EVALUATION OF ENVIRONMENT, HEALTH AND SAFETY ISSUES OF A FLOUR MILL, PAKISTAN

Researcher:
Aneela Iqbal
Roll No. 27
Reg. No. 27/FBAS/MSES/S08

Supervisor:
Dr. Rashid Karim

Department of Environmental Science
Faculty of Basic and Applied Sciences
INTERNATIONAL ISLAMIC UNIVERSITY
ISLAMABAD

EVALUATION OF ENVIRONMENT, HEALTH AND SAFETY ISSUES OF A FLOUR MILL, PAKISTAN

ANEELA IQBAL

Roll No. 27

Submitted in partial fulfillment of the requirements for the MS degree in discipline Environmental Science at the faculty of Basic and Applied Sciences, International Islamic University, Islamabad.

Supervisor

Dr. Rashid Karim

Month, Year

30th August, 2010

DECLARATION

I hereby declare that the work presented in the following thesis is my own effort, except where otherwise acknowledged, and that the thesis is my own composition. No part of the thesis has been previously presented for any other degree.

Aneela Iqbal

Dedicated to

Those who live in my mind. In my heart through the Whole span of my life. And are nearest, dearest and deepest to me.

Special dedication *Most respectfully*
And
In the name of Allah
To
The Holy Prophet Muhammad.
(Sallallaho alaihi wa sallam)
The refulgent sun
Of
Piety, Truth, Justice, Love selflessness, wisdom and beauty,
Who came as
The last Prophet and messenger of Allah
To entire humanity
For teaching they way whereby to combat
All spiritual, Moral, Intellectual, Economic and Political Evils
And
To achieve
The most glorious and Comprehensive Success,
And
Who accomplished
What stand up to this day as
The noblest and tha Most Profound Revolution
In human history
through
the Impact of
his Superbly-Dynamic and Hunamly-prefect personality
and through
the Holy Quran,
which was revealed to him by Allah
to function as
The Basic Instrument of his Aniding Mission.

(Acceptance by the Viva Voce Committee)

Title of the Thesis: Evaluation of Environment, Health and Safety Issues of a Flour Mill, Pakistan.

Name of the Student: Aneela Iqbal

Registration No. 27/FBAS/MSES/S08

Accepted by the Faculty of Basic and Applied Science, Department of Environmental Science, International Islamic University, Islamabad in partial fulfillment of the requirements for the MS degree in Environmental Science.

Viva Voce Committee

Dean

Chairman

External Examiner

Supervisor

Member

Dated: 30th August, 2010

ACKNOWLEDGEMENTS

First of all thanks to "Almighty Allah", who enabled me to do each and every thing I wanted in my life. Who is always there to help me with all the best that life can ever hold for me. After Almighty Allah, I also pay humble homage to the greatest prophet Hazrat Mohammad (peace be upon him) who enabled us to recognize our creator and who is a source of guidance forever for me and for humanity.

This manuscript is the eventual end of my all-embracing journey in attaining my degree of MS-Environmental Science. I have not trekked in a vacuity in the voyage. I would definitely like to express my feelings of extreme thanks, respect and love for "my parents", "Grand ma" and "Grand pa" who brought me up with all their love, care and best efforts so that I am able to do whatever I like. I must say; that without their unending prayers, support (moral and financial) and confidence, I was nothing.

Thanks are due to worthy supervisor, "Professor Dr. Rashid Karim" for his extra kind, nice, encouraging and supporting behaviour throughout the academic session. For raising meaningful discussions and debates to increase our knowledge during the study period and apart as well.

I want to give special credit and thanks to "Parrii" for everlasting care, love, friendship, encouragement, support and numerous fruitful suggestions.

Un-expressible thanks are due to all family members, who have been patient and consistent supporters. They bear me and my stupid behaviour towards study. Thanks a lot to my loving brothers "Irfan", "Kami", "Immi", "Addi" "Channi" and loving sisters "Shani", "Marroo" and "Bana".

Especially "choozi aapi" and "loligo" the little masters always taking my pains away with

their innocent giggles.

Thanks to my friends "Aati", "Meena", "Tahira" and "Ali" who always cooperated with me and always remember me in their prayers.

Special thanks to all my class fellows who have always been very kind and helpful to me, who are always there to give me good company.

Thanks to my all-respectable teachers specially Dr. Irfan Khan, Dr. Rashid Saeed, Dr. Zafeer Saqib, Dr. Naeem Ali and Sir Tariq Rafique for their guidance and affection throughout the session. May God bless them with good health and long life! (Ameen)

Aneela Iqbal

CONTENTS

LIST OF TABLES

LIST OF GRAPHS

LIST OF FIGURES

LIST OF ABBREVIATIONS/ACRONYMS

EEC	European Economy Community
EOBI	Employees Old-age Benefits Institution
HSE	Health Safety and Environment
HSE MS	Health, Safety and Environment Management System
ISO	International Standard Organization
$KMNO_4$	Potassium Permanganate
MSDS	Material Safety Data Sheet
NEQS	National Environmental Quality Standards
OHS MS	Occupational Health and Safety Management System
PPEs	Personal Protective Equipments
RSI	Repetitive Strain Injury
SPASE	Small Plants-Assistance with Safety and Environment
UK	United Kingdom

ABSTRACT

The aim of this study was to identify the potential health and safety hazards faced by the employees in a flour mill of a developing country. The flour milling facility under study was producing ca. 250,000 tons per annum industrial grade wheat flour. The moisture content of wheat grain at the time of milling ranged between 8 and 10%. This necessitated the needs to increase the moisture content of the grain to around 15% at milling time. The strength of employees during milling period ranged between 80-100. The electricity needed to run this 200 tons capacity mill was 100 KW. All employees are insured through Old Age Employee Benefit Institution (EOBI) for which the employer contributed Rs. 300/month/employee and deducted insurance charge of Rs. 60/month/employee. The factory environment, in management view's was conducive by keeping room, air, water and odor within permissible limit. Sharpening of rollers was maintained within the chiseling limit of 37mm. However the factory did not had Material Safety Data Sheets, Maintenance Records and safe keeping arrangements of chemicals within the milling premises. Water sprinklers and smoke detectors were also not installed. Fire extinguisher though outdated remained displayed without instruction. The National Environmental Quality Standards (NEQS) standard for drinking water were not followed and instead drinking water was treated only with $KMNO_4$ (Potassium Per Manganate). The health and safety conditions of the facility were very poor for which proper Environmental Mitigation and Monitoring Plan has been developed. Adherence to the proposed mitigation measures by the study will further improve the health and safety of the workers and the working environment of the employees.

CHAPTER 1

INTRODUCTION

The planet earth is a place that can be damaged irreparably if we do not take a very good care of it. But to protect it from damages, is a very difficult task as constant industrialization is required to meet the needs of growing population and the present trend of industrialization has been contributing more in damaging the earth. In this scenario it is required that industries should be pressed to improve its health, safety and environmental record. In case of industries this provides a double benefit, along with achieving Government standards it helps in the greener business enhancement as now a day's expenditures for health, safety and environment are even more than the cost of doing business to be gradually paid. In this greening of business, health, safety and environmental auditing has become a powerful tool, with its theory and recognized techniques. The awareness and provision of value to human and environment has grown rapidly in the past three decades and has enhanced an internal evaluation tool. A large number of industries in North America, Europe, Latin America and Asia now have effective environment, health and safety audit programs in place (Harrison L., 1995)

Food industry especially flour mill employees are in direct exposure to a lot of health and safety hazards and mechanical work injuries contribute more in this regard due

to type of equipment used in such industries. e.g., knives, mechanical slicers and choppers, smoothness of floor with more chances of slippage, explosions, fires and entrapment, Fork lifters etc., there are some other factors that enhance the chance of health and safety hazard e.g. younger, older or in experienced employees and high job turn over (Raymond, *et al*, 2003).

Reports from employers do not include occupational ill health; the analysis can only cover safety. But experience from the industry suggests the occupational ill health priorities are likely to be:

(a) Chronic ill health from manual handling, e.g. of bags and plant, and repetitive strain injury (RSI), e.g. from packing;

(b) Occupational lung disease from grain and flour dust exposure;

(c) Noise-induced hearing loss from noisy areas in mills.

In 1991-92 the overall incidence rate, that is the number of injuries per 100,000 employees, were 171 for major injuries and 1943 for injuries causing over a three day absence (03D), totaling 2,114 overall.

Before 1989-90 the flour and grain milling industry had a relatively high rate of injuries, especially major ones, making it one of the most hazardous sectors in the food industry. However, since then the performance has improved significantly. Overall the rate has been halved and now approaches the average for general manufacturing as a whole (HS Information Sheet, UK, 1997).

The following Table 1.1 gives the relationship between cause, relative importance and significant factors involved in injuries as reported by United Kingdom's health and safety journal.

Table 1.1: Cause, Relative Importance and Significant Factors Involved in injuries

Cause	Relative Importance	Significant Factors
Handling	22% of all reported injuries.	60% of injuries where the case was specified from heavy items rather than awkward (11%) or sharp (15%). Bags account for most injuries, especially to drivers and packers, but maintenance lifting is also important.
Falls	17% of all injuries, but the main 32% cause 35% of major injuries higher than usual in industry.	Involved ladders (20% of which led to major injuries). 20% involved stairs and 18 % vehicles (40% of which are major).
Slips and trips	16% of all injuries, but the third main cause of major injuries (16%).	Slips and trips occur in equal numbers, tripping proportion was higher than usual. The causes were evenly split between those caused by obstructions and unevenness.
Struck by falling or moving objects (including handling tools	13% of all injuries	50% by moving objects displaced and only 17 % from hand tools.
Exposure to harmful substances	10% of all injuries, about three times the all industry average rate	75% were from the release of substances
Machinery	9% of all injuries, but the second main cause of major ones (22%)	48% of specified injuries were at conveyors and 14% at transmission machinery. other important machines were mixers, roller mills and rotary valves
Striking against objects while moving	7%	
Transport	2%	90% involved fork lift trucks
Fire	1%	
Electrical	1%	

Source: HS information sheet, UK 1997

From the Table 1.1 it is estimated that provision of occupational health and safety management system (OHS MS) is very important in case of flour mills to reduce the work loss and improve employees efficiency by good management practices.

Although it is also suggested that all industries should follow OHS MS and establish that in their facility, for this purpose Makin and Winder in 2008 stated that, the advantages of establishing occupational health and safety management systems (OHS MS) have been totally restricted to large scale industries especially from the manufacturing sector. And to deliver these benefits to the small or medium sized enterprises faces a lot of difficulties with the mechanics and the officialdom of the system. Makin and Winder in their work presented a conceptual framework for ensuring the implementation of the OHS MS for assembling the advantages of three major control approaches that arise for minimizing the work place hazards; safe place, safe person and safe systems. The main idea behind was to abridge the process of implementation and get apparent benefits of OHS MS. They were of the view that without knowing the complete profile and activities/processes of an organization it is not possible to effectively construct and implement an OHS MS, and obviously compliance procedures will be of minor impact on the overall safety performance.

The study provides an insight to all of the processes in a flour mill and has identified the potential risks posed to work force.

1.1 Aims and Objectives of the Study

For evaluation of occupational health and safety condition in Punjab Flour Mill present study is designed and the study is focused on the particular objective of identification of Environmental Health and Safety Issues in a Flour Mill in a developing country (Pakistan) and after identification, assessment of various possible measures to reduce potential occupational health and safety risks has been provided. The main objective was

- To evaluate all possible risks to the environment, and occupational health and safety of the employees at the Punjab Flour Mill, Rawalpindi
- To assess various measures to eliminate or minimize risk to employees at the Punjab Flour Mill, Rawalpindi.

