from the scaffold, and their falling should be stopped.

• Passing under the materials hauled onto the scaffold must be stopped. Working shouldn’t be carried out under the scaffold.

• Material bag must be used for the tools not to fall down.

• The electric appliances to be used on the scaffold must be grounded, and protected in safety.

• Attachments should never be existed on the electric cables used on the scaffold in the way there will be electrical leakage.

• Running, jumping, and joking should never happen on the scaffolds.

• Any materials and waste of materials shouldn’t be left on the scaffold in the way they will hinder passing in safety.

• In order to stop the tools’ and materials’ falling down the floors of the scaffold, a 15 cm high wainscot must be put outside of the floor. There should be at least 1 cm space between wainscot and floor.

• The passes on the scaffolds as bridges mustn’t be narrower than 60 cm. Furthermore, they also have railings.
• While carrying the metal platforms upstairs, at least two workers whose safety belts are tied should carry them.

• In case of using crane or similar machines near the scaffold, measures must be taken for the load to lodge to the scaffold and cause the scaffold to fall down.

• Glass should absolutely be worn to protect the eyes.

• If the lighting is insufficient during the night working, working should never be performed.

• Ropes must be changed when they are worn.

• The ones who have got health problems and psychological problems should never work on the scaffold.

• Cigarette stubs should never be thrown down, and they shouldn’t cause fire.

• The environments where there are burnable and inflammable materials should never be approached with cigarettes, and the tools glowing fire and sparkle.

• The possibility of the jacketing materials covering the spaces on the floor to get broken and removed should be considered, and it must be carefully worked.

• Everybody working high should be trained on “Education for working high”.

Watch Video-14: Education for Working High
4.3. Assembly Method

Since the production of project at the steel buildings is performed in the factories or plants at the rate of 90%, only connecting the steel components (column, beam, purlin, rafter, components of wind and side connection and profiles, inserts, connection lathes, anchorage, screw, etc. every sorts of materials are included) are performed at the building site.

Assembling the steel components transported to the building site and packed in the correct way is performed by connecting with screw or welding. Welded connections are performed according to the crossing and situation workings of the steel rods to get connected with front, end and overlap by using auxiliary lathes as the corner welding additions.

However, it is usually preferred for the assemblies in the building site to be bolted. We can list the advantages of the bolted connection as follows:

- It is easy and fast.
- It doesn’t require qualified worker.
- Assembly is performed in accordance with standards.
- It is easy to check the production and to correct the mistake.
- Assembly isn’t effected by the weather conditions.
- Modification isn’t required after the assembly.
Nowadays, the steel structures are built in the factories according to the project by the full automatic machines including all the operations like cutting (also including the geometrical figures), tapping, and welding, drilling, sandblast, painting, and giving item number. Projects are prepared in the way not requiring assembling in the building site as far as possible. Therefore, all the productions that should be made by welding are performed in the factories as welded connection including all the components’ connection parts like wind braces, purlins, rafters, etc. Main reason of it is that the quality of welding carried out in the building site isn’t as good as the one performed automatically in the factory. For that reason, it is demanded at the steel buildings for the welding production in the building site to be in the minimum level. We can list the main drawbacks of the assembly welded in the environment of building site as follows.

4.4. Drawbacks of Assembly Welded in the Environment of Building Site

- It requires qualified worker, since welded assembly is more difficult than the bolted joint.
- Production lasts longer than the bolted connection.
• It is difficult to keep the standard, since the quality of the production welding will change according to the material used and team.

• Its control is more difficult than the bolted connection.

• Convenient weather conditions require for the assembly.

• It is difficult to modify and repair it.

• The painting retrofit after the assembly should be performed carefully.

Since the column, beam, purlin, rafter, wing connection rods, face connection components, and their connection parts prepared in the factories are put on the column and beam as welded connecting them with screws and nuts is easily carried out. Completing all the productions to be performed with welding in the factories and plants (according to applicability and budget of the project), and only assembling them with screws in the building site is the most important factor that increases the quality at the steel buildings.

4.5. Preparation Before Assembly

Building firm should prepare different certificates about the steel components to get produced according to the application project before the assembly. The documents to be prepared are as follows;

• The production figures constituted based on the application projects,

• A work plan in accordance with the general work program (building site work program) before starting the work,

• The material approval form of the samples of the materials to get used (from the material laboratories of universities or from the producer firms),

• Procedures of welding and production,
• Scaffold erecting report, and

• The list including the information of staff, machine, and equipment to be used should be prepared.

4.5.1. Preparing the Steel Components and Equipments Before Assembly

Application figures, choosing the employees, preparing the materials, producing the steel components, transporting them to the building site and assembling them should be performed according to the standards. Loading the materials, transporting, unloading and packing them must be carried out in the way not to damage the protective primer. The steel building components should never be thrown from the transporting vehicles.

While carrying the steel building components and packing them;

• Trusses and rays must be put and kept vertically,

• Their touching the soil must be avoided,

• Attention should be paid for the steel building components’ having water on,

• Horizontal and vertical wooden wedges must be used at the multi lined hoards,

When it is examined as a sector, for the works of lifting heavy load and the ones performed gropingly being intensive make the preventability situation occurring at production of steel structure a little harder.
However, the studies carried out indicates that most of the health and safety problems at the steel construction production are caused by using and keeping the machine, welding, cutting, bending, lifting load (moving the overhead and moving crane), and the painting operations. In order to eliminate the mentioned hazards, it should be acted convenient to the OHS regulations. In addition, using the special hand tools at the operations of machine, the measures like using the machine cases, avoiding the gases occurring at the cutting and welding operations, not overloading on the crane while lifting load, being sure that the chain and cables aren’t tangled by any object must be taken. Together with these measures, using the necessary available individual protective equipment has got importance to avoid the accidents that can happen at producing steel construction.
Figure 4.9: A sample steel configuration produced by welding connections
Self-control questions

1. What types of scaffold do you know?
2. What kind of the scaffold enables to work on the demanded level of floor?
3. Do you need to wear glasses while working on scaffold?
4. What are the advantages of the bolted connection?
5. What kind of documents do you need to prepare before assembly?

