

**Occupational Safety Problems in Bangladesh Ship-breaking Industry
- A case study.**



by

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December 2007

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A project report submitted in partial fulfillment of the requirements for the degree of
Master of Engineering in Mechanical Engineering.

**Department of Mechanical Engineering
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December 2007

Declaration


This is to certify that the project work entitled “ Occupational Safety Problems in Bangladesh Ship breaking Industry - a case study” has been carried out by – Abu Sayed Md. Kamruzzaman in the Department of Mechanical Engineering, Khulna University of Engineering and Technology, Khulna, Bangladesh. The above research work or any part of the work has not been submitted anywhere for the award of any degree or diploma.



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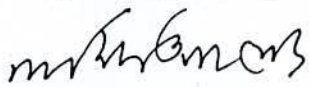

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Approval

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The Author

Abstract

Ship breaking is one of the most hazardous and dangerous occupation. Grave concern about the occupational safety and health problems caused by ship dismantling has been widely reported . Whilst many press articles have appeared globally, little hard evidence of the incident reports has been discussed. In this research, it is tried to explore the occupational safety problems that exists in Ship breaking sector in Bangladesh. It also investigated the possible hazardous and dangerous materials available in the old ships and tried to find out the main causes and agents responsible for accidents [1].

Keeping this view in mind, the data for this project thesis were collected from the yards as primary data through a prescribed questionnaire. Two sets of questionnaires were prepared, one for the workers and other for the yard managers/management staffs. 16 yards were taken into consideration for data collection. The interviewees (workers) were selected on random sampling basis after stratified into 10 different clusters of workers. 160 numbers of workers from 16 yards and 15 Managers from 15 yards were interviewed (Chapter-3).

The different categories of workers were regrouped in to four categories for the study purpose, such as High-skilled, Skilled, Semi-skilled and Un-skilled. 20% High-skilled, 11% Skilled, 34% Semi-skilled and 48% Un-skilled workers were selected as sample to reflect the staffing pattern and total number of workers in the yards. It is found that about 75% of the workers are illiterate or have education below primary; just they can sign their name only. But most of the managers are educated and amongst about 60% have graduation or above degree. About 98% of the workers experienced with accident during their work at the ship-breaking/recycling yards. Out of 160 respondents only fatal accident reported by 38% while 59% observed only minor accidents. Most vulnerable age group is 20-24 faced most of the accidents of about 29%. Some workers (2%) do not have any experiences about the accidents during working in the ship yards as they were very new comer in this job. According to the data it is found that hand and legs are the mostly affected body parts compared to others and are carrying cumulative weight of about 59% of total accidents. About 74% workers know that the ship dismantling are dangerous. Both the workers and managers identified that the Gas (including toxic and combustible) is the most

hazardous substances available in the old ships and hot work is the most vital agent for causing accident. Personal negligence, lack of work experience, not to use of PPE, absence of good working environment, over confidence and finally excessive work loads were also identified unanimously by workers as causes of accident. Most of the managers also support these causes along with others. To prevent the accident 31% suggested to use PPE followed by 27% suggested for raising awareness on occupational safety and health and 25% recommended for providing training, and 8% do not have any idea about how to prevent accident . As far as knowledge of rules and regulations is concerned about 70% workers heard about the Factory Act, 1965 but most of them do not have any idea about the provisions of that Acts and other related rules/regulations applicable to ship breaking sector. On the other hand, workers did not know anything about the new Labour Act, 2006. But all the managers knew about the Factory Act, 1965 while only 46% of them knew about the Labour Act, 2006. Out of 15 managers, only one manager boldly responded that they follow the new Labour Act, 2006 and rest of them said they were trying to follow the Act, rules/regulations to some extent. Moreover, the government departments responsible for the looking after the workers' right and OSH issue along with the working environment of the factory and surroundings were not active at all. According to managers' opinion week monitoring mechanism and less enforcement by the government hindered the proper implementation of the rules. All the yard managers unanimously was agreed upon that a separate set of rules for the ship breaking sector in Bangladesh and separate wage for the workers are required for the betterment of this sector. The long outstanding demand of BSBA for the declaration of ship breaking sector as industry also came up from the views of yard managers.

At last, some recommendations are made for the betterment of this sector as a whole.

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List of Abbreviations

BC	Secretariat to the BASEL Convention
BSBA	Bangladesh Ship Breakers Association
CO₂	Carbon-di-oxide
DIFE	Department of Inspection for Factories and Establishments
DoE	Department of Environment
GoB	Government of Bangladesh
ILO	International Labour Organization
IMO	International Maritime Organization
LDT	Light Weight Tonnage
MOLE	Ministry of Labour and Employment
NGO	Non Government Organization
NPD	National Project Director
PCBs	Polychlorinated Biphenyls
PPE	Personal Protective Equipment
SAFEREC	Safe and Environment Friendly Ship Recycling Project
TBT	Tri-bu-tyltine
UNDP	United Nations Development Programme
WHO	World Health Organization

Glossary

In this project work, the following terms have the meanings hereby assigned to them:

Contractor: A person or an enterprise providing services to an employer at the facility in accordance with agreed specifications, terms and conditions. For the purpose of project thesis, contractors include subcontractors and labour supply agents.

Employer: Any physical or legal person that employs one or more workers.

Hazard: The inherent potential to cause injury or damage to people's health.

Hazardous Ambient Factor: Any factors in the workplace which may in some or all normal conditions adversely affect the safety and health of the worker or to the person.

Labour Inspectorate: The body established according to national laws and regulations to rescue the enforcement of the legal provisions relating to the conditions of work and the protection of workers while engaged in their work.

Labour Supply Agent: Supplier or provider of workers.

OSH: Occupational Safety and Health.

OSH Management System: A set of interrelated or interacting elements to establish OSH policy and objectives, and to achieve those objectives.

Risk: A combination of likelihood of an occurrence of a hazardous event and the severity of injury or damage to safety and health of people caused by this event.

Risk Assessment: The process of evaluating the risk to safety and health arising from hazards at work.

Safety and Health Committee: A committee with representation of workers and employers and their respective representatives established and functioning at facility level according to national laws, regulations and practice.

Supervisor: A person responsible for day to day planning, organization and control of a ship-breaking work site.

Surveillance of the working environment: A generic term which includes the identification and evaluation of environmental factors that may affect worker's health. It covers assessments of sanitary and occupational hygiene conditions, factors in the organization of work which may pose risks to the health of workers, collective and personal protective equipment (PPE), exposure of workers to hazardous agents, and control systems designed to eliminate and reduce them. From the standpoint of workers' health, surveillance of the working environment may focus on, but not be limited to, ergonomics, accidents and disease prevention, and psychosocial factors in the workplace.

Worker: Any person who performs work, either regularly or temporarily, for an employer.

Workplace: Physical area where workers need to be, or to go to, on the instruction of an employer to carry out their work.

Work Related Injury: Death or any personal injury resulting from an occupational accident. Negative impacts on health arising from exposure to chemical, biological, physical, work-organization and psychosocial factors at work.