1.2 Significance of the Study

Safety programs at work place help employers and employees to maintain an efficient and progressive industry. An effective safety program will improve job performance and reduce the chances of personal injury and property damage. An equally important goal is to help citizens find ways to create safe workplaces. Everyone benefits from working together for safety. The Occupational Safety and Health plan holds the employer responsible for the safety of its employees. In general, the employer must furnish its employees conditions of employment and the place of employment free from recognized hazards that are likely to cause serious injury with applicable standards. The employees are also responsible for their safety and health. Employees must know, understand and

follow guidelines and standards that reduce their chances of being in an accident. Failure to become an active partner in safety and health will expose the employee to accidents and losses. Management and employees of feed and grain mill facilities should recognize that an effective accident mitigation and prevention program requires a team effort by all personnel. The employees are the key to program effectiveness, based on their acceptance, compliance and commitment with the safety program. Management should encourage employees to participate actively in the safety program of the facility (Work Sheet, 2009).

CHAPTER 2

LITRATURE REVIEW

Amyotte and Eckhoff in 2010 gave an overview of the dust explosion and their mitigation, in relation to the explosibility parameters. (e.g., maximum explosion pressure and standardized maximum rate of pressure rise). In this paper causation is explained by means of the fire triangle and the explosion pentagon, and standard risk reduction measures are placed in a hierarchical arrangement incorporating inherent safety, passive engineered safety, active engineered safety, and procedural safety. The importance of safety culture and a safety management system approach are emphasized by reference to an industrial case study, So the study provides the identification of major risks posed due to dust like Asthma, fire etc, it also provides applicable mitigation measures to control the chance of being in an accident.

According to a study made by Eckhoff in 2004 in wheat processing industry it was suggested that dust explosions practically always start inside process equipment as mills, mixers, classifiers, conveyers, and storage silos and hoppers. The ease of dust cloud ignition and the combustion rates depend on various factors like primary particle size distribution, degree of de-agglomeration, dust concentration distribution and cloud turbulence ultimately influencing the ignition sensitivity and explosion violence of dust clouds. In the paper safer process design to prevent accidental dust explosions and some consequences of the mentioned factors in design of mitigatory measures such as

explosion isolation, explosion venting, and automatic explosion suppression, are discussed. The role of powder science and technology in understanding development and propagation of secondary dust explosions was also considered. The study looked for the behavior of the processing unit employees and supervision by authority staff for the control of dust related problems.

It is a common fact that the industries engaged in export take a very good care of their health and safety concerns because they are abided by the countries being importing there manufactured material. A study by Kongtip, *et al.,* in 2008 has proved that most of the small and medium sized enterprises in Thailand had better Health and Safety Management System. They obtained information related to employment, education and awareness about health, medical facilities, and accidents ratio and safety activities. They had chosen the mainly exported goods over a period of last five years (2000-2004). They found that all those enterprises that are involved in the export of products take very good care of health and hygiene of their employees. And according to supervisors opinion their production has increased about 50% after implementation of the OHS MS in their industries. So the present study is a step forward to aware the management of flour mill about the safety concerns faced by their workforce and if they intend to export, the in hand information will be help full for them.

Hovdan, *et al.,* in 2008 studied the OHS MS in Norwegian oil and gas industry and examined the role of safety representatives in today's working environment. Their target was to scrutinize the working environment sway on the employee's health and safety as depicted by believes and views of the safety representatives and their managers.

The safety representatives were appointed to manage the health and safety of the employees, their main task was to deliver the safe work practice and look for the established OHS MS for gaps. The safety representatives were of the view that to promote a safe work place culture in the industry there is a dire need of daily and continuous health and safety consultation. According to him the climate of such consultation was less favorable to attain the overall objectives of OHS MS. The results depict that there is a requirement of improvement between the identified problems in the role of representatives and proposed progress in their roles and functions. They even suggested that the difference of opinion must be settled down as it could possibly be a threat to safety. To overcome this issue regular meetings are required for drawing a conclusion. Both the parties must understand each other point of view and accept the safety representative contribution for safety performance. The present study suggests that gaps between the supervisory staff and other employees should be minimized to overcome the problem of negligence for health and safety rules.

In 2008 Duijm, *et al.* reviewed the existing condition of Industrial OHS MS in European Union member states with special emphasis on incorporation of Health and Safety Environment in single management system. Their findings had provided impending trends and requirements for development. They also depicted the behavior of industries as most of the industries are of a mind for goal based HSE MS. They evaluated that existing management systems should be proficiently integrated with health and safety programs for the best performance to avoid accidents in the industry. Present study

provides an insight for the integration of management system with health and safety program to minimize the rate of accidents.

Mearns and Reader in 2008 investigated an ever un-investigated relationship between organizational uphold of safety and safety upshot. They described that behavior of employees towards safety reflects the importance and attention provided by the industry for the care of their employees. If organization is more concerned about the safety conditions at the work place then employees will also be more conscious and their behavior towards safety will also be positive. They showed that broad-spectrum stress from the organization will impose upon the supervisors and supervisors in specific way support the safety situation in the industry hence behavior of the employees is more a reflection of organizations importance provided to safety at work place. And this is also true for the facility under study as no strict supervision is there so employees did not care about their safety and there is a dire need to change their behavior with workshops and trainings.

Hamalainen, *et al.,* in 2006 estimated the occupational accidents worldwide and concluded that information about the accidents in not consistent throughout the world. And the developing countries did not have trustworthy information as be deficient in proper documentation and notification procedures established in their industries. They reported the approximate accidents of 175 countries. There estimation was based on data from selective countries of eight different regions and it provided a base line for comparing different countries and regions for perceiving improvements in safety of employees and work place. According to them estimated incurable occupational

accidents were 350,000 and there were 264 million curable accidents. These estimated numbers can be helpful for the government in decision and policy making. The present study suggests that like all other industries in the world the facility under study should also keep their health and safety record and seek for ways to reduce the accident ratio.

Gingras, *et al.,* in 2006 studied the contribution of occupational health and safety interventions. The intercession made was then observed for there acceptance, modification requirement and implementation. The study showed positive results with effective preventive mediation. So possible suggested mitigation measures can be help full for the control of occupational health and safety problems.

Habibullah and Rajnarayan in 2004 have worked on the rapid industrialization triggered occupational health related issues in India. Agriculture being the main employment of about 58% of Indian people comes with occupational concerns like silicosis, pesticide poisoning and musculo-skeletal injuries while coal employees have to suffer from pneumoconiosis, chronic obstructive lung diseases, asbestosis, byssinosis and noise induced hearing loss. For better occupational health management measures such as creation of advance research facilities, human resource development, formation of environmental and occupational health cells, and development of database and information system should be taken.

For measuring the employees efficiency and factors that contribute in enhancement of efficiency level under health safety and environment programs a study was conducted by Shikdar and Sawaqed in 2003 for selected industries in a developing

country. Fifty managers from different industries reported that 54% hot environmental conditions, 28% noisy environment and 26% unavailability of sources are the cause of less production and efficiency of the employees. Majority of the employee's complaint about tiredness, pain in different body parts and headache. The lack of awareness to ergonomics was estimated to be 88% as 94% of the industries did not pay attention to the ergonomics. A deficiency of skillfulness in ergonomics, training, communication and proper sources may be the factors to effect poor employees working ability. The study in hand provides the major problems raised by the employees during the work.

Cullinan, *et al.,* in 2001 estimated the incidence of IgE sensitization and allergic respiratory symptoms in flour mill and bakery employees in UK, as a function of flour aeroallergen and dust exposure. Using questionnaire and personal sampling techniques to estimate flour aeroallergen and inhaled dust exposure, in a population of 300 new employees for a median (range) of 40 months, they found work-related eye/nose and chest symptoms were 11.8 and 4.1 per 100 persons per year. Positive skin prick tests to flour and α-amylase were 2.2 and 2.5 cases per 100 persons per year. Atopic employees were more likely to develop a positive skin prick test—but not work-related symptoms. These findings were unaffected by age, sex or cigarette smoking. They concluded that although average dust exposures were within current occupational standards, the risks of development of respiratory symptoms and of specific sensitization were clearly related to total dust and/or flour aeroallergen exposure.

To tackle the environment, health and safety issues in small sized processing plants a European project has been launched namely Small Plants-Assistance with Safety and

Environment (SPASE). Ringdahl, *et al.,* in 2000 selected five countries and circulated the questionnaire, although the response was quite low yet the approach to OHS MS was positive and most of the industries showed proclivity to work for OHS MS. Their results showed that small or large size of industry did not appear to be a major factor in problems regarding OHS MS, although they did have quandaries. They recommended that size of industries should not be focused but more emphasis should be given to the industries with problems for establishing the safe work place for employees. The present study concludes that establishment of OHS MS is necessary for all industries whether large, medium or small scale.

Shaikh in 1999 described the limits of occupational noise in industries for developing countries. He considered the occupational noise as a threat to the environment of industrial plants. He mentioned the exposure limits range allowed by the International Standard Organization (ISO), European Economy Community and other developed countries i.e 90-85dB (A) L_{eq} for 8 hr/day (40hr/ week). Since he point out that in developing countries majority of the industrial plants operate for the 8hr/day or 6days/ week. So he proposed a different limit i.e. 88dB (A) L_{eq} with halving rate of 3 dB(A).

Analysis of relationship between supervisor's behavior in accident prevention and usefulness of OHS MS was established on the data from 100 manufacturers by Simred and Marchand in 1994. They assessed the capacity of workforce for development of safe work place in coordination with supervisors. And concluded that to reduce accidents rate OHS MS works very efficiently and for the progress of industry.

Menckel, *et al.,* in 1993 studied the long-term effects of two group (accident investigation and review) routines on accident prevention activities and accident statistics. This was the continuation of their previous three year work at a company, extending to additional 8 years. The investigation group assisted foremen in their accident investigations while the review group kept a check on the implementation of accident prevention measures. Compared to previous three years proposals for counter measures increased by 19 %, accident frequency decreased by 10% while accident severity decreased by 35% during the period the routines were used. The improvements were prominent during first five years. Since the routines begin with minimal instructions and assistance and were taken positively by the foremen and persons involved so they can be of benefit to other companies as well.

Dusts from wheat and other grains as well as flour ignite and propagate flames readily because the source of heat required is relatively small. According to Theimer in 1973 more than 50 % of all combustible dust explosions in United States have occurred in grain elevators and flour mills. The author analyzed the conditions and causes of dust explosions to determine the critical concentrations of dust in air and the temperature necessary to trigger a dust explosion. He suggests adopting preventive measures as well as structural design adaptations to prevent injuries, deaths as well as material loss worth millions of dollars.

A survey and summary of review was conducted on industrial noise and hearing. Effect of noise on production, upon employees with special emphasis on deafness and compensation paid to the employees for hearing loss and measures for reducing or

mitigating noise was described by Sleight and Tiffen in 1948. They suggested the control measures for the noise reduction in the industries for the health and safety of the employees.

CHAPTER 3

MATERIALS AND METHODS

Punjab flour mill is a five storied mill acquiring an area of 32 Kanals and 9 Marlas and is located in Rawalpindi. It has three main sections which are not very close to one another. The three main sections are

- Administration Block
- Flour Mill
- Employees Colony

During the survey of the Punjab Flour Mill one to one interview method was used to collect the data from the employees and the employer. The employer was asked for a number of questions. The questionnaire of the employer is given as Annexure 1 (A).

The work staff was divided into three main sections and a number of persons from each section were interviewed. The three main sections are as follows;

- Administrative staff.
- Supervisory staff.
- Work force directly engaged in milling process.

Two persons from the administrative staff were interviewed. The questionnaire for the administrative staff is provided in Annexure 1(B). Two persons from the supervisory staff were interviewed. The questionnaire for the supervisory staff is provided in Annexure 1(C).

The main work force involved in milling process was also interviewed two persons from each of the milling sub sections were interviewed. The questionnaire is provided as Annexure 1(D).