Exercise

1. Larger than how many cm must the passings that will make bridge duty at the scaffold?
   A) 60    B) 50    C) 40    D) 30

2. Which of the following KKD’s isn’t needed to use while working on the scaffold?
   A) Helmet    B) Work shoes    C) Ear Protector    D) Gloves

3. Which of the followings is one of the drawbacks of the welded assembly in the environment of building site?
   A) It requires suitable weather conditions
   B) It is economic.
   C) Its alterations and repairing is easy.
   D) It is easy to assure the quality and standard.
4. Which of the followings **mustn’t be done** while carrying the steel construction elements?
   A) Trusses and beams must be carried vertically.
   B) Their touching to the soil must be prevented.
   C) They must be covered not to enter water.
   D) Steel wedge must be put amongst the elements

   **The correct answer can be found at page 73**

**Conclusion**

In this chapter you have learned the why the steel buildings have to be taken into account during safety regulation planning. You will be able to recognize what and why is important in order to keep good health for workers at the steel building.

**Further reading**

Construction Technology Area, Steel Structure Manufacturing Module, SVET, 2012.
5. WORK SAFETY AT IRON AND ALUMINIUM JOINERY

Overview

This chapter is focused on safety during the work at iron and aluminium joinery. It provides information on operations at these working place and special safety directions for selected places in them.

Objectives

In this chapter you will learn:

- What kind of operations are provided in iron and aluminium joinery;
- of what you should aware working in these premises;
- How to properly work with up cut shear;
- How to use bending press, special metal clamping machine; buzz saw and bench profile cutting, bench drill and spiral.

Introduction

The operations used the most at the iron and aluminium joinery production are cutting profiles, bending, hunching, boiling, clinching, painting and assembling. The procedures mentioned in the other parts of this module have not been included in this part.

Watch Video-16: Production of Decorative Materials at Metal Joineries

The working area where the production or assembly is performed should be clean and tidy. There mustn’t be any unnecessary boxes of paint
and thinner on the ground. Otherwise, the employees can stumble the untidy materials on the ground and fall down, or they can slip and injure themselves. In order to avoid the slipping risk, the paint and fluids poured on the ground should be cleaned.

Against the possibility of fire, qualified and enough number of fire tubes should exist in the working area.

The angle of the spiral grinding shouldn’t be changed while cutting to avoid getting cut, smashing and loss of limb because of the explosion of spiral grinding during the usage of the electrical hand spiral, the material mustn’t be hit hard, and the spiral grindings eroded much should be changed. Not to be shocked, the cables, and their connections should be strong and insulated. Transparent glasses should be absolutely used in order to avoid entering substances into the eyes. The machines without protecting cases mustn’t be used not to have cutting and loss of limb.

**Figure 5.1:** Sample of Metal Joinery

You must be careful while using the electric hand drill to avoid hand impingement. The cables and their connections should be strong and insulated not to be shocked. Transparent glasses should be absolutely used in order to avoid entering substances into the eyes. It mustn’t be forgotten that vibration gives persistent damages to the human body. The people who work with these sorts of devices should work in shift. Ear protector must be used for the noise not to cause hearing loss.

Maximum care should be taken while working by these types of tools not to have hitting, wrenching, and cutting at the usage of non-electric hand tools.
In the working area, the insulated and qualified section cable should be used to avoid getting shocked or fire danger, and cable ends mustn’t be opened. The damaged cable or the insulation of which is broken down should be replaced by the new one. Qualified power panel must be used. Bare cable connection shouldn’t be made, and qualified plug and jack must be used instead of it. Panels, llugs and jacks ought to be grounded. The electric cables mustn’t be left untidy on the ground in order to decrease the risk of stumbling and falling down.

While working on the scaffold, the rules of working on the scaffold must be obeyed, full body protective safety belt and the other PPE’s should be used everywhere having risk of falling down. While moving the scaffold to another place (swing drift), all the materials on the scaffold ought to be taken off before the moving operation, and the people who work in the scaffold carrying area (excluding the ones assigned to carry) should be taken out of the region.

A safety ladder should be used during the joinery assembly, the ladder using rules must be obeyed, and PPE’s should be used. While working high by using tripod scaffold, the workers working on the scaffold should tie their full protective safety belts to a safe and strong place, and they ought to wear helmet.

If mastic is used during the assembly, coverall should be worn to avoid the mastic’s touching to the bare skin, and gloves must also be used. During the assembly, maximum care should be taken against the risks of hand foot jamming, material fitting, material falling, and getting shocked.

While carrying materials by hand, you can stumble and fall down, the material getting carried can cut our skin or sting. When the material falls down, hand, foot jamming and squashing can occur. If the load is heavy, and convenient lifting and carrying method isn’t used, it shall give permanent damages to body joints. In order to avoid these risks, the heavy
and bulky loads should be carried by the transporting vehicles, and PPE’s must be used.

While unloading the materials from the vehicle, material can fall on the floor or on the workers working there. Hence, the worker can have cutting, wrench or squashing. In order to avoid it, you must be careful while loading or unloading materials and the materials should be lifted and lowered safely.

In order to minimize the possible work accidents at iron and aluminium joinery, in addition to the ISG measures listed above during assembly, it is very important to use the machines which are used to produce the iron and aluminium joineries according to the using instructions. The instructions of the machines which are often used at the iron and aluminium joinery have been given as follows

Watch Video-17: Work Accidents Occuring Because of Carelessness

5.1. Directions of Upcut Shear

- Don’t work at the machines without permission.
- Don’t operate the machine when the front safety shield is removed.
- Be careful that the cutting space of the machine is adjusted according to the thickness of the sheet you will cut.
- Don’t cut the parts which are thicker than 4 mm.
- Don’t touch the moving parts while the machine is operating.
- While cutting, don’t insert your fingers through the front shield.
- Use the ‘EMERGENT STOP’ button in emergency.
- Be careful that there is nobody behind the machine while operating.
- Turn off the machine when you completed your work.
- Don’t leave parts on the machine.
5.2. Directions of Using the Bending Presses

- Check the connection screws before operating the machine.
- Keep yourself away from the bending ties while working at the machine.
- Choose the suitable mould according to the bending you will carry out.
- Do the mould adjustments.
- Don’t perform the bending of the parts cut by flame.
- Oil the moulds while bending.
- Adjust the space of bending according to the thickness of the material that will be bent.
- Don’t insert your hands and arms between the two moulds while working.
- Don’t deal with the other people and work while working at the machine.
- Control the oil level of the machine before bending.
- Turn off the machine when you have completed your work.