CHAPTER 1

1.0 INTRODUCTION

1.1 General

Ship breaking is the process of dismantling a ship's structure for scrapping or disposal whether conduct at a beach, pier, or dry dock. It includes a wide range of activities, from removing all gear and equipment to cutting down and breaking the ship's infrastructure. Ship breaking is a challenging process due to the structural complexity of the ships and many environmental, safety, and health issues involved in it. While ship scrapping in dry docks of industrial countries is regulated but it is unfortunate that ship breaking on beaches or alongside piers is subject to less control and less inspection. Breaking old or redundant ships, rather than scuttling or using them as artificial reefs, enables steel to be recycled at a much lower cost than importing and processing iron ores require less energy. It also provides the timely removal of out dated tonnage from the international waters. Hundreds of vessels scrapped each year. When vessels come to the end of their profitable life, usually after about 20 – 30 years, it sold to ship breakers for recycling/breaking. Over the last decades, ship breaking recognized as a very hazardous occupation and has been concentrated in some Asian countries. A recent feasibility study commissioned by the European Union concluded that ship breaking was unlikely to carry out in Europe due to its hazardous nature, its relatively high cost and lack of demand for scrap steel. On the other hand, the developing countries, like Bangladesh do not have any iron ore. Therefore, Bangladesh has to depend solely on import of scrap steel or ingot. The ship breaking industry could potentially contribute to sustainable development of Bangladesh, as steel and other products from obsolete ships are recycled /reused.

1.2 Background of the Study

The ship breaking industry is mainly concentrated in Asia, specifically in Bangladesh, India, China and Pakistan. These countries recycle approximately 92% of all ocean-going vessels, ranging from small ships to the largest tankers. At present, Bangladesh is one of the leading countries in the world in ship breaking activities. Ship breaking yards in Bangladesh are located exclusively on an 8 to 10 kilometers long stretch of beach in

Sitakunda, approximately 10 kilometers north of the Chittagong city (Location Map of the Ship breaking yards is attached as **Appendix-A**). For a clean, healthier environment, appropriate method of ship breaking and waste management is essential. Bangladesh is in the leading position in ship breaking sector for the last three years 2004, 2005 and 2006 in terms of tonnage (*source: www.cotzias.gr*). For a country like Bangladesh, due to economical and technological drawbacks and lack of giving proper importance in this field, the management of ship breaking in Bangladesh is still using very primitive methods with minimum /or without use of personal protective equipment(PPE) for the occupational safety of the workers. Old ships can not just dump on the seashore or sunk in the sea while containing accumulated hazardous material and different chemical substances. Bangladesh Ship Breakers Association (BSBA) also admires and understands that this is one of the hazardous and risky profession, create various occupational safety and health problems of the workers. The statistics of the World Leaders in ship breaking for the last few years attached in **Appendix-B**.

Ship breaking has emerged as an important economic sector in Bangladesh, some times referred to as '**the iron mine of the country**'. It extracts about 1.2 million tons of scrap iron (about 80% of the total usages), the bulk of which goes to 325 re-rolling and a number of steel mills and is then converted to MS rods, angle iron, flat bars, jet bars, MS coils and is used extensively for constructing buildings, bridges, grills, cargo vessels, motor launches, barges, truck and bus bodies etc. Briefly, the country's rapidly expanding housing sector, road infrastructure, industrialization, and transport sectors are heavily dependent on the ship breaking scraps. Substantial amount of iron, steel and other metal goods such as pipes from 0.5-inch diameter to 36 inches diameter, cables, steel plates, flat bars, iron beams are directly using in the construction sector. In addition, hundreds of different items of machinery and equipment, motors, engines, generators, boilers, lathes, workshop machines, drills etc. are helping the establishment of a variety of industrial enterprises from food processing to garment production, tanning and small engineering workshops. The rapidly growing housing sector receives various types of bathroom, toilet and kitchen fittings. Ship breaking also supplies substantial amounts of highly durable furniture to the urban middle class thereby saving our forestry resources largely.

Bangladesh has comparative advantages in ship breaking over other countries involved in the same business for a number of reasons, which include the following:

- Flat seashore, highly suitable for beaching of ships.
- High tidal fluctuations particularly twice a month during the new and full moon cycles.
- High difference in water levels between monsoon and dry seasons helping beaching of ships during high tides in monsoon months.
- Abundant supply of cheap labourer is available almost round the year. Workers agree to accept low wages, poor working environment and substandard living conditions because of extreme poverty. In addition, the lack of an institutional mechanism to execute the required safety standards and workers' welfare contributes towards the low dismantling cost. This acts as an incentive to the ship breaking labourer contractors and other intermediaries.
- High demand of scrap iron for re-rolling mills and for direct use.
- Good local market for other material coming from the ship as almost everything can sell and nothing goes waste, even asbestos, cork sheets, plastics and oils.

The world must get rid itself of the old ships somehow or other, and recycling is the best option as it is underlined in the IMO guidelines on Ship breaking. This is also important to the rest of the world ensuring the standards mentioned in ISO 14000. Particularly the issues of safety at work, workers health, working conditions and practices, the level of safety awareness of both employees and workers, workers' living conditions both at yards and in the surrounding areas, availability of safe drinking water and sanitation facilities, accident prevention measures, first aid and health services to the workers in the case of accidents and general illness, welfare support etc. are of great concern to both national and international observers..

In a preliminary study, it is observed that most of the workers came here to do this odd and hazardous work are poor and illiterate and, as such are not aware of occupational safety and health requirements from the poverty stricken northern part of the country (locally known as "*Monga*" stricken area) without knowing the scenario and severity of hazards to which

they have face during the work. Most of the workers engaged in the yards through a labour contractor as Ship breaking is not a continuous business round the year. The shipyard owners make a financial arrangement on tonnage basis with the contractor. Since the workers identified in the fake name and addresses, the employers can easily suppress the news of death due to fatal accident. In some yards, owners built shades for providing accommodation for the workers but those are in most unhygienic condition and not properly maintained. Ten or fifteen workers eat and sleep in a room of 150sq.ft, which becomes unhygienic. The drinking water supplied from the tube wells sunk in the yards but no test on the purity of the drinking water has conducted. There are no suitable toilets and urinals for the workers in the recycling yards to maintain occupational safety & health. Some of the Yards have some protective equipment but those are lying idle because the workers do not know their utility. Pre-recycling formalities as provided by International guidelines Conventions and National laws are not followed to the required level sufficiently and due to this non- compliance many fatal accidents occurred in the past, disabling and killing many people. They also exposed to chemically harmful materials that can have disastrous and long-term effect on their health.

As far as work environment is concerned, in most of the yards, safe working environment are not exists. Non availability of safety measures possess a great challenges to the workers enhancing uncertainties and risk, resulting injury and incidents and ultimately turned to sufferings of the workforce, sometimes loss of human lives also. The facilities available in the ship breaking sector in Bangladesh like safety, health, medical, sanitation, social welfare security are minimal. As a result many succumbed to serious diseases /injuries and died in accidents. The occupational status of this class of toiling masses does not have any social acceptance level. Labourer conditions in such area are over sighted and do not receive adequate attentions as an intriguing issue. Intrinsic values of labour force in this occupation are out of realization of most of the yard management, labourer contractor management as well as policy committees despite of the fact that hard and arduous labour of the workers generates a huge amount of revenue hence contribute to the national economy every year.

In spite of all difficulties and problems exists in this sector approximately 20,000 -30,000 thousand people directly engaged in this sector and their entire families are depended on their income. Most of the workers employed by the contractors do not work permanently in any particular yards and move from one yard to another as per need of the contractors. As a result, they are not able to organize themselves and cannot form trade union or association to establish their rights. The workers also engaged in forward linkage industries. Once the workers got injured or faced safety problems in work place or around the workplace, the problem will not only faced by those particular workers but also their family as well as yard management where they worked and finally the national income has hampered.

All the ship-breaking yards registered under The Factories Act, 1965. But very often the yard owners follow that act and other relevant rules prevailing in the country. The list of important rules applicable to the ship-breaking sector includes:

1. The Factories Act, 1965
2. The Factories Rules, 1979
3. The Workers' Compensation Act, 1923
4. The Payment of wages Act, 1933
5. The Employment of labour, Standing Order Act, 1965
6. The Industrial Relations Ordinance, 1969
7. The Environment Conservation Act, 1995.
8. The Environment Conservation Rules, 1997, and
9. The Petroleum Rules, 1937.