After one to one interviews one complete visit for knowing the major issues and problems in the facility and another visit was arranged to completely understand the process of wheat grain milling and hazards related to work was identified during the second visit.

During first visit in the facility the following aspects were keenly observed;

- Gas boilers installed or not?
- Location of tools and other equipment placement
- Condition of electricity cables
- Use of Personal Protective Equipment
- Displayed cards about prohibition of smoking
- Displayed cards about awareness for fire outbreak due to dust in the facility and smoking habit of employees
- Location of First Aid Kit

- Emergency eye wash station
- List of emergency phone numbers displayed or not?
- Provision of exhausts at each flour
- Confirmation of fresh air in the facility
- Dust Proof Lighting
- Water sprinklers/ Smoke detectors installed or not?
- Fire alarms installation
- Emergency exits at each floor
- Rats, insects etc in the facility
- Waste disposal ways

During the second visit complete process of wheat grain milling to flour was observed and potential hazards and risks identified.

CHAPTER 4

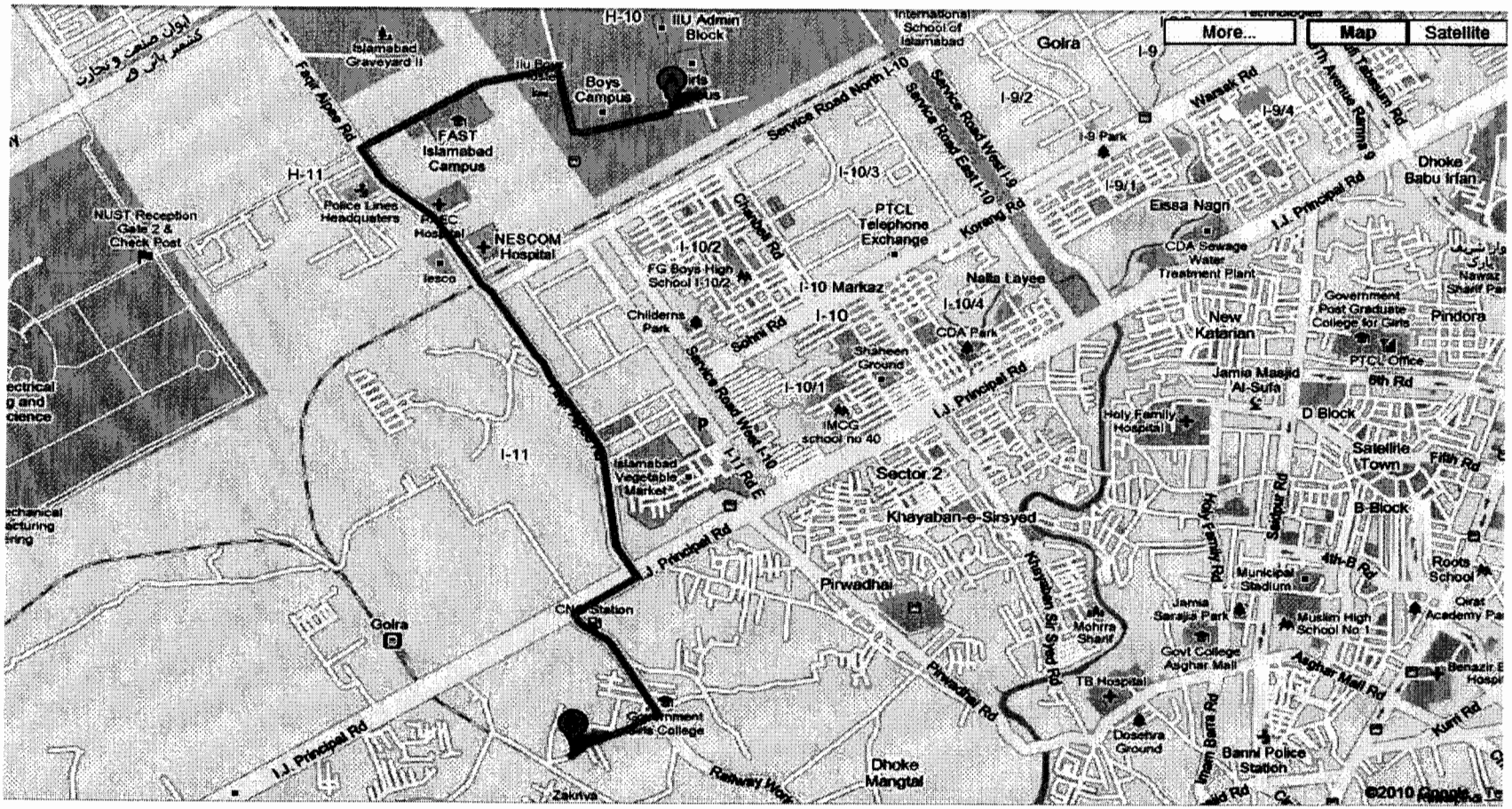
RESULTS AND DISCUSSIONS

Pakistan has 283 wheat flour mills. In the Punjab province there are 203 flour mills, while in the province of Sindh 14, in Khyber Pakhtoonkhwa 13, 28 in Balochistan province and 25 in the Federal territory of Islamabad (CMI, 2005-2006). Punjab Flour Mill is a five storied mill acquiring an area of 32 Kanals and 9 Marlas located in Rawalpindi. Location of the Punjab Flour Mill is provided in the Figure 4.1. The Punjab Flour Mill has three main sections which are not close to one another. The three main sections are shown in Figure 4.2 and are as under;

- Administration Block
- Flour Mill
- Employees Colony

To establish an OHS MS in any industry it is required to first of all understand it's all of the processes, identify risks, evaluate emergency response and planning procedures, enquiry of occupational injuries or accidents and regular monitoring of Air, water and Noise Quality and then in turn formulate mitigation measures to prevent all the risks. For the said purpose complete processing of flour mill was investigated and visit to facility

was organized and personnel interviewed to get information. A view of processing unit building of Punjab Flour Mill is given in Annexure 2 (Figure 1).



Source: Google Earth, 2010

Figure 4.1: Location of Punjab Flour Mill (B) with reference to International Islamic University, Islamabad (A).

Source: Google Earth, 2010

Figure 4.2: Punjab Flour Mill and its main buildings

4.1 Processing of the Wheat Grain

The following are the major findings of all the visits (interviews and observations).

The facility is producing 5,000 tons per week of industrial grade wheat flour. The plant has its existing storage area located in the ground floor of the mill where trucks use to deliver sacks full of wheat in store room. Wheat remain stored there and when required is removed and stored in silos from where it is used for grinding.

Wheat is then taken from the raw wheat silos, weighed and then passed through various cleaning operations as follows:

- Sieves for the removal of impurities larger or smaller than wheat
- Gravity separators for the removal of heavy impurities such as stone;
- Magnetic separators for the removal of ferrous metal impurities; and
- Aspirators, using air currents, for the removal of lighter impurities.

The moisture content of wheat received at the site is estimated to be in the range of 8% - 10%, which is too dry for milling. Water is therefore added to the wheat in a carefully controlled manner to increase the moisture content of the grain to around 15%. The damped wheat is then be stored in a conditioning or tempering bin where it is allowed to remain for a period of time to allow the added moisture to be fully absorbed into the grain. Conditioning of grain is very necessary to:

- Assist in the separation of the component parts of the grain by toughening the bran to ensure a clean separation of the endosperm from the bran and germ; and
- Allow the reduction rollers to grind the endosperm into flour with the minimum power consumption, and ensure accurate and easy sifting on the following sieving machines.

When the grain is at the optimum milling condition it is then taken from the conditioning bins and passed through final scouring, weighing and separation stages before being passed to the mill. Milling is carried out on roller mills which mill the grain into progressively finer fractions. Each milling process is followed by coarse sieving to separate large flakes of bran and chunks of endosperm, which is then passed to the next milling cycle. The finer starchy material is passed over a series of progressively finer sieves to remove any flour, and to grade the remaining particles into various sizes for further grinding.

Flours from the various grinding operations is collected and blended together before passing through final treatment and weighing operations to bulk storage bins. Flour is taken from these bins for use in existing site production processes.

The coarse particles left at the end of the reduction system, known as pollard, and the bran from the end of the break system, is combined into a single by-product for sale as animal feed. All air extracted from the mill is being discharged to the atmosphere. The plant is powered by electrical energy, and it does not require any additional gas supply,

and use compressed air only for instrument use. A single wheat grain provides the following products;

- Flour
- Fine Flour
- All Purpose Wheat Flour
- Semolina
- Pollard
- Bran

4.2 Environmental, Health and Safety condition at the Punjab Flour Mill

Following are the major findings of interviews and personal observations.

- In total 80-100 employees are there in the flour mill.
- They utilize electricity as a source of energy to run the facility as it is 200 ton mill and 1000 Kw is required to run it.
- All the employees are insured through Employees Old-age Benefits institution (EOBI). For the insurance Rs. 60 is deducted from employee's salary per month and Rs. 300 are paid by the employer per month per person. (EOBI, 2010)
- No noise, Air, Water or Odor Quality Audits are being carried out in the facility.

- Employees are trained with the starts up and shut down procedures of mill and Emergency Preparedness Response, but they were not trained about the use of chemicals, there was no Evacuation Plan even the five storied building has a single exit and entrance door at the ground floor and there is no Emergency Exit or cards displaying Emergency Exit Route on any of the floors,
- Wheat is transported in sacks by trucks and is stored in store room present in the ground floor of the flour mill.
- Tools are inspected only when required after three months especially for sharpening of rollers, as chilling is required of 37mm after every three months. Rollers and chilling machinery is shown in Annexure 2 (Figure 2 and Figure 3).
- Questionable tools are not marked as "out of order" and there is no method of timely reporting to management for further action.
- Electricity cables were in very poor condition, were mostly bare or hanging from the switch boards.
- There is no trend of Material Safety Data Sheet availability, maintenance and chemicals are not properly handled.
- Protective gears are provided as shown in Annexure 2 (Figure 4) but employees do not use them as according to them the use of PPEs hinder them during work thus reduce their efficiency. This may be due to careless behavior of the employees or negligence of the supervisory staff to keep proper check upon use of PPEs.