5.3. Directions of Using Special Metal Clamping Machine

- Keep your working area tidy.
- Don’t approach any point of your body to the working area.
- Be careful that the sleeves of your overalls aren’t long, the front of it is closed, and your neck tie isn’t outside.
• Don’t deal with the other people and work while working at the machine.
• Don’t hit on the bending jaws with hard object.
• Don’t bend the parts longer than 1310 mm and thicker than 1,5 mm.
• Check the bending angle while bending.
• Don’t smooth the bent parts compressing them between the jaws.
• Clean the machine when you completed your work.

Watch Video-20: Working with Automatic Special Metal Clamping Machine

5.4. Directions for Use of Buzz Saw and Bench Profile Cutting

• Check if the saw has got any damages like broken or cracked teeth, etc.
• Do the resistance adjustment according to the part you will cut.
• Don’t work without glasses.
• Don’t work without gloves. Be careful that your gloves are eligible for the measure of your hands., and it is close fit to your hands.
• Don’t measure the size while the saw is operating.
• Don’t play with the adjustments of the saw while the saw is operating.
• While cutting with the saw, be careful that it is at the position of triangle (on the 2nd phase). Don’t perform cutting when it is at the position of star (at the 1st phase).
• While cutting, be careful that there aren’t any materials to be able to blaze around the machine like oakum, paper, etc.
• Don’t cut the full materials on the saw.
• Don’t hold the cut-to sides of the parts cut with bare hands.
• Don’t use nogs to stop the saw blade.
• Turn off the saw when you have completed your work.
• Don’t leave pieces on the saw.

Watch Video-21: Working with Buzz Saw

5.5. Directions of Using Bench Drill

• Always check the sharpness of the drill, and tie it to the drill chuck steadyingly.
• Never turn on the machine without removing the drill chuck key from the drill chuck.
• While drilling, don’t force it in the way the drill is burned or broken. At the holes the depth of which is much, assure that the chips are discharged by drawing the drill back at intervals and the drill gets cold.

Watch Video-23: Working with Pillar Drill

• Tie the work piece to the platform steadyingly.
• Always use the shelter of drill protector. While drilling, protect your hand from the drill and especially from the outlet mouth.
• When you turn off the switch, don’t try to stop it immediately by holding the drill chuck in your hand.
5.6. Directions of Using Spiral (Jet Grinding)

- While working, don’t wear necklace, wristband, etc. accessories, necktie, long sleeved and large dresses, and turn the sleeve of the dress inside.
- The processed part should stand steadily while working. Otherwise, tie it to the clamp.
- Check the cable and plug strength of Spiral grinding motor.
- Be careful that the grinder is tied uniformly, compressed with its key, without crack and dry, and the grinder case is in its place.

Watch Video-24: Changing Spiral Grinding

- Grinding mouth won’t be more than 180 degrees.
- While maintaining and repairing it, machine is never operated.
- Spiral is a sparkling device. If there is any burnable and inflammable material in the area used, clean it and take the necessary safety measures.
- Take precautions that the sparks and flashes leaping while working won’t come to the ones working in the environment.
- Check that the on / off switch is durable.
- Use the grounded electric appliances.
- Grinding and cutting is used at spirals. Don’t misuse the spiral grinding according to the type of it.
- Unplug the spiral grinding from the jack after working is completed.
- Don’t leave the spiral on the ground, lift it to its place after working is completed.
- The cycle it will operate with is written on the grinding, spiral’s cycle must less than the cycle of grinding.
- While working with the cutting spiral, spiral should come to the material that will be cut vertically, and it mustn’t be inclined while cutting.
• In order to increase the cutting, don’t press the spiral on the part so much.
• Don’t leave it on the ground unless the spiral grinding stops completely.
• Nobody should use the spiral other than responsible one.
• When it is break time, or when the grinding requires to replace, the spiral must be unplugged from the socket.
• Don’t perform sharpening and grinding the spiral by getting it on the ground. Fix the part that will be grinded absolutely.
• Don’t use the spiral with wet and oily hand or with gloves.
• While working with spiral, use protective toed shoes, face hood / glasses, assembler gloves, and ear protector.
• Spiral mustn’t be operated lower than knees and above the head.
• Chuck key or other apparatus shouldn’t be on the spiral.
Furthermore, the following measures should also be taken during all the workings at metal sector in addition to the work health and work safety measures suggested in the previous pages.
• While working, the accessories like necklace, earring, watch, ring, etc. mustn’t be used. They should be taken off before starting to work.
• Never use gsm telephone while working.
• If the worker has got long hair, hair must be tied up or collected in a protective hat.
• Single piece (fitted) overalls while working.
Self-control questions

1. When planning work in iron and aluminium joinery what is crucial to know for safety assurance?
2. During working with upcut shear can you cut parts which are thicker than 3 mm?
3. Do you need oil the moulds while bending?
4. While using special metal clamping machine can you bend the parts longer than 1000 mm?
5. Can you cut the full material with the saw?
6. Can you use spiral with gloves?

Exercise

1. Which of the followings must be noticed while using electric hand drill?
   A. Brand of drill
   B. Drill chuck’s grasping the bit tight and correctly
   C. Model of drill
   D. Color of drill

2. Which of the followings isn’t needed to do while working with spiral?
   A. Protecting head must be mounted.
   B. Glasses must be used.
   C. Handle must be removed.
   D. Gloves must be used.