The most important legislations relevant to the Ship breaking are The Factories Act, 1965 and The Environment Conservation Act, 1995. Both cover most of the occupational safety, occupational health, and welfare of labourers, child labourers, women labourers, employee organization and environmental issues.

So far no specific Act, Rule or Guidelines have been prepared for the Ship breaking sector in Bangladesh but a number of national legislations, rules and policies are generally applied in its governance. Presently, Government of Bangladesh accumulated all rules and regulations related to Factory, worker's right, updated and renamed as **The Labour Law-**

2006 and finally declared as **The Labour Act 2006**, all the previous Act, Rules related to this issue was also declared as obsolete and invalid.

1.3 Objectives of the study

The study is an attempt to blaze a new field of exploration so far as safety problems of Ship breaking workers are concerned. The workers in the Ship breaking yards constitute a fragile locus suffering manifold hazards. These workers are remain outside the purview of policy intervention and their visibility in a struggle for survival with a bitter taste of life has not been translated in to an issue of human development index. Non-availability of safety measures poses a great challenge to the workers enhancing uncertainties and risks. As a result many succumbed to serious diseases, injuries and have been killed in accidents. The main objectives of this research work can be outlined as:

- a) To find out hazardous substances available in the old ships and their effects as well as risky works involved in ship-recycling which are responsible for various injuries and occupational diseases.
- b) To find out the probable causes and types of accidents occurring frequently in the yards.
- c) To find out the causes of legacy to practice the usage of existing national legislation and the situation covered by rules and regulations prevailing in Bangladesh in connection with workers safety at Ship breaking yards.
- d) To look at whether the systematic approach for assessing risk mentioned in the ILO guidelines could be replicated to Bangladesh Ship Breaking Industry.
- e) Finally, to make some policy remarks for the betterment of the present situation in light of existing rules and regulations prevailing in Bangladesh as well as different international conventions that Bangladesh already agreed to ratify/already ratified like ILO, IMO and BASEL Conventions.

1.4 Scope of the study

Ship breaking business in Bangladesh is carried out since the early eighty's yet to organized as a systematic sector. Manpower/staffing pattern is also not uniform in all yards. But there is a close-similarity of staffing pattern in most of the yard management.

Accordingly, for the study purposes four classifications were made as High-skilled(Ship in-charge, Supervisor), Skilled (Foreman, Assistant Foreman, Winch Operator) Semi-skilled (Cutter, Fitter) and Un-skilled(Loader, Cutter Helper, Fitter Helper, Cleaner and workers in wire group) for easy explanation. Like other industries, ship breaking is not a continuous business round the year. It depends on the availability of ships at the yards. All categories of the workers were not usually found available at the yards in same time.

Due to non availability of excess to some yards and other constraints 160 workers of different categories were interviewed and 16 yards were covered out of active 28 yards. From each yard it was tried to interview the similar categories of workers, so that there is a consistency of information/data and that can be comparable with other yards. Few owners have more than one yard. On the basis of the owner the total number of active yards during the study period was 19. As the BSBA representative requested the yard managers to provide support to the author, they did it with least support. Basically yard management has no control over the workers. During the research time, no workers were found interested to talk with the author unless the contractor as well as yard management allow and requested them to discuss. As they worked under contractual basis on tonnage, the workers did not want to waste their time anyway.

Though lot of incident reports were known from the newspaper but no specific data of that incidents or fatal injury caused death were maintained either by concern yard management or by the respective of Government Departments like Department of Inspection for Factories and Establishments, Department of Labour etc. Safety and health concern of the worker also neglected due to lack of monitoring mechanism of the concern departments and weak law enforcing systems.

If sincere cooperation could be ensured by the yard management as well as by the BSBA more comprehensive study could be possible.

CHAPTER 2

2.0 LITERATURE REVIEW

2.1 General

There is hardly any systematic work, so far, has made on this issue in Bangladesh. As this sector was recognized as unsystematic, isolated and concentrated in a specific area of the country, it is out of sight of the mass people and also has very limited access to information about the occupational safety, health and environmental conditions of the ship breaking yards which are detrimental to the workers health as a whole. For conducting the research work, the availability of information is one of the major issue, without this any significant development could not possible on this specific issue. Similar situation prevails in the Bangladesh Ship Breaking sector where safety, health and environmental issues are not considered as important factors. The information collected from newspaper is one of the important sources for monitoring the accident cases.

To conduct the research several documents and literatures are reviewed. A limited number of reference literatures found to know about the Ship breaking in Bangladesh. However, some important study related to ship breaking conducted in the recent past are discussed below.

2.2 Present state of art of the research topic

The first ILO guidelines ever prepared on Ship breaking is entitled *Safety and Health in Ship-breaking : Guidelines for Asian Countries and Turkey (2004)*. The guidelines cover ship breaking activities of few Asian countries and Turkey. It consists of Ship Recycling Plan (SRP), list of hazards and dangerous materials and their location in the ship. On the basis of this international Guidelines, any ship breaking country like Bangladesh can take assistance and guidance to prepare the country's specific ship breaking guidelines. The aim of this study is to assess how far this guidelines along with other national regulations are being followed by the ship breaking yard owners in Bangladesh. The guidelines lists many hazardous materials used to build ship like asbestos, polychlorinated biphenyls (PCBs),

toxic paint such as Tri-butyl-tin (TBT) and heavy metals which are mostly banned or restricted now a days. It classified these hazards into seven categories as (1) hazards with the potential of causing accidents (2) hazardous substances and wastes (3) physical hazards (4) mechanical hazards (5) biological hazards (6) ergonomic and psychosocial hazards and (7) general concerns.

The guidelines provide information on hazards and safety measures from international, national and shipping sources are needed at the worksite level for safe performance. Necessity of “Green Passport” which should consist of information with regard to materials known to be potentially hazardous and utilized in the construction of ship, its equipment and system, is also discussed.

Many hazards may attribute to a hostile environment rather than to inadequate requirements compounded by the negligent behavior. Laws and regulations can not expected to cater for every variable; however, laws and regulations should provide a sound basis for safe and healthy work practice. A systematic approach for assessing risk in ship breaking is also provided in these guidelines. One of the aim of this study is to look at whether this approaches could be replicated to Bangladesh Ship breaking sector.

Another work on ship breaking is “*Workers in Ship-breaking (YPSA)*”, (2005). The report focused on advocacy regarding the social aspects of the workers. They also suggested some recommendations that would help a lot to get clear understanding about this sector. They identified some social problems confronted by the ship breaking workers and provide some recommendations to eliminate these difficulties. But YPSA did not focused on technical issues such as safe handling and removal procedure of different hazardous materials available in ship breaking yards, technique of assessing risks etc.

The most valuable report on ship breaking is found in the literature is *Findings of the Baseline Survey of the Ship Recycling Yards (2005)*. The report explained the procedures adopted by the ship breaking yard management to dismantle a ship. It also highlighted the activities of the different government agencies without specifying any specific duties of these departments (**Appendix-C**). It also discussed the ship breaking situations and procedures followed in the neighboring countries like India, China and Pakistan. China

uses more capital intensive method with limited manual work using jetties. Moreover, a series of sequential activities for dismantling a ship is shown in **Appendix- D**.

The report also explained that incident reporting was very weak due to reluctant attitude of the yard management, negligence, incapacity and weak monitoring system of the government departments. This report suggested that the recycling authority should check every ship before it is accepted for recycling. It also stressed to follow the International rules/regulations related to ship breaking requirements mentioned in the ILO, IMO, Basel Convention and other international guidelines/conventions.