- Smoking is in prohibited in the facility as well as administration block, for this purpose awareness cards are also displayed on walls as shown in Annexure 2 (Figure 5) (only in Administration block) but due to poor supervision employees use to smoke even while working.
- First aid kit is available at the administration block as shown in Annexure 2 (Figure 6).
- There is no emergency eye wash station.
- List of emergency phone numbers is displayed on walls in administration as shown in Annexure 2 (Figure 7), but there is no telephonic connection between administration office and mill, so it take lot of time during emergency to reach administration and from there to call respective office/department.
- Employees are strictly restricted to their work places.
- There's especial works permit system in sensitive areas especially to facility's portion for chilling of rollers with maximum risks of cuts.
- For provision and circulation of fresh air exhausts are not present instead facility have broken window panes of all the floors that act like exhausts for air circulation Annexure 2 (Figure 8).
- There is no concept of use of dust proof lighting, so inside facility was darker although all the lights were switched on as can be assessed by all the figures provided.
- Water sprinklers or smoke detectors are not installed

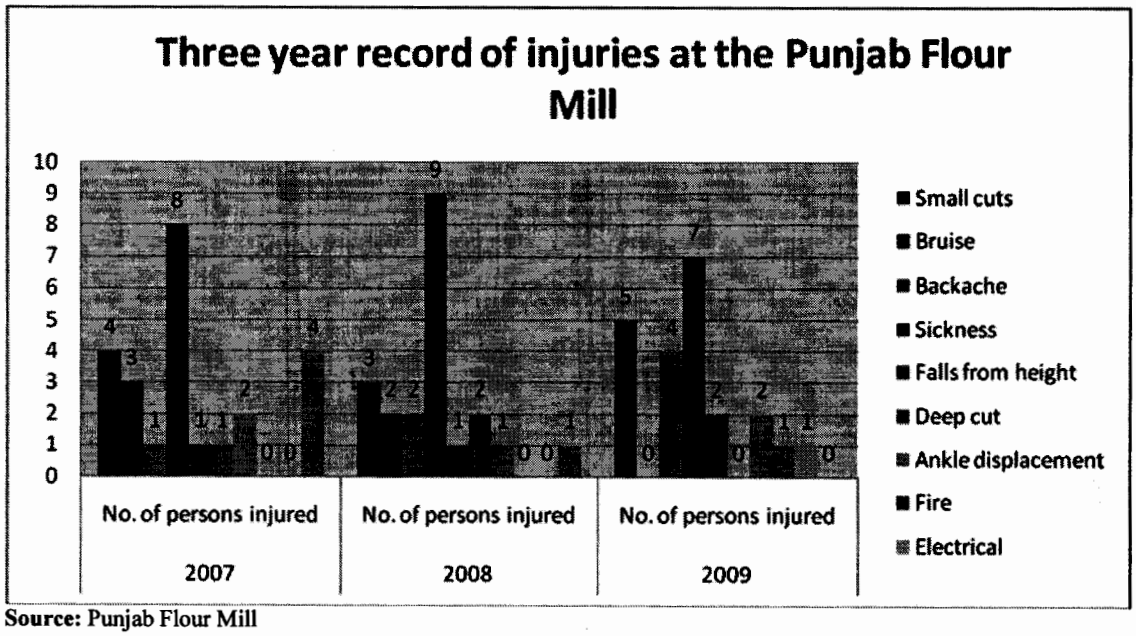
- The fire alarm system shown in the Annexure 2 (Figure 9), at the facility; was not properly working.
- Employees are provided with Emergency Preparedness/Response Training once a year but there is no management for Emergency Preparedness Drills from supervisors so at more risks to injuries and damages.
- All the employees are insured through EOBI and when get sick they get medical treatment through EOBI.
- There is no trend of regular monthly check up of employees in the facility.
- People mostly face skin irritation and asthma like symptoms and after 45 years of age or above they either got tuberculosis or other lung diseases due to less immunity to cope with the microbes of these diseases.
- Generators are not installed to combat power cut off so facility halts its work during power cut off.
- Rats, cockroaches and other insects like small bugs are there in the facility and there is no standard method used to keep them away.
- There is no trend of fumigation in the facility, so no fumigation schedule was available in the facility.
- Although flour mill premises and employees residence colony has a lot of space yet there is no trend of tree plantation, the whole facility has only three trees of *Dalbergia sissoo* Annexure 2 (Figure 10).
- Waste is mostly in the form of straws and grains of *Pennisetum typhoides*, they are collected and heaped in the back yard of the mill shown in Annexure

2 (Figure 11). From there gardeners buy them and utilized them as urea for growing potatoes as it enhances the yield. One truck is sold at a rate of 1,000 Rs. Per truck.

- Over all the sanitary condition of the mill was very poor, no proper and regular sweeping of the facility is carried out dust was there on everything, on walls, on machinery and spider webs were hanging from the roof, unusable materials and roller belts were dumped only in a corner of the mill as shown in Annexure 2 (Figure 12).
- Properly equipped standby personnel methodology is not in practice before any work regarding confined space.
- Supply and discharge equipment for moving grain or other material was not de-energized or locked out.
- Safety belts or harnesses were not used while doing checking the machinery and bins for grinding.
- Proper emergency procedures are not used for any of the process at the facility like fire safety and fire extinguishers were placed only on ground and buckets were in very poor condition as shown in Annexure 2 (Figure 13 and Figure 14), instructions regarding use of fire Extinguishers were displayed but were out dated as shown in Annexure 2 (Figure 15).
- The last section where flour bags are filled with flour was too slippery as due to dragging of bags and sacks over tiles, they become extra smooth and cause slippage accidents and leads to mostly displacement of ankle etc, also manual lifters are used for the transport of sacks as shown in Annexure 2 (Figure 16).

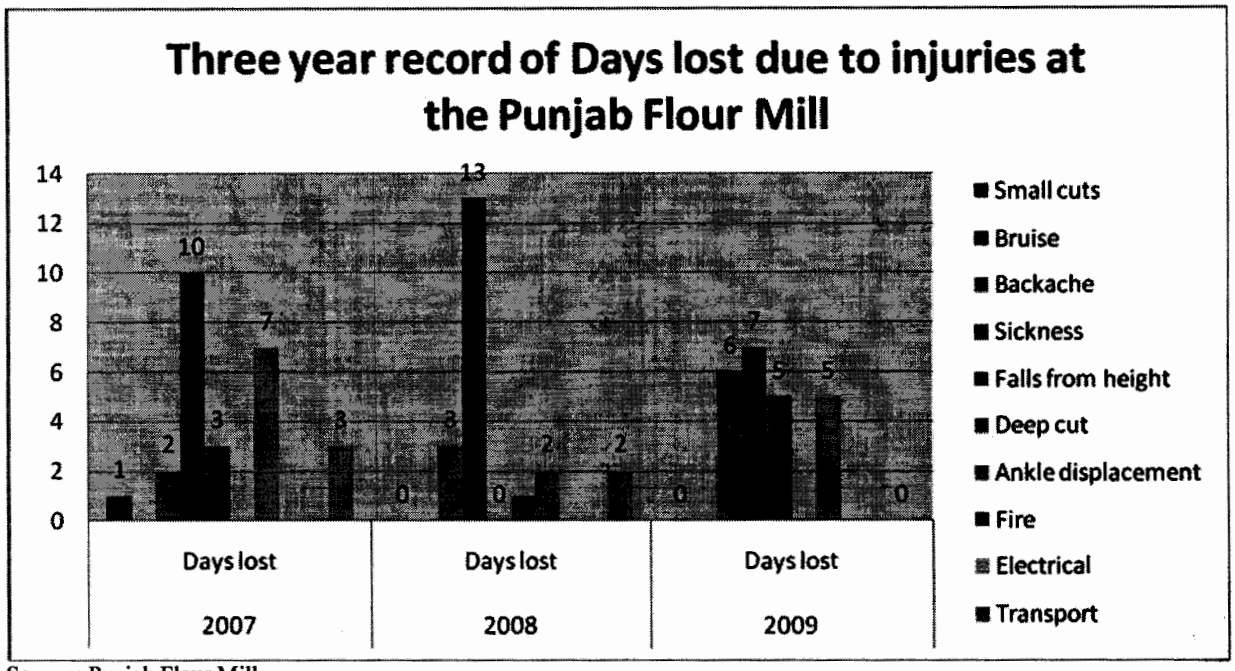
- There is no trend of provision of good quality drinking water as assessment of drinking water and comparison with NEQS is not practiced instead the stored water is treated with $KMNO_4$ (Potassium Permanganate) every month to kill bacteria and make water drinkable.
- In case of accidents employees are provided with pays and leaves until injured is again fit for work and if unable to work or severely injured then a person from his family is given preference to work at his place and injured is provided with sufficient money.
- Employees were reluctant to give information about previous accidents but those reported are provided in Graph 4.1 (A&B) below;

Graph 4.1(A): Three year record of injuries at the Punjab flour mill



Source: Punjab Flour Mill

Graph 4.1(B): Three year record of Days lost due to injuries at the Punjab flour mill



Source: Punjab Flour Mill

From the above graphs it can be concluded that most of the work days lost are due to Backache (poor ergonomics), Sickness (mostly flue), Falls from height (no use of safety belts) and ankle displacement (slippery floor).

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Care for environment, health and safety is for encouraging people and enhancing their sensitivity to the environment in order to reach a suitable code of conduct by constantly setting preventive actions related to environmental pollution, complying with national laws and regulations, as regards to environment preservation also Regularly monitoring environmental aspects and their impact, both for new and existing products and for present and future activities by employing the finest product/process technologies that allow the best use of: energy resources; reduction in consumption; minimization of waste products and preventing accidents and promoting work hygiene by improving safety and reliability levels and ensuring compliance with legal requirements.

It is concluded that overall situation of environmental health and safety issues is very poor. The employer of the Punjab Flour Mill is intended to make contributions towards the health and safety of his employees as they are the real assets of his industry, without them his industry cannot progress. The owner was given information about the potential health and safety risks posed to his work force and was suggested with the type of safety measures to reduce potential of accidents and hence improve the growth of the industry by improving the capacity of the employees.

5.1 Recommendations

The following the recommendations for improving the overall health of the facility.

- Employees should be trained about the potential for entrapment and suffocation associated with stored grain or other loose materials. The training should include information on safe work practices and rescue.
- Employees should be trained with emergency preparedness and response procedure and for this purpose drills should be established to reduce possible risks.
- Employees should be trained about all the processes in the processing unit.
- Employees should be trained about ergonomics to reduce backache, sprain etc.
- Employees should not be allowed to enter a storage area from the bottom when material is adhering to the sides or is bridged overhead.
- When employees must enter storage areas, they should stay above the material at all times and should never stand on top of stored material.
- Safety signs should be posted to warn employees of the hazards of working with stored grains and other loose materials. Safety signs alone are not sufficient to provide the information needed to prevent fatalities; such signs should be only one component of a comprehensive safety program.
- Proper trainings about work in Bins, hoppers, silos, tanks, transport vehicles, and surge piles where loose materials are stored, handled, or transferred should be provided to reduce risks of injury.

- Any time a employees enters a storage area (bin, tanks, etc.), the supply and discharge of materials must be stopped and the supply and discharge equipment must be locked out (NIOSH Alert, 1987).
- Employees working on top should wear safety belts or harnesses equipped with properly fastened life lines. A similarly equipped standby person should be stationed outside the area.
- There is a requirement of separate containers to store all the empty sacks to reduce the number of rats.
- Personal protective equipment should be provided to all the employees working in the mill like ear muffs\plugs to reduce noise level at a threshold not harmful for employees, masks and googols to prevent exposure to dust. Helmets to prevent any head injury, as the mill has five floors and internally it is interconnected, so there is a chance of downfall of employees while working. Supervision must be there to look for the use of PPEs and fine should be taken from the employees not taking care of the rule and not using the PPEs for establishing the trend of PPEs utilization.
- Lifting of sacks is done by conventional hand driven lifters that should be displaced by fork lifter and driver should be trained to minimize the accidents like fall down of sacks during their displacement from the point of packaging to the point of storing of bags and sacks.
- Fire alarms are not installed these should be installed and should be checked after a specific interval and record of each and every checking along with condition should be maintained.

- Time specific monitoring of safety valves of all the machines and equipment should be maintained and record should be kept with date and conditions of valves.
- Proper maintenance of machines should be insured.
- Fire exit routs should be established at each floor and ensured safe proper care should be there that these ways should not be blocked
- Proper evacuation plan should be established and procedures and instructions should be known to every employees
- Water sprinklers should be maintained and they should always be in usable form.
- Tools should be placed at their proper places and if require maintenance they should be immediately reported to management.
- Lock out and tag out system should be practiced and communicated to all for improving safety conditions.
- All the waste material should be disposed of properly for example can be sold to nursery for preparation of green manure for plants.
- Water used for washing of grains is full of dust, soil and small straws that should be disposed of properly on an agreed safe place.
- There should be proper cleaning system in mill to avoid any possible harm and reduce risk of health hazard.
- First aid box should be placed in the working area and every employee should know its location and its use.