The correct answer can be found at page 73.
Conclusion

In this chapter you have learned about safety measures while working in iron and aluminium joinery. You are able to understand why the measures in these premises are so important from safety point of view. You know why and what questions to ask yourself in order to guarantee good working conditions. You should be able to advise on proper measures for preventing the occurrence of risk.

Further reading

• Metal Technology Area, Aluminium Joinery Course Modules, SVET, 2011.

• Metal Technology Area, Basic Metal Forming Course Modules, SVET, 2011.
6. METAL SECTOR OCCUPATIONAL DISEASES AND PROTECTION WAYS

Overview

This chapter is focused on occupational diseases. The different occupational diseases are described which are common for workers in the metal industry. Four protective approaches to occupational diseases are discussed.

Objectives

In this chapter you will learn:

- What types of occupational diseases can be caused by working in the metal industry;
- How to protect workers from these diseases;
- About four protective approaches to occupational disease;

6.1. Physical Reasoned Occupational Diseases

We can tell noise-induced hearing loss, occupational diseases seen at the people who work in the hot and cold environment, diseases depending on ionizing, non-ionizing and effects of radiation, health problems caused by high and low pressure, and the diseases happening due to the effect of vibration and repeating operations.

6.2. Chemical Reasoned Occupational Diseases

Chemical factors are the most common ones amongst the workplace environment factors seen at the metal sector. The number of chemical substances appeared during the different work and operations performed at
the sector are expressed by hundred thousand. Some of them don’t constitute for human health, but many occupational diseases can constitute belonging to the chemical substances. Amongst the most common samples, poisoning caused by the heavy metals like lead, mercury, the diseases caused by poisonous and irritant gases like carbon monoxide, hydrogen cyanide, sulfur dioxide, the health problems caused by benzene, toluen, hekxane, trichloroethylene, chloroethyleneetc, etc. solvents, and the diseases caused by acid and alkaline substances, pesticides, carcinogenic materials, etc.

6.3. Occupational Diseases Caused by Dusts

There are different diseases caused by the dusts, many of them relate to respiratory system. Some dusts make irritant effect on the skin and mucosas, some of them gather in the lungs, cause the chronic diseases of respiratory system by causing reaction, and some cause cancer to develop.

6.4. Occupational Diseases Belonging to Ergonomic Factors

While working, some factors like the positions and working forms not suitable to health, lifting heavy load and carrying it, and fast working tempo can also be the reason for health problems.

Occupational diseases are the diseases which are possible to protect from. Since the reason for the disease belongs to work place, occupational diseases can be avoided by taking effective measures in the work place. As well as the technical applications to control the factor causing the disease are base, some medical applications are also important for protection. The protective approaches at the occupational diseases can be discussed in four titles:

1) Controlling Approaches at the Source: The most effective approach to protect from the dangers in the work place is to control the risk at the source. For this reason, several engineering applications are carried out. For example, stopping the dusting by the effective ventilating methods in the
dusty environments and by keeping the environment wet is quite useful to avoid the diseases belonging to dust. Decreasing the level of noise by adjusting a machine making noise or operating the device in the closed system are also the examples of controlling at the source. In order to control the risks in the source, amongst the methods used the most, the methods like ventilation, covering, separating, or changing the technology used can be said. For the ventilating system to be able to be effective, it requires to move the harmful substance away from the environment by sucking through a level lower than the breathing level of the person. This type of ventilating is named local emptying ventilation.

2) Individual Protective Applications: Although the studies of controlling the risks from the source is the most effective approach for protection, opportunity cannot be found in every case. As well as all the effort is made for the control at the source, it can’t be to control the risk completely. In the cases like this, some applications can also be performed in order to decrease the employees’ getting effected. For example, if it is not possible to decrease the level of noise in a metal shop down the limit value permitted, you can benefit from the ear protectors. In the similar way, if it can’t be possible to control the dust completely in a dusty work place in spite of all the efforts, or if it isn’t possible to control a chemical substance at the source, different masks can be used. In fact, if the individual protective applications can’t assure the demanded output, it can require to be used for the other applications. A subject that must be considered here is that the individual protective applications mustn’t be the first solution to mind. Technical applications primarily being for the source should be fulfilled, in addition to them, when it requires, the individual protectors must also be used.

Watch Video-25: Importance of Individual Protective Equipments
3) **Medical Approaches**: About avoiding the occupational diseases, some medical approaches are also benefited from. The objective of the medical applications is to prevent the principal education and some clinics and persons to meet risk. However, in spite of all the effort, also the occupational diseases to be able to occur can happen in the early period with the clinics, and in this way, the possibility to recover can be increased. The medical approaches on avoiding the occupational diseases can continue with examinations to enter the work, distent control examinations, and health education.

4) **Administrative Measures**: In order to protect the employees from the dangers in the work place, the applications mentioned above are very important. However, sometimes, especially in cases the danger is more, some applications can also done administratively. Amongst them, decreasing the number of employees in the sections where danger is more, shortening the working time, or working in these sections alternately (with rotation) can be example for this subject.
Self-control questions

1. How would you explain occupational diseases?
2. What factors belonging to ergonomic factors contribute to occupational diseases?
3. Can you list so called controlling approaches to source of occupational diseases?
4. Does shortening the working time belongs to medical approaches?

Exercise

1. Which of the followings is a chemical caused occupational disease?
   A) Tuberculosis  B) Anthrax
   C) Brucellosis  D) Lead poisoning

2. Which of the followings is the most effective approach to protect from the hazards in the work place?
   A) Controlling the risk at the source  B) Using KKD
   C) Medical approaches  D) Administrative measures

The correct answer can be found at page 73.
Conclusion

In this chapter you have learned about what kind of occupational disease could workers in metal industry possibly suffer from. You are familiar with most dangerous items and most common reasons of diseases. You are aware of ways how the occupation diseases can be prevented.

