

HIGHER TECHNICAL INSTITUTE

MECHANICAL ENGINEERING DEPARTMENT

DIPLOMA PROJECT

SAFETY MEASURES AND PROCEDURES

IN A METAL WORKING INDUSTRY

M / 789

BY: CHIOTIS KYRIAKOS

JUNE 1997

SAFETY MEASURES AND PROCEDURES IN METAL WORKING INDUSTRY

**PROJECT SUBMITTED BY:
CHIOTIS KYRIAKOS**

**In part satisfaction of the conditions for the award of Diploma of
Technician Engineer in Mechanical Engineering of Higher
Technical Institute of Cyprus**

**PROJECT SUPERVISOR: Mr. D. Roushias
Lecturer
H.T.I.
TYPE OF PROJECT: Individual**

JUNE 1997

HIGHER TECHNICAL INSTITUTE	PROJECT NO 2713
----------------------------------	--------------------

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	
SUMMARY	
INTRODUCTION	
1.0. LAYOUT OF THE MACHINES IN THE FACTORY	1
2.0. DRILLING MACHINES	3
2.1. INTRODUCTION	4
2.2. RISKS OF ENTANGLEMENT	5
2.2.1. Hair	5
2.2.2. Gloves	5
2.2.3. Bandages and Rings	5
2.3. GUARDING	6
2.4. METHODS OF SAFEGUARDING	6
2.4.1. Adjustable Guard Attached to a Fixed Part of the Machine	6
2.4.2. Collapsible guard attached to the Quill	7
2.4.3. Combined Guard and Jig	7
2.5. PROPOSED SAFEGUARD	8
3.0. SAFETY IN THE USE OF PRESSES	17
3.1. INTRODUCTION	18
3.2. GUARDING METHODS FOR PRESSES	19
3.2.1. Automatic Guards	19

	Page
3.2.1.1. Automatic Push Away Screen	18
Guard	20
3.2.2. Interlocked Guards	21
3.2.2.1. Screen Guards	22
3.2.2.2. Clutch Interlock	22
3.2.3. Electrosensing Devices	24
3.2.4. Enclosed Tools	25
3.2.5. Static Fixed Guards	26
3.3. MAINTENANCE OF PRESSES	27
3.4. PROPOSED SAFEGUARD	28
4.0. ARC WELDING	29
4.1. GENERAL	30
4.2. WELDING EQUIPMENT	30
4.3. PROTECTIVE CLOTHING	31
4.4. CHIPPING, CLEANING AND GRINDING	32
4.5. WELDING AND CUTTING AS A FIRE CAUSE	32
4.5.1. Precautions Recommended	32
4.6. EXPLOSION HAZARD	33
4.7. STORAGE OF CYLINDERS	33
4.8. USE OF CYLINDERS	34
4.9. HANDLING THE CYLINDERS	35
5.0. CRANES, DERRICKS AND HOISTS	36
5.1. DESCRIPTION OF FUNCTION	37
5.2. OVERHEAD TRAVELING CRANE	37
5.3. SAFETY THROUGH DESIGN	38

	Page
5.4. SAFETY IN OPERATING	38
5.5. HANDLING THE LOAD	39
5.6. STANDARD SIGNALS	40
5.6.1. One-hand Signals	40
5.6.2. Two-hand Signals	41
5.6.3. Whistle Signals	42
6.0. INSPECTING FOR SAFETY	45
6.1. INTRODUCTION	46
6.2. POINTS THAT SAFETY INSPECTIONS PROVIDE FOR	46
6.3. STEPS IN A SAFETY INSPECTION	47
6.4. INSPECTION TIPS	48
6.5. WHAT TO CHECK IN A SAFETY INSPECTION	48
7.0. PERSONAL PROTECTIVE EQUIPMENT	50
7.1. SELECTION OF EYE AND FACE-AND-EYE PROTECTIVE DEVICES	51
7.2. EYECUP GOGGLES	52
7.2.1. Cup Type	52
7.2.2. Cover-Cup Type	53
7.3. HELMETS AND HAND SHIELDS	54
7.4. EAR PROTECTION	56
7.4.1. Inserts or Plugs	57
7.4.2. Muffs	57
7.4.3. Helmets	57
7.5. FOOT PROTECTION	58
7.5.1. Safety Shoes	58