- Smoking prohibition cards were displayed in the administration block (those should be upgraded) but not in the working area so these must also be displayed over there and strict supervision must be there to look for it.
- Prohibition should be there to go near machines when they are in working condition for all the employees except the person who is working on it and know how to handle it.
- Electric wires should be grounded for the prevention of electric shocks.
- There should be proper ventilation system for smell and indoor air pollution reduction.
- Employee's rotation for work and work place should be there to increase employee's efficiency.
- Person of right qualification should be appointed to do a job for example a health and safety coordinator should keep all the records instead a man from human resource department.
- Air, water and odor quality audits should be maintained.
- MSDS should be maintained and employees trained to know its use.
- An emergency eye wash station should be established.
- Provision of telephone connection to the mill should be established and list of emergency phone numbers displayed for utilization in any emergency situation.
- All broken window panes should be replaced by new ones and exhausts should be installed for air circulation.
- Dust proof lighting system should be established to reduce risks.

- Regular monthly and quarterly check up of the employees shall be managed to increase the employee's efficiency.
- Trend of fumigation in the facility should be established and ways to keep rats, cockroaches and other insects away should be managed.
- Tree plantation should be done along the road, flour mill and in open spaces of the colony.
- Employees working in packaging section should be provided with proper shoes that prevent slippage over slippery floor to reduce risks.
- Clean and safe drinking water should be provided to employees and reduce possible health effects.
- If above mentioned recommendations are met then it is anticipated that efficiency of employees and hence production of flour mill will increase to its maximum. Table 5.1 provides the Environmental Mitigation and Monitoring Plan for the OHS MS of the Punjab Flour Mill.

Table 5.1 Environmental Mitigation and Monitoring Plan for the OHS MS of the Punjab Flour Mill

Activity	Impact	Mitigation measures	Binding authority	Supervision
Wheat brought to mill	• Aesthetics • Dust • Fall of sacks from truck	Truck should be covered with Tarpaulin cover	Contractor	Senior Supervisor, Punjab Flour Mill
Storing of wheat	• Piling of Sacks • Rats or other rodents • Fumigation	• Piling should not be too high • Proper ways should be there to keep rodents away • Fumigation schedule should be established on weekly basis	Store man	Senior Supervisor, Punjab Flour Mill
Milling of Wheat Grain	• Cuts due to the sharpening of rollers • Struck into falling or moving objects and machinery • Exposure to harm full substances • Dust problem • Noise problem	• Proper training about work procedures and awareness about chemicals utilized in the mill. • Labeling of chemicals. • Use of PPE should be obligatory • MSDS should be maintained • Dust proof lighting system should be ensured	Supervisor of the milling section	Senior Supervisor, Punjab Flour Mill
Fire hazard	• Fire out break due to dust or electric spark • Fire due to temperature rise.	• Exhausts should be Installed • Electric wire should be grounded • Fire safety equipment should be regularly maintained and date of previous inspection should be recorded	Supervisor of the milling section	Senior Supervisor, Punjab Flour Mill

		• Fire alarms should be properly checked and reporting to the senior supervisor on monthly basis • Evacuation plan and exit routs should be established and fire drills practiced regularly • Water sprinklers should be installed • Safety sign should be posted • Use of PPE should be obligatory • First aid box should be in the reach of every employee • There should be strict prohibition on smoking		
Trainings	• Behavior of the employees towards safety • Start up and shut down procedures • Emergency preparedness and response procedures • Evacuation plan, exit rout and fire drills	• Awareness should be provided about safety at work • Trainings should be provided regularly about work at height and use of safety belts while work at height • Incentives should be given on best performance and response to safety • Safety sign should be posted • Training and workshops regarding ergonomics should be provided	Administration	Senior Supervisor, Punjab Flour Mill
Air, Water, Noise and	• Health of employees	• Use of PPE should be obligatory • Air, Water, Noise and Odor	Administration	Senior Supervisor,

Odor quality		quality assessments should be regularly done and records maintained • Smoking should be prohibited. • Exhausts should be installed • Waste should be disposed off properly		Punjab Flour Mill
Packaging of the bags	• Accidents like ankle displacement • Fatigue and RSI	• Awareness should be provided about ergonomics • Use of PPE should be obligatory • Proper cleaning of the floor should be ensured • Required number of sacks should be transported by lifter from place of packaging to the final store point	Supervisor in the packaging section	Senior Supervisor, Punjab Flour Mill
Tree plantation	• Aesthetics	• Plantation should be done along the boundary wall of the mill • Fast growing , evergreen and shady plants should be preferred • Indoor plantation within the administration block should be done • Monitoring and care of the raised plants should be done Uptill maturity	Administration	Senior Supervisor, Punjab Flour Mill

Source: Compiled by Aneela Iqbal

Bibliography

Amyotte, R. and Eckhoff K. (2010). Dust explosion causation, prevention and mitigation: An Overview. *Journal of Chemical Health & Safety,* Volume 17, Issue 1, January/February 2010, pp1020-1024.

Government of Pakistan. (2009). 2005-2006, Census of Manufacturing Industry (CMI), GoP, Statistical division, Federal Bureau of Statistics, Islamabad. Issue February 2009.

Cullinan, P. Cook A. Nieuwenhuijsen M. J. Sandiford C. Rosemary D. T. Katherine M. V. McDonald C. J. and Anthony J. N. T. (2001). Allergen and dust exposure as determinants of work related symptoms and sensitization in a cohort of flour-exposed workers: A case control analysis. *The Annals of Occupational Hygiene,* Volume 45, Issue 2, March 2001, pp 97-103.

Duijm, N. J. Fievez C. Gerbec M. Hauptmanns U. and Konstandinidou M. (2008). Management of health safety and environment in process industry. *Safety science,* Volume 46, July 2008, pp 908-920.

Eckhof, R. K. (2004). Partial Inerting- an additional degree of freedom in dust explosion protection. *Journal of Loss Prevention in the Process Industries*, Volume *17,* 2004, pp 187-193.

Employees Old-age Benefits Institution (EOBI), 2010: www.eobi.gov.pk

Gingras, G. B. Bellemare, M. and Brun, P. J. (2006). The contribution of qualitative analysis of occupational health and safety interventions: An example through a study of external advisory interventions. *Safety Science*, Volume 44, Issue 10, December 2006, pp 651-674.

Habibullah, N. S. and Rajnarayan R. T. (2004) Peak Expiratory Flow: A Study among Silica-exposed Workers, India. *Indian journal of occupational and environmental medicine*, Volume 8, Issue 1, 2004, pp 7-10.

Hamalainen, P. Takala J. and Saarela K. L. (2006). Global Estimates of Occupational Accidents. *Safety science*, Volume 44, Issue 2, 2006, pp 137-156.

Harrison L. (1995). Environmental, Health and Safety Auditing hand book. Second Edition, Mc Graw Hill NY, pp 303.

Health and Safety Information Sheet. (1997). www.hse.gov.uk/pubns/fis13.pdf

Hovden, J., Lie T. Karlsen J. k. and Alteren B. (2008). The safety representative under pressure: A study of Norwegian oil and gas industry. *Safety science,* Volume 46, Issue 3, March 2008, pp 493-509.

Kongtip, P. Yoosook W. and Chantanakul S. (2008). Occupational health and safety in small and medium sized enterprises: an overview of the situation in Thailand. *Safety science,* Volume 46, Issue 9, November 2008, pp 1356-1368.

Makin, A. M. and Winder C. (2008). A conceptual framework to improve the application of occupational health and safety management systems. *Safety science,* Volume 46, Issue 6, July 2008, pp 935-948.

Menckel, E. Carter, N. and Hellbom, M. (1993). The Long term effects of two group routines on accident prevention activities and accident statistics. *International Journal of Industrial Ergonomics,* Volume 12, Issue 4, December 1993, pp 301-309.

Mearns, K. J. and Reader, T. (2008). Organizational support and safety outcome: an un-investigated relationship. *Safety science*, Volume 46, Issue 3, March 2008, pp 388-397.

NIOSH Alert, December, 1987. Preventing Suffocation and Entrapment of Employees.

Raymond, C. S. Randall S. Michael C. Mary P. Trang N. and Leslic S. (2003). Evaluation of a safety training program in three food service companies. *Journal of Safety research*, Volume 34, 2003, pp 547-558.

Ringdahl, L. H. Jansson T. and Malmen Y. (2000). Safety Haelth and environment in small process plants-results from a European survey. *Journal of safety research,* Volume 31, Issue 2, pp 71-80.

Simred M. and Marchand A. (1994). The behavior of first line supervisors' in accident prevention and effectiveness in occupational safety. *Safety science.* Volume 17, Issue 3, March 1994, pp169-185.

Shaikh, G. H. (1999). Occupational noise exposure limits for developing countries. *Applied acoustics*, Volume 57, Issue 2. May 1999, pp 89-92.

Shikdar, A. A. and Sawaqed, N. M. (2003). Employees productivity and occupational health and safety issues in selected industries. *Computers and industrial engineering,* Volume 45, Issue 4, December 2003, pp 563-572.

Sleight, R. B. and Tiffen J. (1948). Industrial noise and hearing. *Journal of applied psychology*, Volume 32, Issue 5, 1948, pp 476-489.

Theimer, O.F. (1973). Cause and prevention of dust explosions in grain elevators and flour mills. *Powder Technology,* Volume 8, Issues 3-4, September-October 1973, pp 137-147.

Work sheet. (2009). A guide to safety and health in food and grain mills. NC Department of Education, Training And Technical Assistance Bureau, USA, April 2009.

Annexure 1(A)

QUESTIONNAIRE FOR THE EMPLOYER

- Total workforce in the flour mill.
- Monthly average production of the flour mill
- Source of energy and amount of energy utilized to run the facility.
- Insurance policy of the employees.
- Waste disposal methodology.
- Noise, Air and Odor quality audits.
- Training of employees
- Maintenance of Material Safety Data Sheet (MSDS)
- Provision of protective gears.
- Provision of safe and clean drinking water

Annexure 1 (B)

QUESTIONNAIRE FOR THE ADMINISTRATIVE STAFF

- Ways of compensation for accidents either leaves, payments or both.
- Provision of contact list of emergency phone numbers.
- Established Work Permit System.
- Knowledge about Evacuation Plan and Emergency Exit Routes.
- Provision of Medical Facility.
- Utilization of generators in case of power cut off and fuel consumption by generators per day.
- Insurance policy of employees.

Annexure 1(C)

QUESTIONNAIRE FOR THE SUPERVOISERY STAFF

- Training of employees on tools handling and regular inspection of equipment and there labeling.
- Awareness training about starts up and shut down procedures of machinery used.
- Inspection of tools before use.
- Questionable tools marked as "Out of Order" and reported to management for further action.
- Maintenance of Material Safety Data Sheet.
- Employees awareness about chemicals.
- Number of accidents related to the use of chemicals, slips, trips, falls etc
- Assessment of drinking water quality
- Provision of protective gears
- Prohibition of smoking in the vicinity of flour mill
- Provision of first aid kit
- Provision of Emergency Eye Wash Station
- Restriction of staff to required work area.
- Work permit system
- Evacuation Plan and Exit Routes
- Fire alarms installation
- Emergency Preparedness and Response Trainings

- Provision of Medical facility
- Fumigation schedule
- Tree plantation
- Waste disposal ways/ Waste Management Procedure

Annexure 1 (D)

QUESTIONNAIRE FOR THE WORKFORCE DIRECTLY INVOLVED IN MILLING PROCESS

- Means of wheat delivery to the mill
- Separation of impurities either manually or one of the following;
    - Gravity Separator for stones
    - Magnetic Separator for Ferrous Metal impurities
    - Aspirators for light objects
- Provision of moisture to the wheat grains before grinding to keep the 15% moisture content of the grain so that milling becomes easy.
- Employees awareness about starts up and shut down procedures
- Employees awareness about hazards of chemicals being utilized at the facility
- Types of trainings acquired by employees during job at mill
- Major health concerns like skin diseases, eye infection, asthma etc
- Provision of Medical facility and monthly regular check up
- Major problems at work fatigue, headache etc