CHAPTER 3

3.0 METHODOLOGY

3.1 General

A descriptive type study accomplished in a systematic manner on the workers as well as on some management personnel of ship breaking yards in Chittagong, Bangladesh. In this descriptive type of study different variables such as age, educational qualifications, skill, job type of the worker, injury in different body parts, agent of accidents and type of hazards taken into consideration. Several management personnel and workers called for interviewed to collect information associated with occupational safety, health and hazards. Some focus group discussions also arranged to cross-check the information as well as to avoid confusion.

3.2 Research Methodology

Importance of methodology in conducting any research can hardly be over looked. It needs a very careful and sincere consideration. The methodology, which is used in this study, enables to collect valid and reliable information and to analyze those data to arrive at correct decision. Keeping this in mind, utmost care has been taken for using proper methods in all aspect of this study. The details steps of the methodology to accomplish the objectives of the study are stated in the followings:

3.2.1 Selection of Sample: A reasonable sample size, which can at least satisfy the objectives set for the study, taken into account. During the research period, number of active yards was 28. Number of yards varies frequently upon availability of ships to be scrapped in the particular yard. Moreover, few owners have more than one yard. In considering this, the number of yards counted 19. For the study, it is tried to cover all the active yards. However, due to variation of active yard number and the availability of the different types of employee at a time in the yard, 16 were covered. From each yard 10 categories of employees (generally Ship In In-charge, Yard Supervisor, Forman, Cutter,

Fitter, Cutter Helper, Fitter Helper, Wire group personnel, Loader and Cleaner are the common categories of work force pattern in each yards) interviewed. In total 160 workers were covered and 15 yard Managers were interviewed.

3.2.2 Sampling Technique: Sample selected in such a way that collected data fulfill the objectives of the study. As the total number of sample were not so big, but considering the limitations of time, efforts, availability of concurrence for providing information, purposive sampling technique were used in this study.

3.2.3 Period of Research: Ship breaking in Bangladesh is not a continuous business like other industries. It depends on the availability of ship in the yard and any owner can run the business round the year if the yard has ship to be scrapped. All seasons are suitable but winter is more favorable for the yard owner as well as for the workers as there was no botheration to work under the open sky and no rain that frequently occurring in rainy season. Therefore the research work was conducted in the field from January-June, 2007 for data collection.

3.2.4 Research Instruments : In order to collect information, two sets of interview schedule (Questionnaire); one for the Workers and other for the Yard Managers were prepared. Keeping the objectives of the study in mind, after a primary visit and informal discussion made with some management staffs and workers in order to develop a format with variables of interest . Based on the primary survey and knowledge gathered from the field level, two sets of questionnaire were prepared. Before preparing the final Questionnaires, these were pre-tested in some yard. The questions were both close and open ended. For the workers, it was tried to keep the question within close ended. But few questions were kept open for the interest of the study. Questionnaire for the Managers had also some open ended questions for the fulfillment of the objectives of the study. This pre-test was helpful to find the gaps and to locate faulty questions and statement in the draft questionnaires. Necessary additions, alterations and adjustments were made in the schedule on the basis of the feed back from pre-test. The finalized version of questionnaires were photocopied and used for collecting information. The data for this project work were collected from the yards as primary data using the above mentioned pre-tested prescribed

questionnaire. Questionnaires prepared for the workers can be seen in **Appendix-E** and for the yard managers/management personnel can be seen in **Appendix-F**. Workers are categorized into four groups as High Skilled (Ship In-Charge and Yard Supervisor), Skilled (Foreman and Assistant Foreman in different groups, Winch Operator), Semi-skilled (Cutter, Fitter) and Un-skilled (Cutter Helper, Fitter Helper, Cleaner, Loader and Others). The sample were selected on random sampling basis after stratified into 10 different categories and finally re-grouped as four categories. No female labour was employed in the recycling yards. The staffing pattern of the technical personnel of a ship breaking yard is shown in **Appendix-G**.

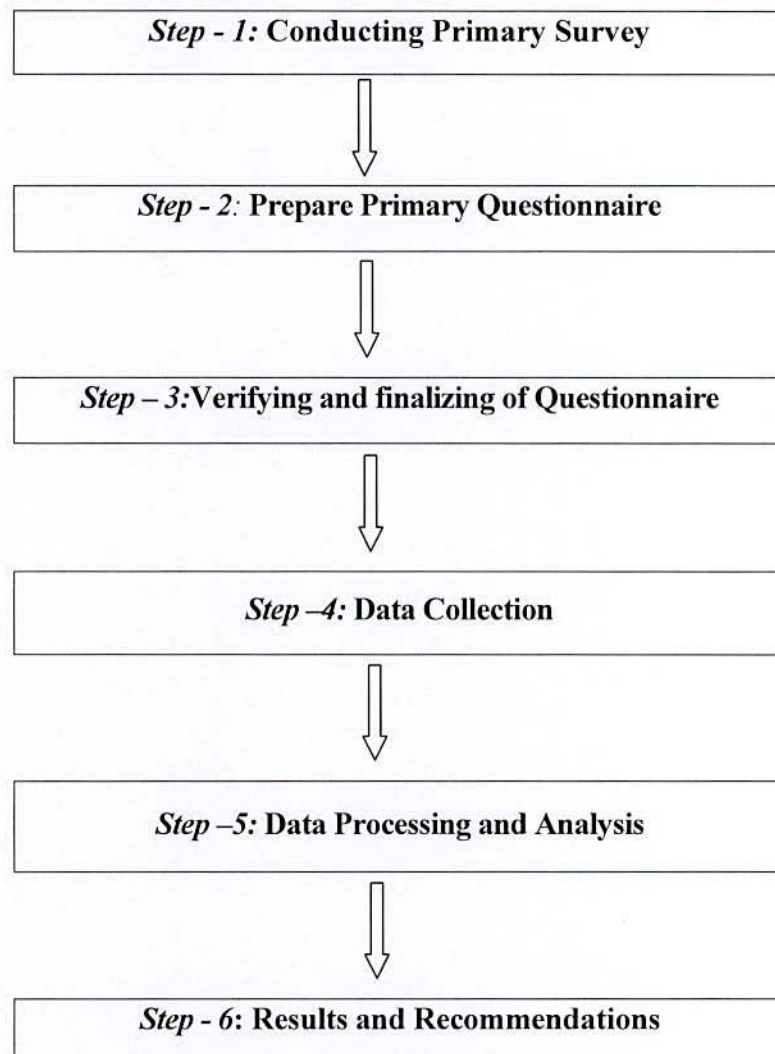
3.2.5 Procedure of Data Collection: Data for this study were collected from the respondents of the study area by using the questionnaire prepared. The interviews were made individually in the ship breaking yard during their work and leisure time with the permission of the yard management as well as contractor management. Sometimes, workers or managers hesitated to provide some information about matters relates to him or the information that would go against their management. Keeping this in mind, it was tried to explain the purpose of the study to each of the interviewee and established rapport before starting the interview with every respondent. Whenever any respondent faced difficulty in understanding any question, the researcher took utmost care to explain that particular question clearly to him.

In response to the question related to accident records and information, some respondent was reluctant to answer. But after motivation they tried to give the information as they could remember. Some information they provide on assumption basis as the yard management did not maintain any record of fatal and even minor accidents / injuries due to fear from law enforcing authorities and other relevant government agencies. To overcome this problem, all possible efforts were made by the researcher himself to ensure the collection of reasonably accurate data from the field. When each interview was over, each schedule was checked and verified to be sure that answers to all items had been properly recorded. If there were any items which were overlooked or contradictory, the respondents were revisited to obtain the missing and/or correct information.