	Page
7.5.2. Foot Guards	59
7.6. ARM AND HAND PROTECTION	60
7.6.1. Gloves and Mittens	60
7.6.2. Hand Pads, Finger Cots	61
7.6.3. Sleeves	61
7.7. BODY AND LEG PROTECTION	61
8.0. SAFEGUARDING MACHINERY	64
8.1. AREAS REQUIRING MACHINE GUARDING	65
8.2. REASONS FOR MACHINE GUARDING	65
8.3. FUNCTIONS OF THE IDEAL GUARD	66
8.4. CONSTRUCTION DETAILS	66
9.0. WORKING ACCIDENTS	68
9.1. ACCIDENT CAUSES	69
9.2. ACCIDENT FACTORS	69
9.3. PERSONAL FACTORS	71
10.0 INVESTIGATION OF ACCIDENTS	72
10.1 PURPOSE OF ACCIDENT INVESTIGATION	73
10.2 ACCIDENTS THAT SHOULD BE INVESTIGATED	73
10.3 SIX QUESTIONS TO ANSWER AS THE BASIS OF ACCIDENT INVESTIGATION	74
10.4 SPECIFIC INFORMATION THAT SHOULD BE OBTAINED	75
10.5 DESCRIPTIONS BY WITNESSES	75
10.5.1. Unsafe conditions	75
10.5.2. Unsafe Acts	76

	Page
10.5.3. Corrective Action	76
10.6. WHO SHOULD INVESTIGATE?	76
10.7. PRINCIPLES WHICH SHOULD BE OBSERVED	76
11.0. RESPONSIBILITY OF SAFETY OFFICER	78
11.1. SUPERVISORY RESPONSIBILITY FOR SAFETY	79
11.2. WHAT THE SUPERVISOR SHOULD KNOW	79
11.3. HOW TO SUPERVISE FOR SAFETY	80
11.4. HOW SAFETY PAYS OFF FOR THE SUPERVISOR	80
11.5. SOME WAYS A GOOD SUPERVISOR PUTS SAFETY TO WORK	81
12.0 ERGONOMICS	83
12.1 INTRODUCTION	84
12.2 ARRANGEMENT CONSIDERATION	85
12.2.1. Instruments and Controls	85
12.2.1.1. Ergonomics Applied to Instrument Design	85
12.2.1.2. Ergonomics Applied to Machines and Controls	87
12.2.2. ERGONOMICS APPLIED TO THE LAYOUT OF A WORKPLACE	88
12.2.3. WORKING ENVIRONMENT	91
12.2.3.1. Noise	91
12.2.3.2. Precautions Against Noise	91
12.2.3.3. Heating and Ventilating	92
12.2.3.4. Air Conditioning	93

	Page
12.2.3.5. Heating Methods	93
12.2.3.6. Lighting	95
13.0. COST ESTIMATION	96
CHECK - LISTS	
REFERENCES	

ACKNOWLEDGMENTS

I would like to express my thanks and gratitude to my project supervisor, Mr. D. ROUSHIAS, lecturer in Mechanical Engineering Department for his guidance and help given throughout the project.

My thanks extend to the Management and Personnel of N. CH. FESSAS Industry as well as to the officers of the Ministry of Labour for their continuous help and information.

I also strongly feel the need to thank my family that provided me the psychological support for the development of the project.

SUMMARY

This project deals with the design and safety measures and procedures in a Metal Working Industry (N. CH. FESSAS LTD).

The objectives of this project were:

1. To study the methods of safety in a metal workshop factory.
2. To get full acquainted with the factory act regulations and draw up plans for implementing them.
3. To investigate all safety guards and any existing safety precautions.
4. To improve safety measures and design equipment for a better safeguard of operators and other personnel.
5. To write up safety rules for individual cases.
6. To write up procedures and responsibilities for a safety Officer and to design chars for possible communications with management and operatives.
7. To estimate the cost involved in designing and implementing the safety procedures and equipment.

INTRODUCTION

This project deals with the design of health and safety procedures for N. CH. FESSAS Industry.

Every year serious industrial accidents happen. These accidents occur due to the ignorance of the workers about the hazards, that exist, when they operate a machine. The other factor that causes accidents, is the attempts of the employers to increase the efficiency of production without taking the appropriate safety measures and actions, because employers consider safety as an obstacle to production or waste of money.

In this project suggestions are made in order to prevent N. CH. FESSAS Industry from accidents.