Annexure 2 Figure 1

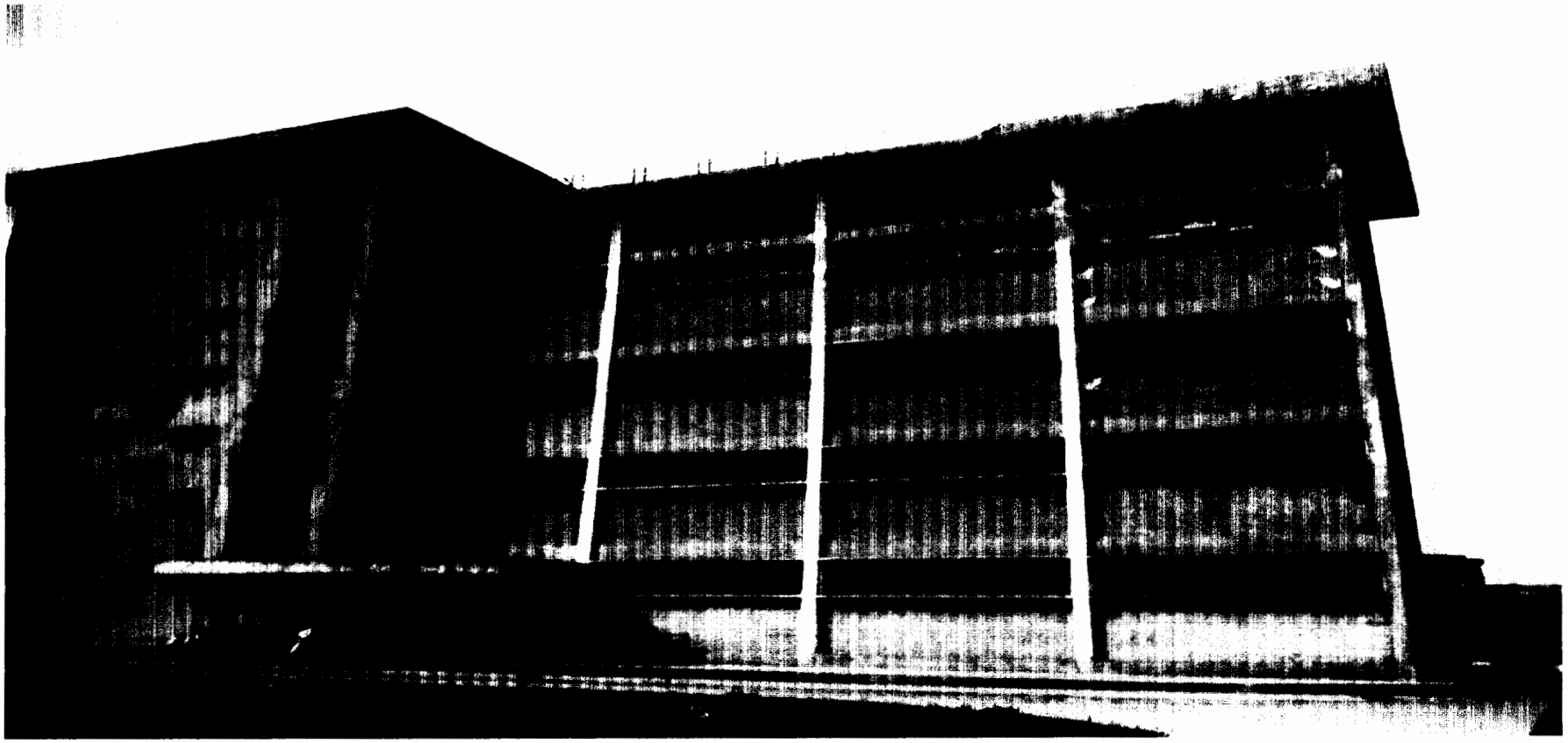


Figure 1: A view of Punjab Flour Mill (Processing Unit Building)

Annexure 2 Figure 2

Figure 2: Chilling Machine for Rollers

Annexure 2 Figure 3

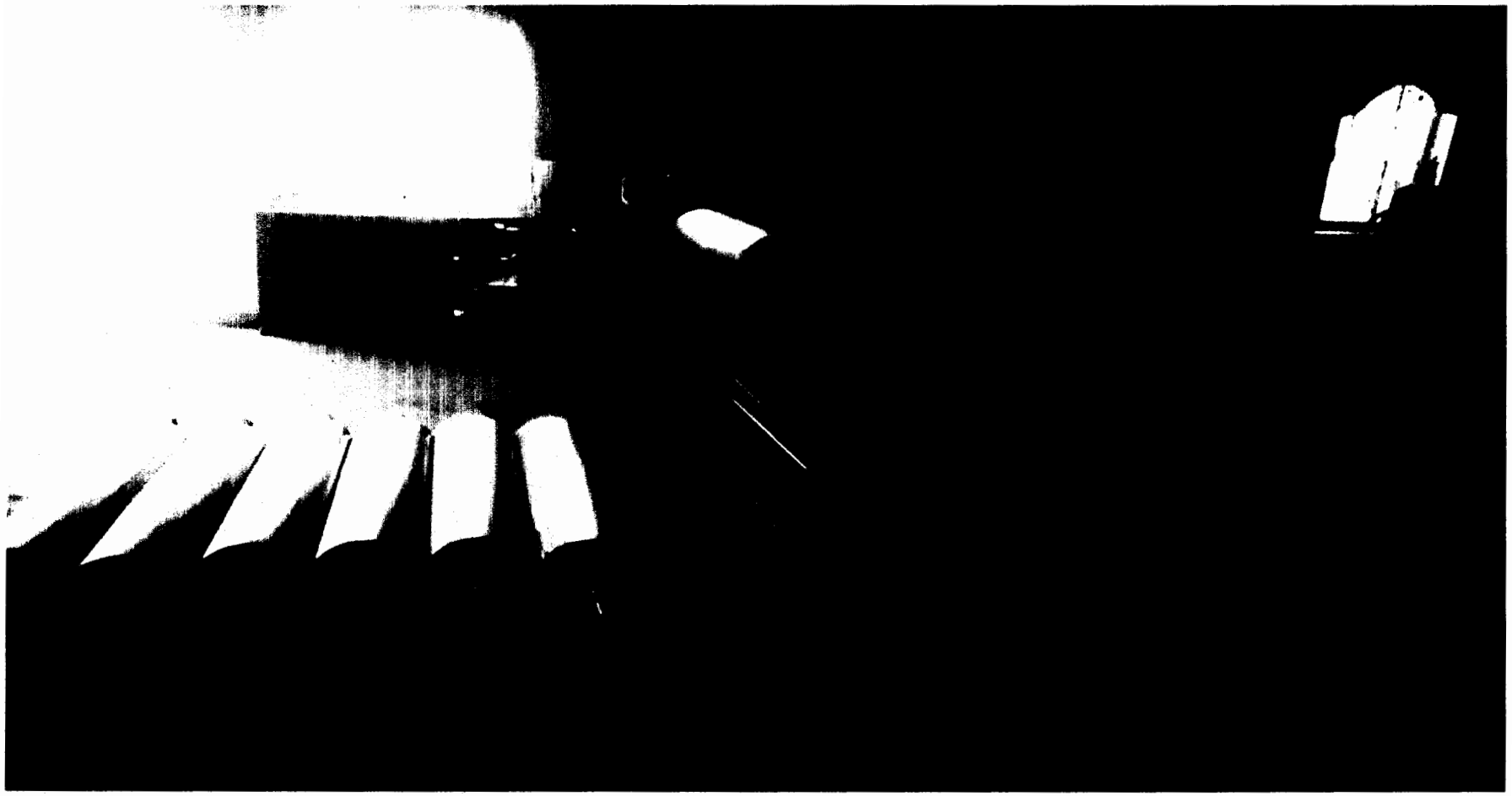


Figure 3: Rollers and Chilling Machine

Annexure 2 Figure 4

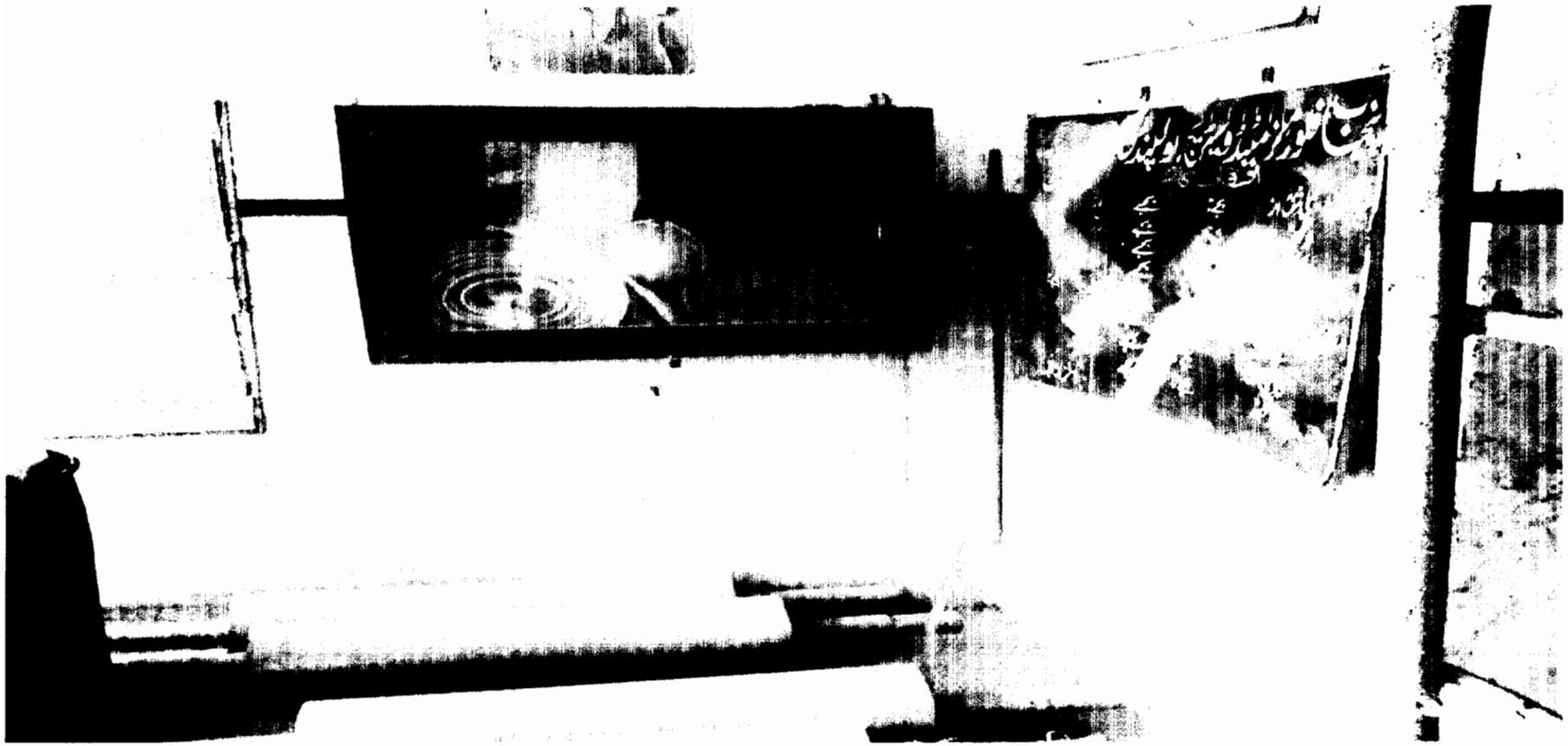


Figure 4: Safety hats stored in the fire safety box and unusable rollers are thrown openly