Further reading

7. REFERENCES


• Construction Technology Area, Steel Structure Manufacturing Module, SVET, 2012.

• Metal Technology Area, Aluminium Joinery Course Modules, SVET, 2011.

• Metal Technology Area, Arc Welding Technics Course Modules, SVET, 2011.

• Metal Technology Area, Steel Structuring Course Modules, SVET, 2011.

• Metal Technology Area, Ironwork Course Modules, SVET, 2011.

• Metal Technology Area, Heat Treatment Techniques Course Modules, SVET, 2011.

• Metal Technology Area, Advanced Arc Welding Techniques Course Modules, SVET, 2011.

• Metal Technology Area, Advanced Metal Processing Course Modules, SVET, 2011.

• Metal Technology Field, Metal Surface Processing Course Modules, SVET, 2011.

• Metal Technology Area, Oxy-Gas Welding Modules, SVET, 2011.

• Metal Technology Area, Hot Shaping Course Modules, SVET, 2011.

• Metal Technology Area, Cold Forming Course Modules, SVET, 2011.

• Metal Technology Area, Basic Metal Forming Course Modules, SVET, 2011.

• ÖZAT Kemal, Determination of risks to be exposed to employees in a workplace manufacturing steel construction and determination of precautions to be taken, Occupational Health and Safety Specialization Thesis, Ankara, 2015


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# 8. ANSWER KEY

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Newsfeed Module for Metal industry
9. NEWSFEED MODULE FOR METAL INDUSTRY

Dear Students; the tools, materials, methods and technologies used in metal sector show alteration rapidly. The addresses of the sites that you can follow the developments concerning the metal sector in Europe and Turkey in the following links. By clicking these links, you can follow the developments on metal sector, the work accidents occurred, the measures taken currently, and update your knowledge.

Metal Industry in Europe

http://ec.europa.eu/social/main.jsp?catId=89&langId=en&newsId=664&furtherNews=yes
http://www.salute.gov.it/portale/temi/p2_4.jsp?area=Sicurezza%20lavoro
https://www.inail.it/cs/internet/multi/english.html
http://travail-emploi.gouv.fr/sante-au-travail/
http://www.securite-sociale.fr/La-direction-de-la-Securite-sociale-est-rattachee-a-deux-ministeres?id_mot=65
http://www.inrs.fr/
http://www.santepubliquefrance.fr/Infos/About-Sante-publique-France
Dear Students; The addresses of the sites where information, news and events are shared on work health and security in the following links. By clicking these links, you can learn the legislation of work health and security referring to the sector, have information about the accidents occurred and the measures taken in order to decrease the work accidents.

**Occupational Health and Safety News in Europe**

https://osha.europa.eu/
http://www.iloencyclopaedia.org/ohsnews
http://www.euro.who.int/en

**Occupational Health and Safety News in Turkey**

http://insaattaisguvenligi.com/
https://isgfrm.com/
http://www.isgforum.net/
http://www.isguvenligi.net/
http://isgtedbir.com/
http://www.isghaberleri.com/
http://www.osgbhaber.com/
http://www.osgbhaber.com/rss/
https://tuisag.com/isg-aktuel/isg-haberleri/
World Module for Metal Sector
10. WORLD MODULE FOR METAL SECTOR

Dear students; there are many educational games in the metal sector related to occupational health and safety in the world and in Turkey. A few of these are listed below. By playing these games you can improve your knowledge and skills on occupational health and safety.

http://www.pegneon.com/custom-games/

There exist two groups of games named Custom-Made Institutional Games and Serious Institutional Games in this site. In Serious Institutional Games, what you can do during fire is told, the player is warned, but in the group of Custom-Made Institutional Games, there are the games indicating the dangers occurred in the working environment. Language of the games is English.

Figure 1: Pegneon Games Login Screen

http://www.play-it-safe.co.uk/games

Figure 2: Login Screen of Play It Safe games
There are 8 games in this site about work health and security. You can enter in whichever you like from the games the language of which is English, and develop your knowledge on this field.

You can watch the video footages referring to the game named Fire Fighting Activity clicking on video.

https://www.convergencetraining.com/blog/10-osha-based-word-games-download

![Login Screen of Word Plays](image)

**Figure 3: Login Screen of Word Plays**

There exist 10 word plays referring to work health and security the language of which is English in this site, but you should be registered into the site in order to be able to download the plays.

http://www.oyungaleri.com/is-guvenligi-uzmani

One of the plays you can play free of charge on work health and security exists in this site. When you want to play this play named “Expert of Work Security”, you see a scripted work environment of a dangerous situation, and you are expected to escape that danger with the minimum loss.
This play which is both entertaining and informative on using the Personal Protective Equipment (PPE) is developed by the firm 3M, which produces Personal Protective Equipment, and its links exist in the sites about work health and security. You can play the play both on line through the site and download into your computer, and play with your friends in the environments not having internet. When you click on the link above, you will see the following play link on the bottom of the page opened.

Please click to play the play named **3M E-Game İSG – KKD.**

When you click on the play link, the play will be opened, and you will see four different working environment choices that you can test your knowledge about PPE’s. You can learn using the the necessary PPE’s for that work through game by clicking on the one you wish.
For example, when you click on Welding Shop, the dangers in the welding shop will be written on the top left corner of the screen opened. You are expected to choose the suitable PPE’s on the shelf for the employee in the welding shop not to be damaged from the dangers in the shop, and put them on the employee. Choosing the PPE’s, carrying and putting them on the employee can be easily performed by the Mouse.

**Figure 5:** Login Screen of Play named 3M E-Game İSG –KKD

**Figure 6:** The Play Named “Choosing PPE” Suitable for the Employee in Welding Shop
https://safety.blr.com/fun-games/

You can find many caricatures, puzzles, and fun things about work health and security in the site the address of which is given above. The only thing you should do is to be member of the site and to press the “GO” button by choosing the products you wish.