3.2.6 Techniques of Data Analysis: Based on the prepared questionnaire, data on the variables were considered and the information were summarized, complied to fit those into tables and finally analyzed in accordance with the objectives of the study. In this way overall picture of the study unit were identified to point out various occupational injury patterns.

3.2.7 Interpretation of the Results: On the basis of the results, necessary recommendations were made for the betterment of this sector in terms of both policy issues and field level issues.

The whole process of study work can be shortly explained by the flowchart mentioned below:



CHAPTER 4

4.0 DATA ANALYSIS AND RESULTS

4.1 General

As two sets of questionnaires were prepared for the data collection, the data analysis and discussion has been made separately. In total 160 workers (32 High-Skilled, 18 Skilled, 34 Semi-Skilled and 78 Un-Skilled) and 15 yard Managers were interviewed. After completion of these data feed into tabular format, the analysis work has been done and on the basis of this analysis, results were found. In the prescribed Questionnaires, few questions were asked to the workers for the workers interest and few of them did not have any direct value for this specific study but this information carried a value for clear understanding and these data were helpful for providing policy recommendations for the betterment of this sector. The data regarding the fatal accidents were collected from the present workers as the wounded workers were not available in the yards due to loss of working capacity.

4.2 Data Analysis (Based on questionnaire prepared for the Workers)

4.2.1 Level of Education of the workers

Education is the most important factor for any sustainable development. It helps to enhance the knowledge. Through this study, it was tried to know the level of education of the workers engaged in ship breaking sector. Though there is no direct linkage of accidents with the educational status of the workers but education can guide a person to do the job in right direction and that can reduce the safety problem to a great extent. The workers of the ship breaking yards have no individual choice to do any work and have to follow the contractor's guidance to complete the job within a minimal time without giving little attention towards the safety and health issues as well as other welfare issues of the workers. It is observed from the **Table -1** that about 35% of workers are illiterate or do not have any formal education followed by 40% up to the primary education. About 18% of workers have education up to Secondary School Certificate (S.S.C) and about 6% have Higher Secondary School Certificate (H.S.C) while graduation and above found very seldom

(0.63%). It is found from the primary data that most of the illiterate workers belong to Loader, Cleaner, Cutter Helper and Fitter Helper cluster.

Educational Status	Number of Respondent	Percentage
Illiterate	56	35.00 %
up to Primary	64	40.00%
up to S.S.C	29	18.12%
Up to H.S.C	10	6.25%
Graduation and above	1	0.63%
Total	160	100.00 %

Table -1: Education level of the Workers

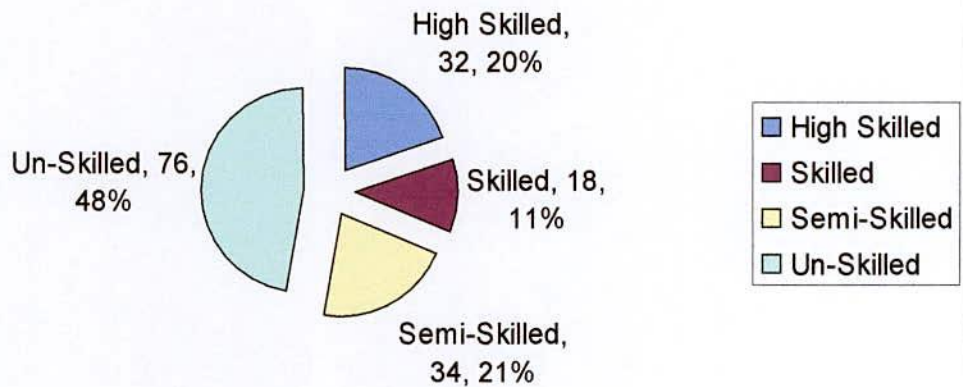
This huge number of illiterate and low educated labour force probably has less accessibility for better professional jobs within and out side the sector and less accessibility to different opportunities including information for exercising rights, as they are less exposure to education. As they were mostly uneducated, they even do not know their rights mentioned in the national rules and regulations. As a result the workers deprived from their rights also.

4.2.2 Categories of Workers Interviewed according to their Skill

Through this data, it was tried to justify the sample size. As approximately 10 different categories of workers are working in the ship breaking yards, for study purposes they are classified in to four groups, like High-Skilled, Skilled, Semi-Skilled and Un-Skilled. High-Skilled category includes Ship-in-charge and Supervisor, Skilled category includes Foreman, Assistant Foreman, and Winch Operator. Accordingly Semi-Skilled covers Cutter & Fitter and finally Loader, Cleaner, Cutter Helper, Fitter Helper and workers involved in wire group grouped as Un-Skilled category. All these categories of workers were selected according to the proportionate number of workers. From the **Figure-1**, it reveals that 48% un-skilled workers were interviewed those were mainly exposed to accident due to work assigned and lack of technical knowledge and education. Keeping the objectives of the study in mind, to find out the causes of occupational accidents and injuries as well as find

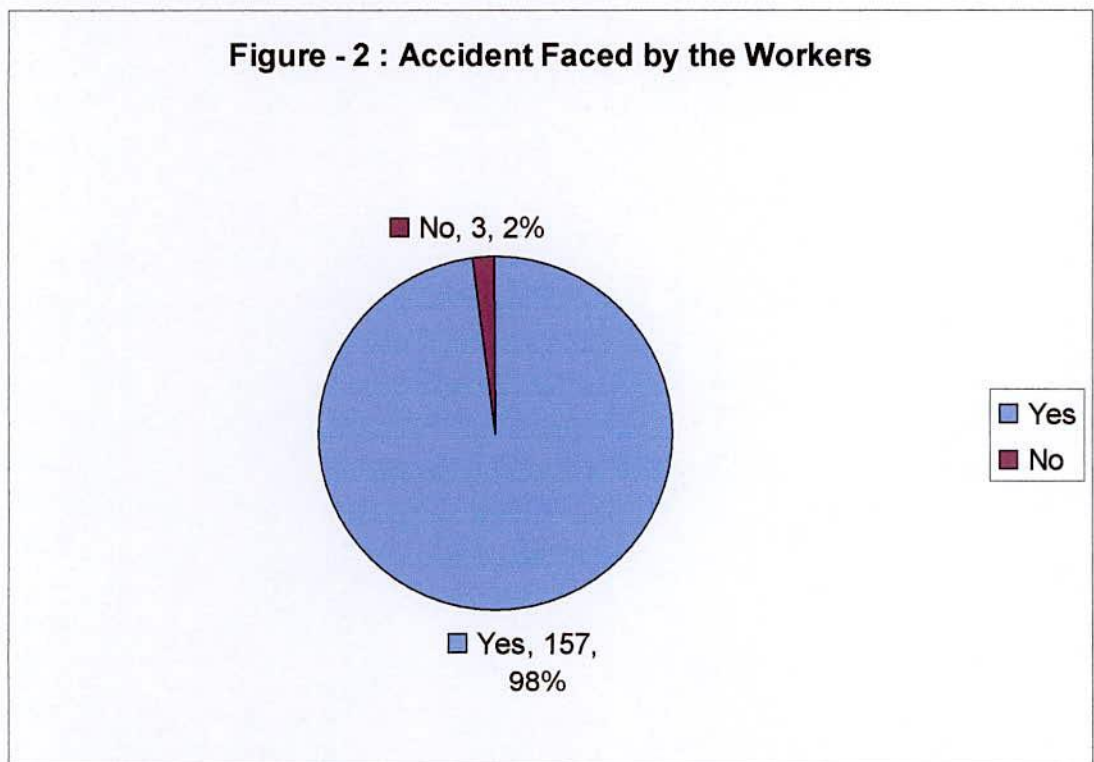
out the possible remedies to minimize the number of accidents, Un-Skilled cluster (about 50 % of the sub-sample) given highest priority. The next vulnerable group is Semi-Skilled (21%) followed by High-Skilled group 20%. Usually all the Skilled category of workers had a long working experience rather than institutional education, resulting less possibility of exposure to the accidents. Mainly Un-Skilled and Semi-Skilled (covers about 78%) workers engaged in work directly. So, the possibility is also higher to get injured by these two categories of workers compared to High-Skilled and Skilled group. The latter two groups of workers do mainly supervisory type of work.