Annexure 2 Figure 5

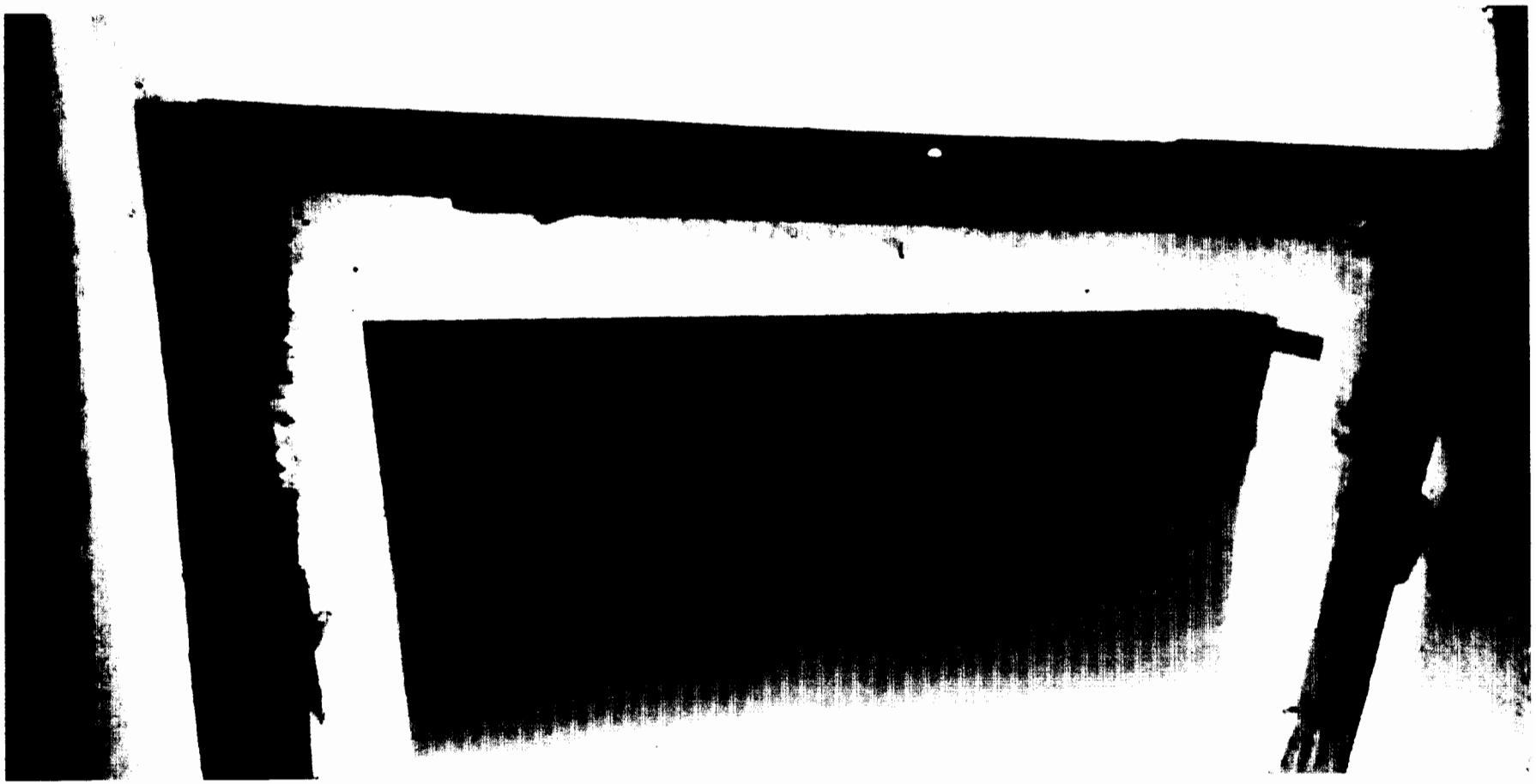


Figure 5: Hand written faded display note for prohibition of smoking

Annexure 2 Figure 6

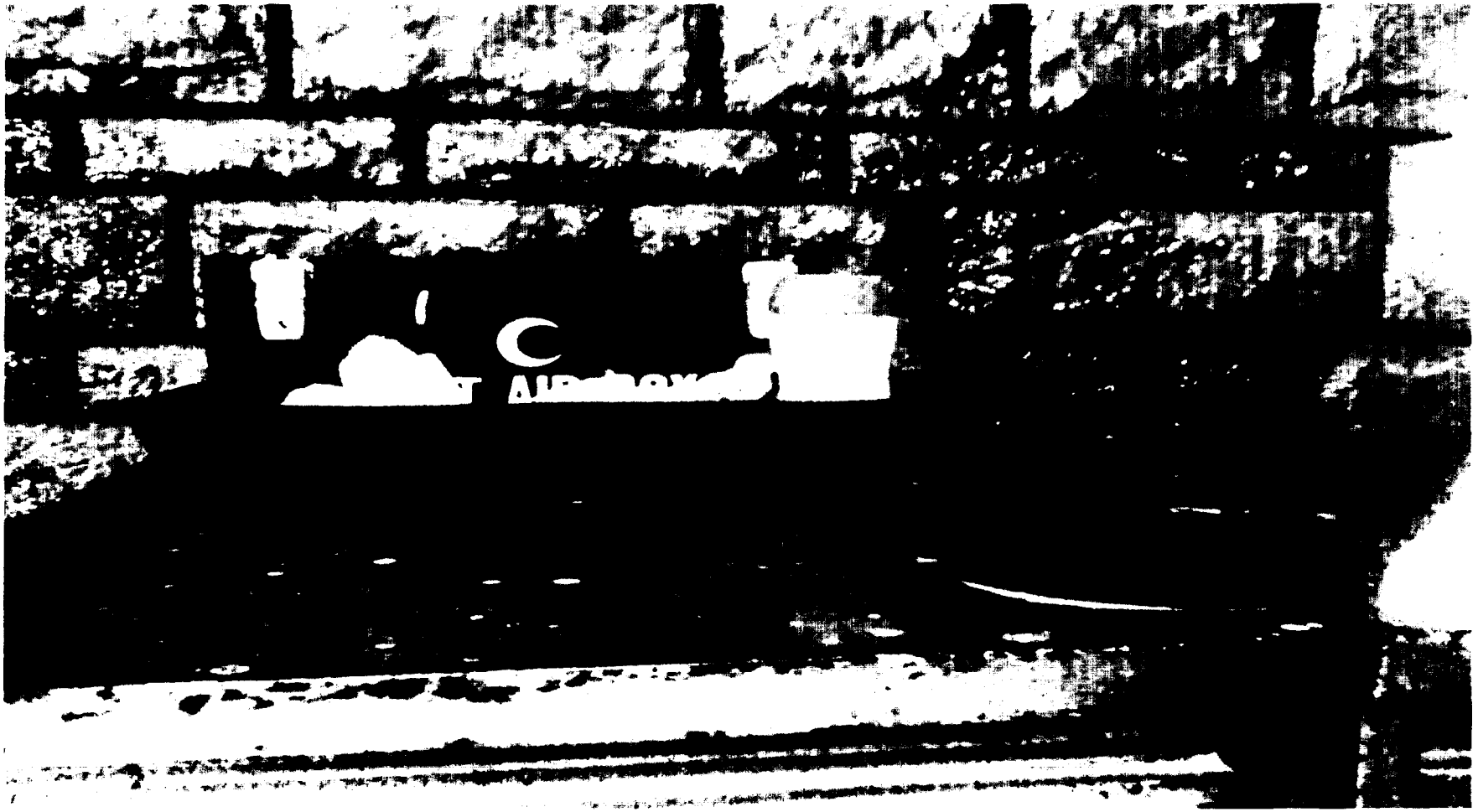


Figure 6: First Aid Box in Administration block

Annexure 2 Figure 7

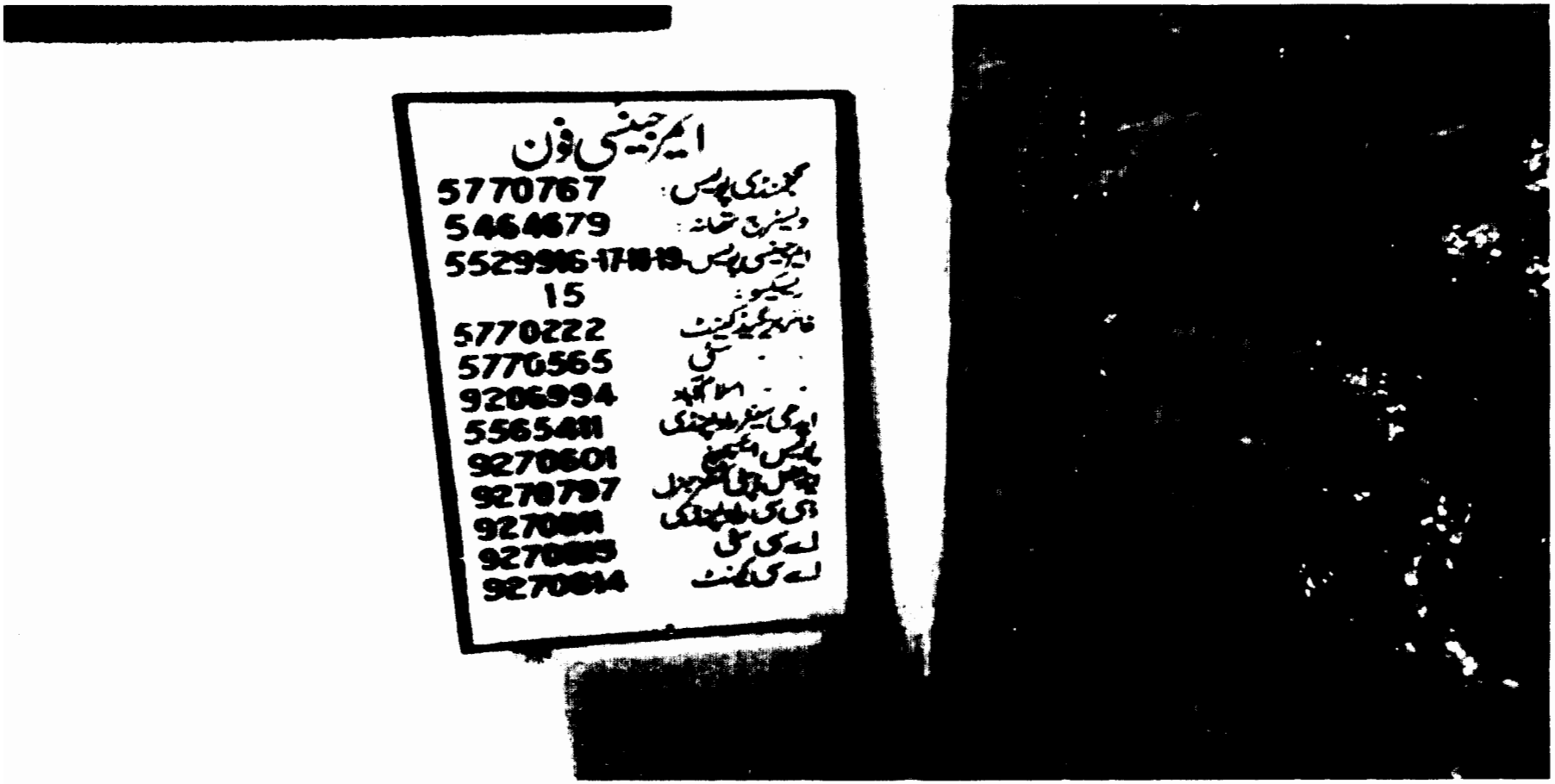


Figure 7: List of Emergency Phone Numbers Displayed in Administration block

Annexure 2 Figure 8

Figure 8: Broken Window Panes of All the floors of the building for air circulation