Figure 7: Login Screen of Safety Fun Games

https://www.osha.gov/hazfinder/index.html

When you click on the link above, you can enter into the site of United States Working Department. In this site, you can access many sources about work health and security in this site. One of them is the play named “Danger Determination Educational Appliance”. You can play the play the language of which is English on line if you want, or download into your computer and play if you wish. When you click to open the play, descreens will come against you first. After you do the suitable choice to your screen, press “Play” button.
You are presented four different scenarios in the play, and one of them is wanted to get chosen by you. These are Work Health and Security Visual Audit Education, Production, Construction, and Emergency Service. When you choose any working area, the equipments and materials related to that work and the dangers waiting for the employees in the screen to be opened.

**Figure 8:** Login Screen of Danger Determination Educational Appliance

The thing expected from you will be your determining the dangers and taking the necessary measures within the play. Since the rules are changed in every scenario, your reading these rules well and determining all the dangers

**Figure 9:** Danger Determination Educational Appliance Concerning Construction Workings
will be for your benefit. You can also approve some scenarios as employer or employee.

![Fact Cards](http://clewett.net.au/whs/study_mate/OHSfun.htm#)

**Figure 10:** Login Screen of Fact Cards

Click to Use Danger Determination Educational Appliance.

**http://clewett.net.au/whs/study_mate/OHSfun.htm#**

When you enter into the site, you see this message on the screen: “Click to Play the Following Plays Referring to Work Health and Security”. In the site, 8 plays exist in the field of work health and security. However, “adobe flash player” attachment in your scanner should be active in order to play them. The language of the plays is English. The plays existing in the site are as follows:

**Situation Cards (Fact Cards):** There are 13 cards in this play. You can ask your friend the question in each card, and you can play together mutually. In addition, you can mix the buttons and cards on the screen, and eliminate with the cards forward or backward.
Situation Cards + (Fact Cards Plus): The difference of this play from “Fact Cards” play is that you can choose the subject titles. The other rules of the play is the same.

*Figure 11:* Login Screen of Situation Cards + (Fact Cards Plus) Play

Flash Cards: The difference of this play from the other card plays is that the answer of the question exists on the back side of the card. If you wish, you can look at the back side with the “Flip Card” button.

*Figure 12:* Login Screen of Flash Cards Play
**Pick a Letter:** In this play, how many words and letters the answer of the question existing on the screen consist of is marked by line as follows. If the player can’t know the answer of the question directly, he / she takes letter from the alphabet above until finding the answer, and tries to find out the answer. Of course if he / she wishes, he / she can access the answer by “Show Answer” button.

![Login Screen of Pick a Letter Play](image)

**Figure 13:** Login Screen of Pick a Letter Play

**Fill in The Blank:** In this play, you are requested to write the answer of the question existing on the screen in the space constituted in the middle. If your answer is false, a new section is opened indicating how many words and letters the answer consists of below. You can check how much you have approached the answer here. In addition, you can find a clue by using the buttons in the screen or see the answer.
Figure 14: Login Screen of “Fill in the Blank” Play

Matching: In this play, you answer the question given in the big cartridge by choosing one of the 9 small boxes under the big box. If your answer is true, green “OK” sign appears on the screen and you can pass another question.

Figure 15: Login Screen of “Matching” Play
Crossword Puzzle: In this play, there are the groups of empty cartridges placed horizontally and vertically. Each cartridge group can correspond to the answer of one of the questions asked at the bottom of screen. While playing this play, you require to choose the cartridge group which word you will answer first, then to estimate by reading the question or assure the answer get appeared by taking letter. You can see the number of your true or false letter estimations on the screen.

Figure 16: Login Screen of “Crossword Puzzle” Play

Glossary: Glossary includes the explanation of the terms concerning work health and security. It is aimed to have knowledge rather than entertain. By clicking one of the letters above the screen, you can display the term beginning with that letter and its explanation and in this way you can renew your knowledge. If you wish, you can obtain more detailed
knowledge by writing the words you worry onto the google seek bar existing below the screen.

![Glossary Play](http://www.atksolutions.com/games/playwordsearch.php?id=3358&username=beetlebugz&gridsize=14x14&large=600x450)

**Figure 17: Login Screen of “Glossary Play”**

When you click the link above, a play is opened concerning work health and safety in the site. List of words exists in the field on the right side of play screen. In the big field, many irrelevant words together with these words are placed complexly. When the player sees the word looked for, he / she should sign it by holding from the first letter of the word till the end with the left button of the mouse, and assure to cross the word looked for. The language of the play is English.
When you enter into this site, there are 20 questions to test yourself on work health and security. You are given a 8 minute period to answer the questions. Receiving feedback at the false and true answers you have given will assist you to develop yourselves.
The site the link of which is given above has got many educational materials on work health and safety. Amongst them, there are the plays and funny measuring tests that you can play online. When you enter into the play named “PLAT IT SAFE”, you will be requested to decide one of the four different ways and to enter into it. These: Way 1: Dangers of gliding and stumbling, Way 2: Ergonomies, Way 3: Falling Dangers, and Way 4: Pavements.

![Figure 20: Screen of “Play It Safe” Play](image)

For example, when you choose Way 3: Falling Dangers, a scripted danger situation will appear on the screen. The thing expected from you is to determine the real dangers within the time given.
Figure 21: Screen of “Falling and Dangers at Construction” Play
11. Annotated Risk Terms Dictionary

**Wooden construction:** The construction made of the materials built from wood or woods.

**Field scanning sensor:** It is a safe security system used at presses. The field around the press is continuously scanned by the field scanning sensor. It sounds alarm, and makes the press stop running, when somebody enters into the scanned field.

**Flame holding valve:** It is the valve which prevents the flame sucked from the torch to pass through the feeder hose and reach at the regulator and tube at the gas and welding operation.

**Anchoring point:** It is the safe junction point that transmits the load of worker onto the construction while working at height.

**Acetylene:** It is a colorless, garlic smelling and hydrocarbon gas which burns very powerfully and by giving a white light.

**Acid steam:** It is the steam occurring as the result of the acid used which arrives at the evaporation temperature or its reacting with the material.