Figure -1 : Categories of workers interviewed based on their Skill



4.2.3 Accidents Faced by the workers

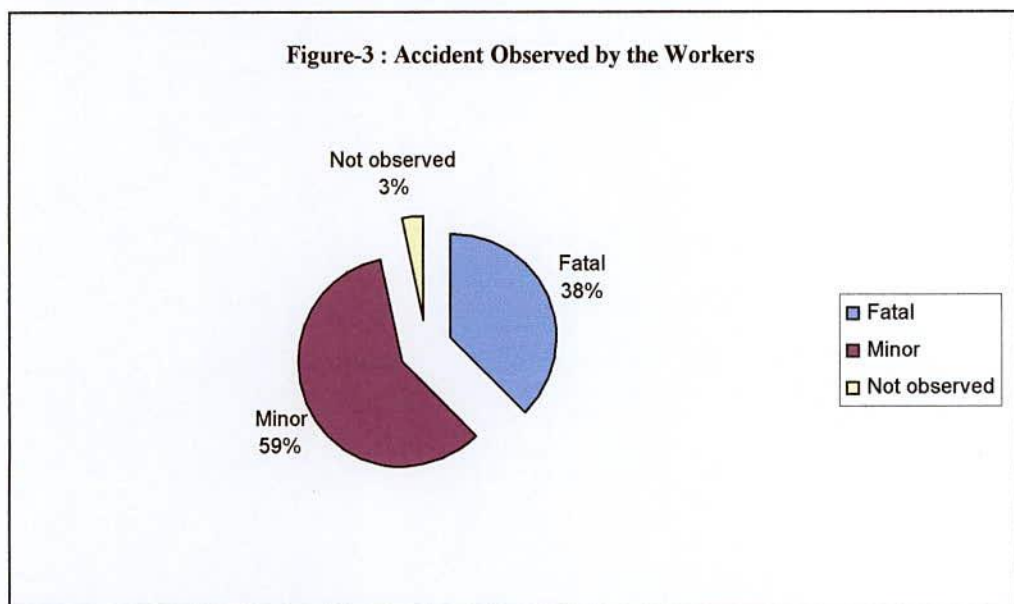
Accident is a common phenomenon in the ship breaking yards in Bangladesh. Each and every day few minor accidents or injuries occur that results loss of working hours as well as potentials of the active workers. The purpose of this data to get an essence how many workers are experienced with accident or injuries during their work at the ship breaking yards. It is found that about 98% of the workers faced accidents and got injured. Only 2% did not experience any accidents as they were new comer in the yards.



From this results it can be guessed that how accident prone this sector is and also the severity of accident in this sector. So, this result provides the importance of this study as well as justification of choosing the subject.

4.2.4 Categories of Accidents observed by the workers

Any data related to fatal accidents could not be found in any ship breaking yard. From the literature review a statement of fatal accidents found that was also prepped based on newspaper. A question was asked to the workers during the interview regarding the accident, observed within the last one year to get the idea about the accident patterns. This question was closed ended and three options were given. They had to choose any one of these. Fatality includes Death, Loss of Leg(s), Loss of Arm(s), Loss of Eye(s) or in general loss of any body part or disability. On the contrary, minor injuries are the injuries of Hand, Feet, Chest to Thigh, Arm, Eye, Face, Head, Ankle, Knee, Shoulder and Legs.



It is revealed from the **Figure-3** that fatal accidents are reported about 38% of the respondent and minor accidents reported by 59% of the respondent. About 2% of workers did not meet any accident during their working period as they were new in this field and their work experience in this sector was less than one year. The workers provided this information from their memories. The victimized workers due to fatal accidents were not found in the yards as they lost their capacity to work anymore. Information from **Figure-3** provides a general idea which can be used to take necessary measures to prevent or minimize accidents.

4.2.5 Accidents faced by the workers based on Age group

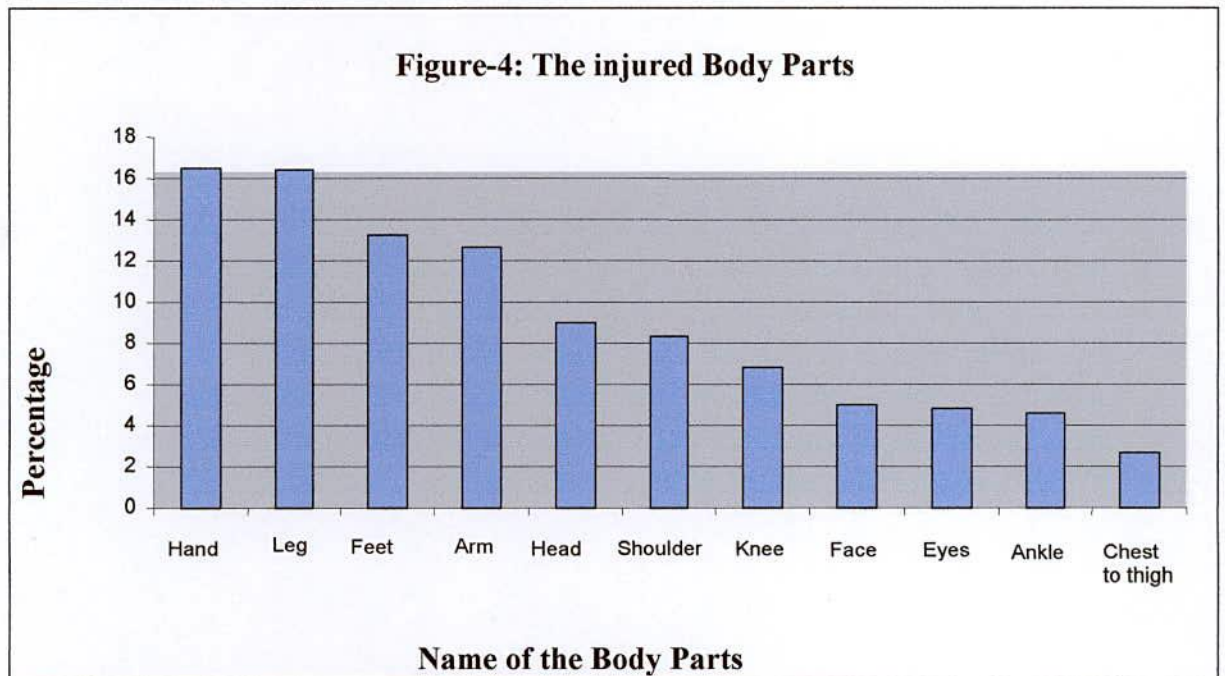
A question was asked to the workers regarding accidents faced by them during the data collection. Age of human being play a vital role to control the behavioral attitude of a man. Usually Childs are very sensitive, fast and immature in thinking while an adult always think before he start to do something and also its future effects. On the contrary, with the increase of age after certain limit human being become old and is gradually loosing their potentials. According to the statement mentioned above the youngest and oldest age group should be the most vulnerable group. But it is found from the **Table-2** that only one respondent belong to youngest group and came to ship breaking yards recently and the most oldest age group(55-59) is in third position (about 15%) in terms of vulnerability. It is also observed that more than 52% of the respondents within the age group of (15-24) faced maximum accidents. But in a single age group, the most vulnerable group is 20-24; about 29% faced accidents followed by the age group 15-19 where about 24% faced accident. Excluding the exception for the age group (10-14), it reveals that the age group 40-44 are very serious and cautious about their work and that is why this group rarely faced accident; about 2%. From the result it can be concluded that though age is a vital factor to control the attitude of human being which is directly related to accident, it also may be possible that accident which occurred in the ship breaking yards may not have a fault of the person who get injured. He may be the victim of other's fault or absence of good working environment.