Annexure 2 Figure 9

Figure 9: Fire Extinguisher and Fire Alarm

Annexure 2 Figure 9

Figure 9: Fire Extinguisher and Fire Alarm

Annexure 2 Figure 10

Figure 10: Trees at the facility

Annexure 2 Figure 11

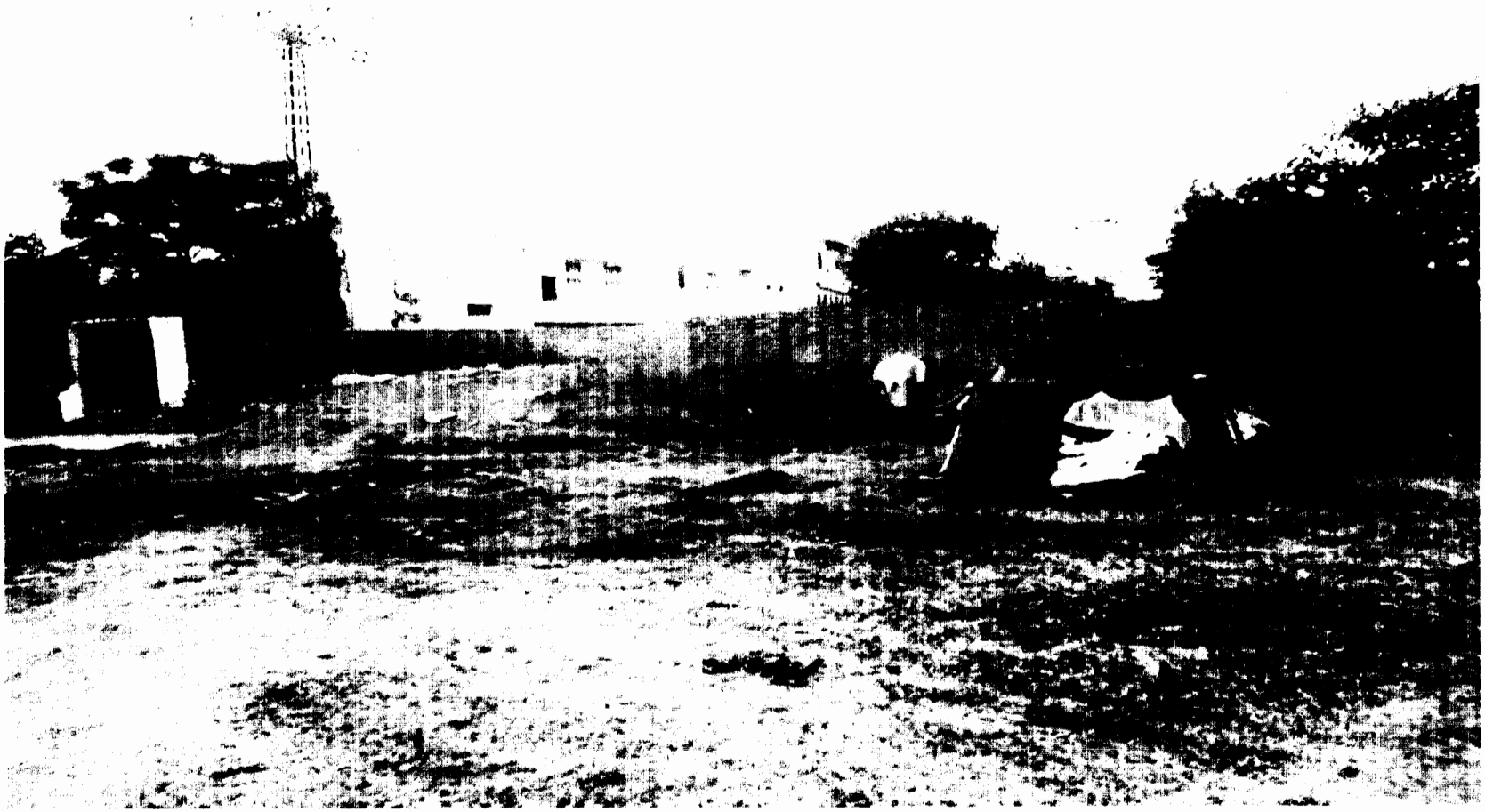


Figure 11: Straws dumped at the facility

Annexure 2 Figure 12

Figure 12: Waste dumped in the corner of the ground floor

Annexure 2 Figure 13

Figure 13: Fire Extinguishers

Annexure 2 Figure 14

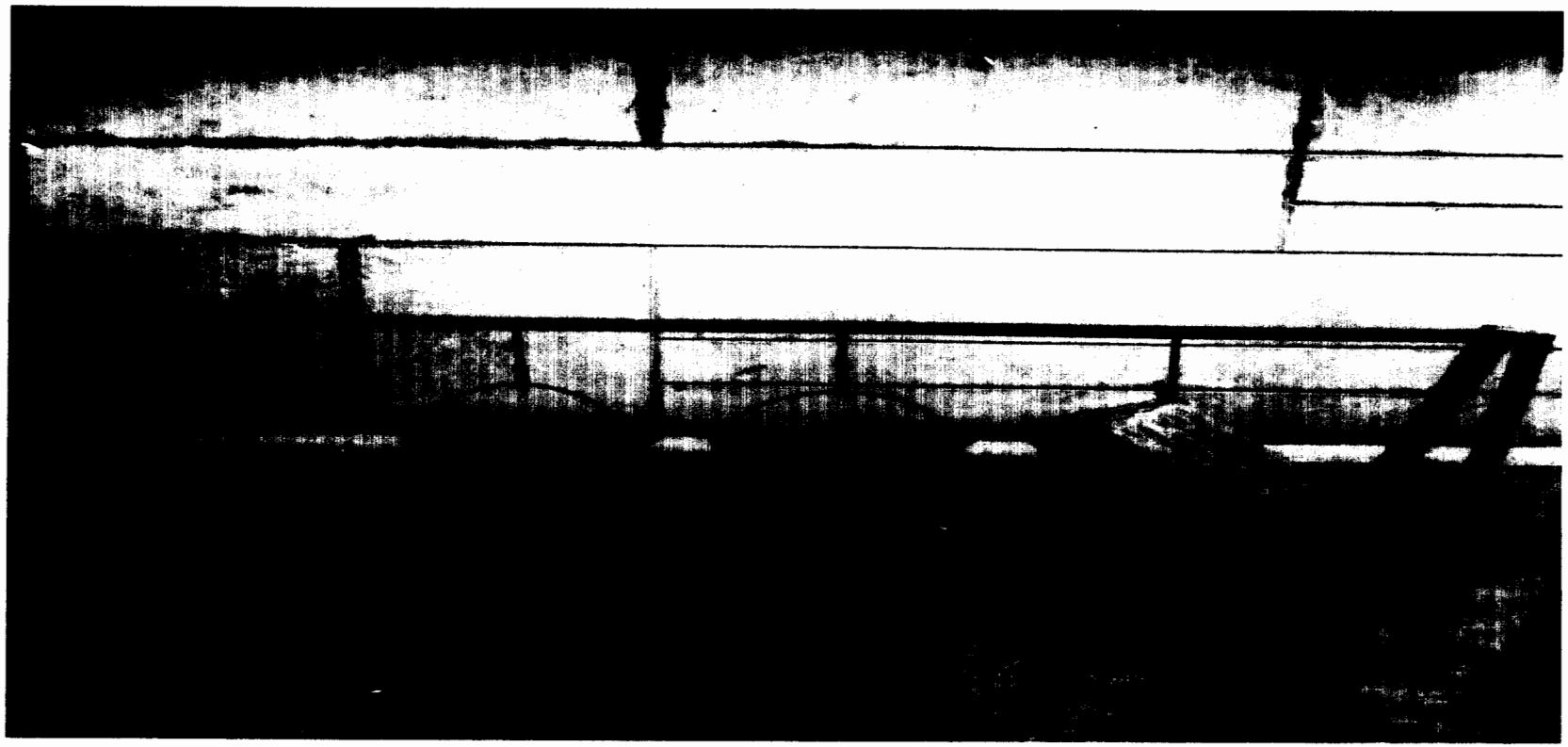


Figure 14: Condition of buckets

Annexure 2 Figure 15

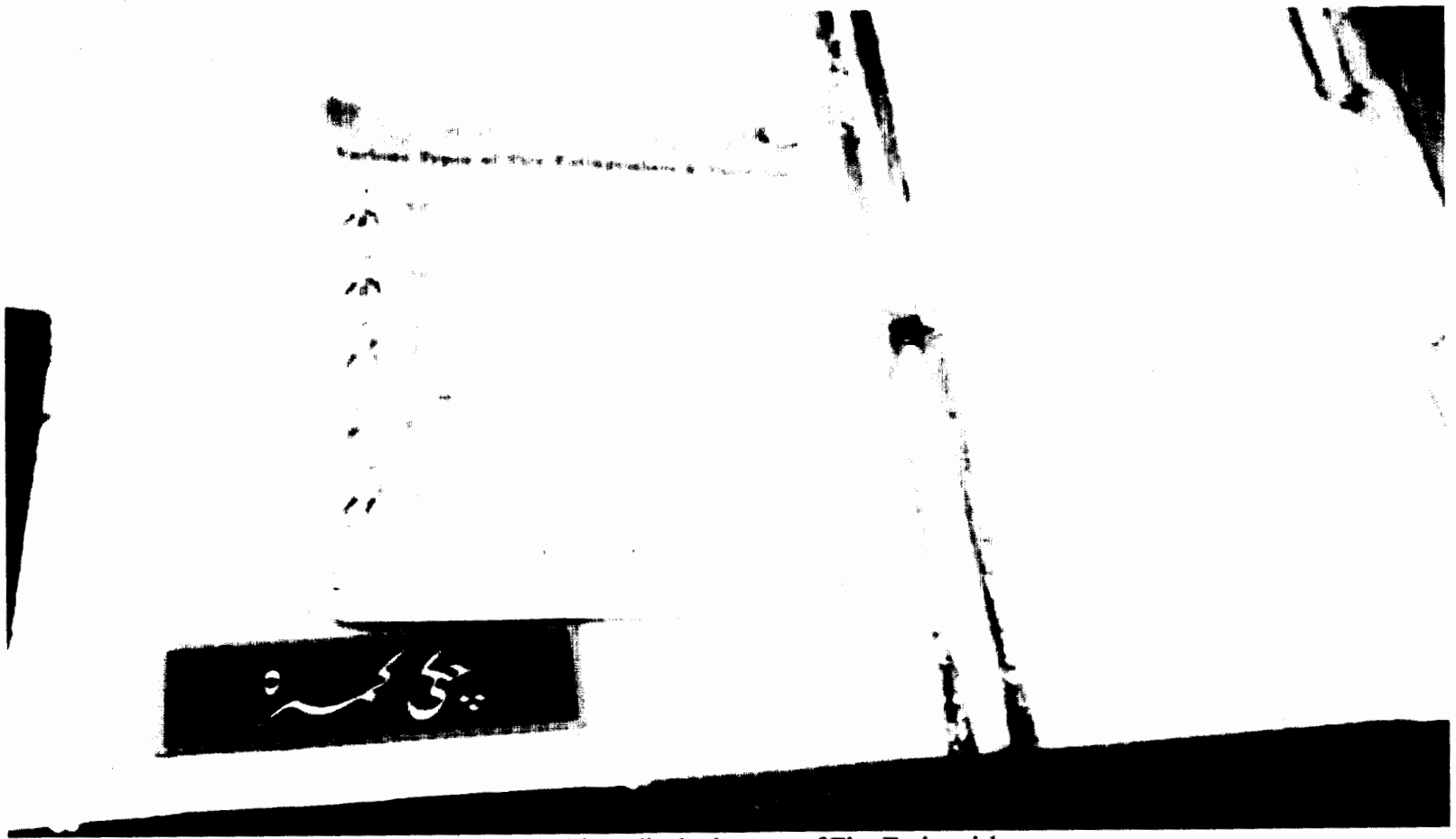


Figure 15: Chart displaying use of Fire Extinguisher

Annexure 2 Figure 16

Figure 16: Manual lifter