**Aspiration:** Sucking the dirty air by means of mechanical devices and providing the sufficient clean air.

**Priming:** It is the transaction of preparing the surface of metal material for the main paint with the priming coat. Priming coat is applied in order to protect the metal against rusting.
Purlin: It is the roof construction component which is fitted on the rafters. Purlins transfer the load of rafters onto the pillars at the free standing roofs and onto the king posts at the suspended roofs against flexion.

Reinforced concrete construction: The construction into which metal rods are implanted to resist the strength of flexion and pulling produced from concrete.

Drowning: Being the breathing tract of a person furred up by solid, fluid or gas, and the body’s being oxygen-starved.

Bonnet: The heading usually made of cloth, latex or silicon, covering the whole hair.

CNC: The trestle supported or controlled by computer.

Working platform: It is the OHS safe and available area where the worker stands and working is carried out at height. It can be moving or fixed.

Deformed: The pattern or shape is declined, misshapen.

Disassembly: Dismantling the machine and system in the way that it can be carried.

Electromagnetic field: An effect created by the particles which are alive around and which applies force on the other hot particles. This force can be perpendicular to pulling, pushing or line between.

Injection: The action of feeding a liquid into the canal or space by means of injector.
Fiber: The material obtained by compressing the plant grain having extensive usage area.

Photocell: The photo sensor that produces voltage proportionally to the light intensity fallen over.

Voltage: The force which moves the electrons against the electrostatic field force under the influence of which they are impressed. In other words, it is the potential difference between the two ends of a conductor. The unit of voltage is Volt. It is measured by Voltmeter.

Intricate: The thing undecipherably cluttered getting interpenetrated, interwoven, complicated.

Vision haze: The case of not being able to see clearly or seeing little when the eye structure of person can’t refract the light exposed sufficiently.

Eye wash solution: The protective safety material used at the injuries happened when the harmful chemicals damaging the eye health like acid, alkali, caustic are touched into eye or for cleaning the eye from the foreign matters penetrated in like wood, metal shavings, dust, dirt while working is called “eye wash solution”.

Eye lens: The lenticular transparent organ enabling the images of the objects in front of the eye and outside to fall over the retina.

Level of noise: The degree of sound pressure. The difference of atmospheric pressure changing during sound spread according to the balance pressure. Its unit is decibel (dB).

Safety PLC: The programmable logical control system used at the presses.
**Safety valve:** A sort of valve integrated in order to discharge the excess pressure of the device at the devices operating under pressure.

**Hydraulics:** The (machine, system, etc.) operating with the pressure of water or another liquid.

**Heat transfer plate glasses:** The personal protective equipment preventing the eye from getting exposed to torridity and sweating at the high hot working environments.

**Light barrier:** A confidential and defect-free safety system used at the presses. In this system, the light curtain is used like a key controlling the machine, and the hands and fingers of the people who work at the machines are protected.

**Light stress:** The enthusiastic and mental tension of the person caused by the light.

**İnert gas:** The gases which don’t react chemically under certain conditions. Inert gases and nitrogen don’t react with many matters in general.

**İris:** The layer consisting of a thin and contractible membrane and existing between the cornea and eye lens and encolouring the eye.

**İrritan:** Exhibitive.

**Scaffold:** The interim supporting structures erected by using platforms from wooden and metal materials for the construction, maintaining and repairing works at the necessary heights in order to satisfy the need of safe working area and transport.
Ionising: Ionising radiation. Any type of electromagnetic radiation having the quanums carrying enough energy to detach electron from the ionisable atoms or from the ionisable molecules.

Small current relay: The switch turning on the circuit when imbalance namely difference occurs between the phase and neutral conductors.

Carcass: The framing system carrying a building.

Cataract: The natural eye lens’ losing its transparency and becoming dull existing behind the pupil and enabling to see.

Getting Slippery: The ground’s becoming slippery by means of snow, ice, rain, water, or oily matters.

Infrared light: (IR, Infrared) The electromagnetic radiation the wavelength of which is far from the visible light, but which is shorter than the radiation and microwaves.

Chemical foam extinguisher: The fire extinguisher tube in which there exist protein or synthetic based, alcohol resistant and film former chemical foam. It is usually used at the fires of fuel oil and inflammable matter, and liquid chemicals.

Girder: The horizontal bearing element transferring the loads existing on a floor in a building onto the vertical carrier like wall and pillar.

Pillar: The vertical constructional component combining the floors at the storeys to each other.
**Concentration:** Increasing density; a substance’s becoming strong by losing the water in its composition.

**Construction:** Integrating by collecting more than one pieces together, constituting new formation.

**Cornea:** A transparent and sloping tissue formed to focus the light and to protect the eye from the external factors existing in front of the eye.

**Shoes having protective toes:** The work shoes produced with composite or steel padding toes in order to protect the toes in case of falling tools and materials.

**Chronic:** Continuing long term. Perpetual, protracted.

**Lead poisoning:** A serious medical situation occurring in consequence of the increasing lead in the blood at high level and causing fatal results.

**Dry chemical powder fire extinguisher:** The firefighting tube in which there is chemical powder. It is usually used at the mid and low heat fires. The most important characteristics of it is that it puts out fire by smothering the fire.

**LEL:** The concentration limit of the gases existing in the environment not constituting explosion or flash is named Lower Explosion Level – LEL). The LEL value of each gas is different.

**LPG:** (Liquid Petroleum Gas) The gas produced from petroleum and liquefied under pressure.
**Putty hardener:** Polyester is a chemical material used for hardening the putty and consisting of benzoyl peroxide.

**Puttying:** The process of decreasing the roughness of the metal surface by means of proper putty and assuring the surface smoothness.

**Safety data sheet of material:** The form having 16 constant titles constituting an important part of the studies to eliminate the risks of Worker Health and Work Security that can occur while using the chemical matters and storing them, prepared in order to inform the reader accurately and sufficiently, and explaining the hazards and risks of the concerned chemical matters and other information.