Age Group (years)	Minor Accident	Percentage
10-14	1	0.64
15-19	37	23.57
20-24	45	28.66
25-29	8	5.10
30-34	16	10.19
35-39	5	3.18
40-44	3	1.91
45-49	6	3.82
50-54	13	8.28
55-59	23	14.65
Total	157	100

Table-2: Experience with Accident by age group

4.2.6 The injured body parts

All the body parts are not equally exposed to or affected due to injuries and accident. Accident or injury can not be predicted. A question was asked to the workers during the interview to collect the name of body parts usually got injured during work at ship breaking yards and which one is most vulnerable. This was a closed ended question. Most of the workers mentioned more than one body parts. According to the statement made by the workers from **Figure-4** it is found that hand and leg are the most vulnerable body parts (about 16% each) usually got injured. Cumulatively about 59% injury occurred in hand, leg, and their surroundings (Hand, leg, arm and feet). As these two body parts are vital for working.



This reveals the necessity of using PPE (Gloves, Safety Helmet, Safety Shoes, Safety belt with life line, Goggles, Apron, Musk and Ear Plug etc.) can protect these human body parts to certain extent and can easily be provided by the owners of the ship breaking yards rather than selling as these were available in the old ships. The injuries depend on which type of work they are handling. All the jobs do not have the same type of risk. So necessary measure to be taken to control these injuries with minimal efforts and at the same time workers to be motivated to use the PPE not for the owners but for their own safety and to keep a good health.

4.2.7 Idea about the Hazardous and Dangerous materials available in the old ships

Old ships which were imported for breaking contain lot of hazardous and dangerous materials. These materials are detrimental to human health as well as for environment and may create serious health hazards during breaking of the ships. Many workers do not have any idea about these materials. To find out the status of knowledge of the workers about the hazardous items a closed ended question was asked. About 74% workers responded that they know about the existence of the hazardous materials in old ships. On the other hand 26% workers are not aware of these hazardous or they do not have any idea that some materials may cause harmful effects if it is not handled properly.

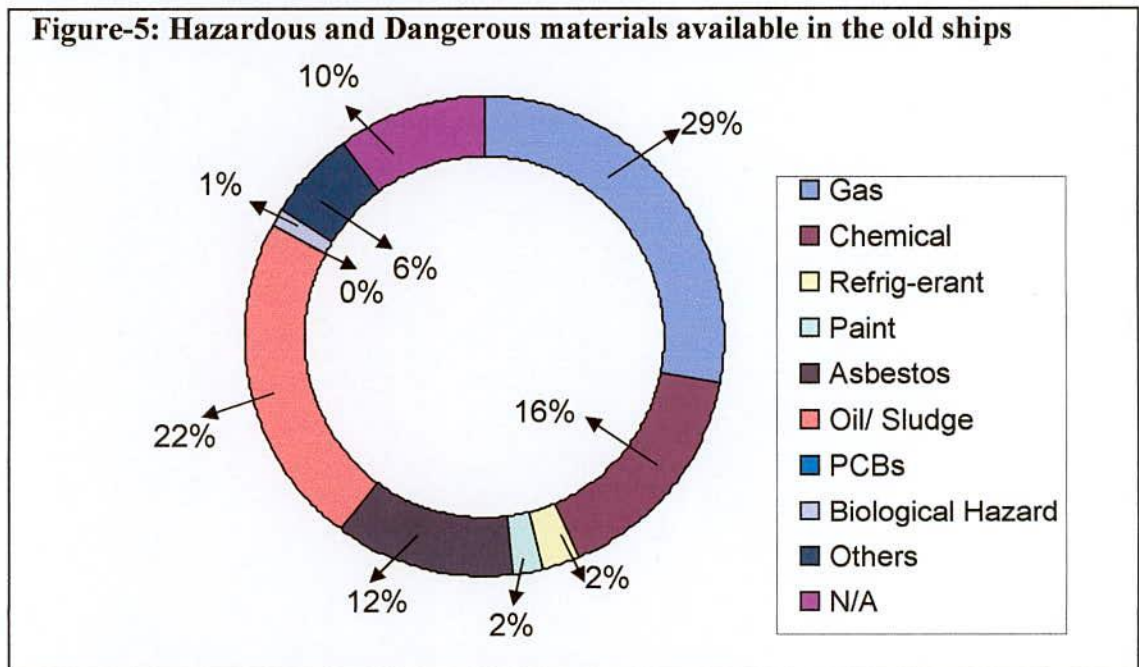
Response	Yes	No
Number	119	41
(%)	74.38%	25.62%

Table - 3: Idea about the Hazardous and Dangerous Materials

However, most of the workers informed that when they came to work in the ship breaking yard, they were in dark. As they are working for the long time and heard about the advocacy dialog from different corners, they became aware about this. Still then they are not in a position to raise their voice to protect themselves from the effect of these hazardous materials. Even they do not have any workers association. Moreover they are always feeling insecurity to loose their job.

4.2.8 Hazardous and Dangerous materials available in the old ships

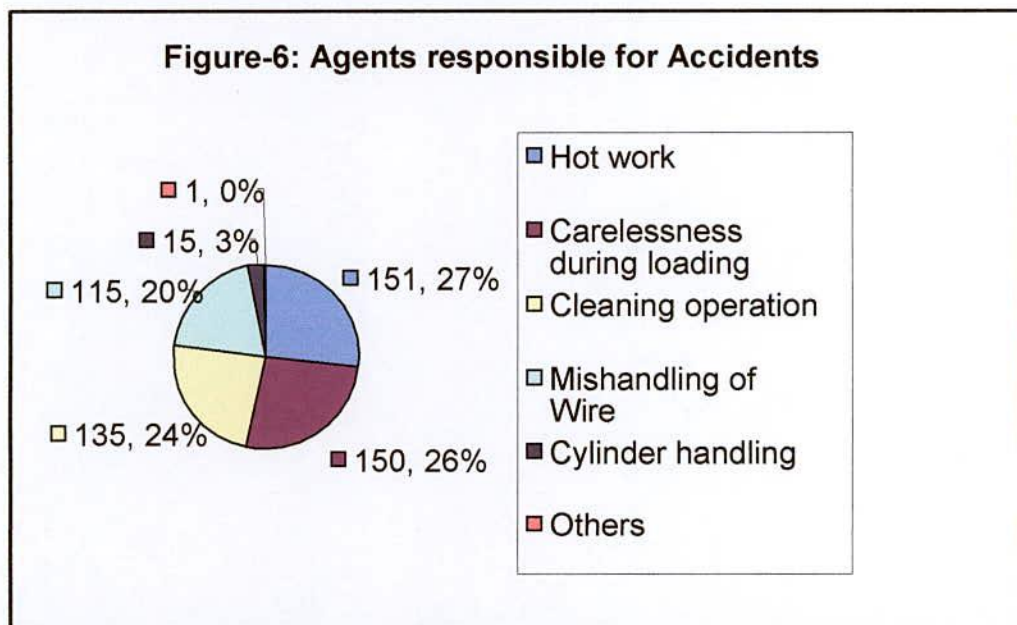
All the hazards do not have the same magnitude of influence to the worker's safety and health. But it is necessary to know which hazards are the most harmful and how these can be handled safely without investing so much. As it reveals from the **Table-3** that about 74% workers know that old ships contained lots of hazardous materials, that is why a supplementary question was asked to the workers whether they are capable to mention the names of hazardous materials. Most of the workers provided more than one name. But they do not know the effect of these hazardous materials to human health. It is observed from the **Figure-5** that 29% of workers mentioned the name of gas as they observed many accidents both fatal and minor were occurred due to this followed by 22% mentioned that sludge regenerate gas in the tank which also causes of explosion during hot work.