**Plunger switch:** A gear component having a conical structure used for tipping nozzle to the plunger.

**Suberication:** The cracking, enlargement, and erosion seen at the headings of hand tools like chisels, bush hammers, and hammers.

**Mask:** The personal protective equipment worn onto head in order to protect the health of eyes, face, mouth, and respiratory system while working.

**Mechanical filter dust mask:** The respiratory protective device designed to assure protection against the solid and liquid aeroceles / particles covering the mouth, nose and chin and consisting of filter material substantially.

**Rafter:** The roof belonging to the cover construction sitting on the purlins having 50 cm axis intervals sitting on the furring wood on the inclined roofs.

**Metal fume fire:** An acute fume appeared a few hours after breathing the particles of a metal or its oxides. The person who has had this situation has
irritation in the nose and throat, dryness, cough, head ache, malaise, trembling and fever.

**Ultraviolet ray:** The radiation that can’t be sensed by our eyes and the wave length is between 100 and 400 nm.

**Mucosa:** Mucous membrane. The membrane layer consisting of the cells flooring the canals and spaces inside the body. The internal spaces floored by mucosa gets in touch with the body canals going out.

**Non-ionizing:** The radiation which isn’t ionizing.

**Folding screen:** The moving framed curtain connected by the hinges to each other consisting of a few parts and used for separating some sections in the buildings.

**Inflammable matter:** The liquids and gases the flashpoint of which is low that can be evaporated under the normal conditions or existing as gas.

**Rusting:** Getting the surfaces of the materials like iron burned and oxidized when they contact with oxygen.

**Plate:** The planar surface or bench on which marking operations are carried out in metal plants.

**Pneumatic:** (The machine, system, etc.) operating with air pressure.

**Polyester putty:** The synthetic, fiber and plastic based surface putty having the features of semi-flexible, filling very well and sticking, that can be grinded. It is also known as steel putty.
Posture: The standing form of body. It indicates variety at statics and dynamics, but the true posture should be kept while standing and working.

Press safety valve: The valve that secures the air to be conveyed into the cluthing group at the pneumatic presses.

Procedure: All of the way and methods which require to be obeyed and kept at a business.

Radiation: Radiance

Reaction: Response

Risk: The danger to be damaged, the possibility of impairment.

The celluloid framed glasses: The personal protective equipment the frame of which is made of celluloid material to protect the eyes from the harmful substances.

Solvent: The liquid or gas matter that constitutes solution by dispersing a material. Nowadays, the most common dispersing material is water. The organic chemical materials are also used as solvent.

Spiral grinding: This machine named as grinding machine or jet motor is used for cutting metals and for grinding their surfaces.

Exposed: Being exposed

Torch: The Flame thrower tool which is used at welding operations while melting or cutting the metals.
**Conditioner:** The element which is used at the pneumatic systems making the air have the usable features within the system.

**Grinding Protector:** A metal shield which is used getting mounting around the spiral grinding to protect the user against the possibilities of the cutter or grinding tip of the spiral grinding’s working out or getting crashed while operating.

**Thermoplastic:** The plastic based material which softens when they are heated and hardens again when they are cooled.

**Rod:** The most important one of the mold accessories which assures the combination and mold setting at the molds of column and beam. It is also called mold material shaft.

**Grounding:** A vital precaution taken against a possible danger of electric leakage at the electrical devices. A simple system that assures the electric leakage to transfer into the soil through a conductor.

**Leggings:** A type of case made of cloth or leather which is wrapped from the upper side of the shoes up to the lower part of the leg.

**Overalls:** The dress whose part of chest and trousers is connected. Work clothing.

**Warning and caution plate:** The plate on which there exist the signs warning about a case that can cause a danger or damage.

**Loss of limb:** An organ’s getting completely removed from the body. Arm and leg rupturing, etc.
**Inflammable matter:** The matter which burns and spreads heat around when it is heated at its burning temperature as result of combining with oxygen

**Life line:** The vertical and horizontal system which is used at all the fields when there is possibility for the person working high to fall, primarily to prevent the falling, and to minimize the shock load that will effect the body of the personnel by means of force absorber systems when falling occurs.

**Managerial:** Concerning management.

**Face shield:** The personal protective equipment used for protecting the eyes and face from the harmful and poisonous matters by wearing on the head and covering all the face transparently.

**Emery:** The abrasive tool which is used for burring on the surfaces of metals before painting operation.
“OccuSafeInCMIS – Occupational safe and risk control in construction and metal industry sectors” is an Erasmus+ strategic partnership involving five organizations of various type: OSTIM MESLEKI VE TEKNİK ANADOLU LİSESİ (Turkey), EUROPEAN CENTER FOR QUALITY OOD (Bulgaria), CIAPE – CENTRO ITALIANO PER L’APPRENDIMENTO PERMANENTE (Italy), TECHNCAL UNIVERSITY OF KOSICE (Slovakia).

The project aims at making contribution to both vocational high school students and employees & employers in construction and metal industry sectors in terms of developing their basic and transversal skills using innovative ICT based methods as well as raising awareness. Indeed, one of the main problems of labour market consists in occupational health and safety (OHS). According to current International Labour Organization (ILO) data, in 2.8 billion labour force, 340 million occupational accidents happen and 2 million people are dead due to these accidents all over the World (ILO, 2013). Beside the costs for employee and employer, occupational accidents also have costs for national economy. For this reason it is essential to act in line with the motto “preventing is cheaper and more humanistic than paying”.

Thanks to the project “Occupational Safety and Risk Control in Construction and Metal Industry Sectors” loss of labour force and production will be reduced. The aim of the project is to contribute to vocational education with the aspect of occupational health and safety. Importance of occupational health and safety is increasing both in Europe and Turkey. In terms of awareness, however, vocational education institutions are not at the desired level in Turkey. Occupational Safety and Risk Control in Construction and Metal Industry Sectors project shall aim to increase the awareness of occupational health and safety among the students of vocational schools, employees and employers and to increase the implementation capacity of EU acquis in Turkey.