About 16% mentioned about the chemical and 12% mentioned about the asbestos which causes cancer and other skin diseases. Paint, Refrigerant, Different Biological Hazards were mentioned by the nominal percentage of the respondents (combined 5%). 10% of the workers knew from the other colleague that old ships contain hazardous materials but they could not mentioned any name. These hazardous materials may cause harm to human body even without direct contact. These hazards are polluting the environment. So, every body should be aware of these. Even the owner himself might be affected while visiting the yard if proper attention would not be taken.

4.2.9 Major agents responsible for accidents

Ship breaking involved different activities. Different agents have different risk and these are harmful to workers health and safety at works site. A question was asked to workers to know the information whether the workers aware of the risks of different agents or not and if, up to what extent. This question was mixed type; both open and closed ended. While asked this question to the workers, maximum of them mentioned more than one agent. From **Figure-6** it is found that about 27% answered that hot work is the main agent for causing accident in ship breaking. 26% of the worker mentioned that carelessness during loading operation is also an agent and responsible for accident followed by cleaning operation mentioned 24% and mishandling of wire mentioned by 20% of workers reported. During cylinder carrying accident might occurred is mentioned by 3% respondents.



Accidents happened through these agents are due to the following reasons: Personal negligence, Lack of work experience, Lack of use of PPE, Absence of good working environment, Excessive work load and over confidence. It is true that most of the fatal accidents due to explosion occurred in the ship's tank as combustible gases exist while hot work is carried out. It could be easily prevented by ensuring the tanks free from that gases before cutting started. Sometimes presence of toxic gases also responsible for the death of the workers, as they did not checked it properly before entering in to the tanks for inspection and cutting operation.

4.2.10 Main Causes of Accidents

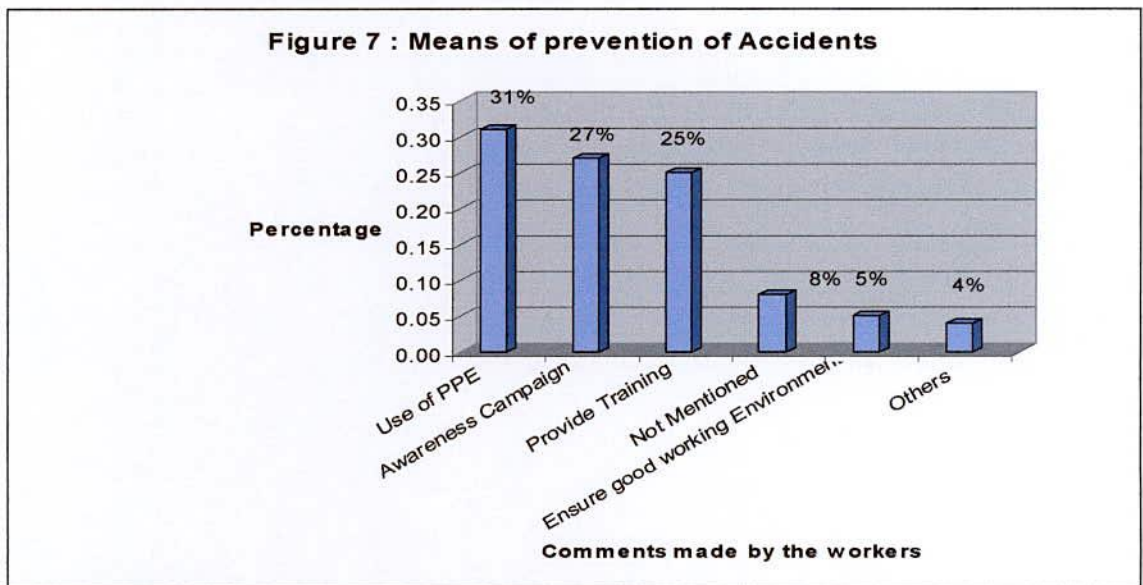
During the interview for data collection a question was asked to the workers to know their ideas about the causes of accidents that they frequently faces or observed. This was a mixed type question; both closed and open ended. Workers are not habituated to face this sort of interview. For the clear understanding of the question which was asked to them few causes were mentioned to them as reference. This reference helped them to answer properly. The entire respondent unanimously agreed that occupational accident occur in ship breaking yard are due to the following reasons:

- Personal negligence
- Lack of work experience
- Not to use of PPE or proper PPE
- Absence of good working environment
- Over confidence and
- Excessive work load

There might be other causes of accidents but no one answered any more causes though there is an open scope to mention other causes. It is found that they knew the causes but still they are not in a position to control the accidents. One of the aims of this study is to find out this gap and provide suggestions that ultimately ensure a good working environment so that the ship breaking activity will be carried out in a safe and environmentally sound manner.

4.2.11 Means of Prevention of Accidents

Workers those are in vulnerable situation and frequently faced different types of accidents, whether they have any idea to prevent the same, this question was asked to them. The question was set in the questionnaire as open ended question. It is observed from the **Figure -7** that 31% of the respondent believes that accidents can be minimized by ensuring the use of PPE followed by 27% mentioned awareness campaign on occupational safety and health issues. Training can play vital role to reduce accident expressed by the 25% respondents. Rest 8% of the workers do not have any idea about any measures to prevent or to minimize accident or may be they would not like to mention anything.



From the Figure-7, It is found that most of the workers knew the prevention measures to minimize accidents but they were not in a position to ensure that. Many of them did not follow these prevention measures due to their ignorance.

4.2.12 Knowledge about the Factory Act, 1965 / The Labour Act, 2006

Most of the ship breaking yards were registered under the Factory Act, 1965 and the corresponding rules entitled the factory Rules, 1979 are also applicable to this sector. Recently, at the end of the year 2006, government introduced the new Act entitled as The Labour Act 2006 accumulating all Acts and rules related to worker and factory and declared that the Factory Act, 1965 as obsolete. Through this study it was tried to know the knowledge of the workers about these rules and regulations prevailing in the country which are applicable to this ship breaking sector. This was a closed ended question and the workers had to choose either of the two. From the **Table -4** it is revealed that about 71% of the workers do not have any idea about the rules and regulations applicable to the ship breaking yards both for the welfare of the workers as well as maintaining good working environment. Though 29% responded reported that they knew about the rules and regulations but amongst them only 10% have idea about the provisions explained in the Factory Act, 1965.

Knowledge about the Factory Act,1965 or The Labour Act			Familiarity with the provisions of OSH issues of the Acts	
Responses	Yes	No	Yes	No
Number	47	113	17	143
(%)	29.38%	70.62%	10.63%	89.37%

Table -4 : Status of knowledge about Rules and Regulations stated in the Factory Act,1965/ The Labour Act, 2006.

It was found that workers those who are educated and belong to High skilled category almost have idea about the details of the Factory Act, 1965 and few of them have a very limited idea. As most of the workers are illiterate and they did not know about their rights due to their ignorance, they were deprived.

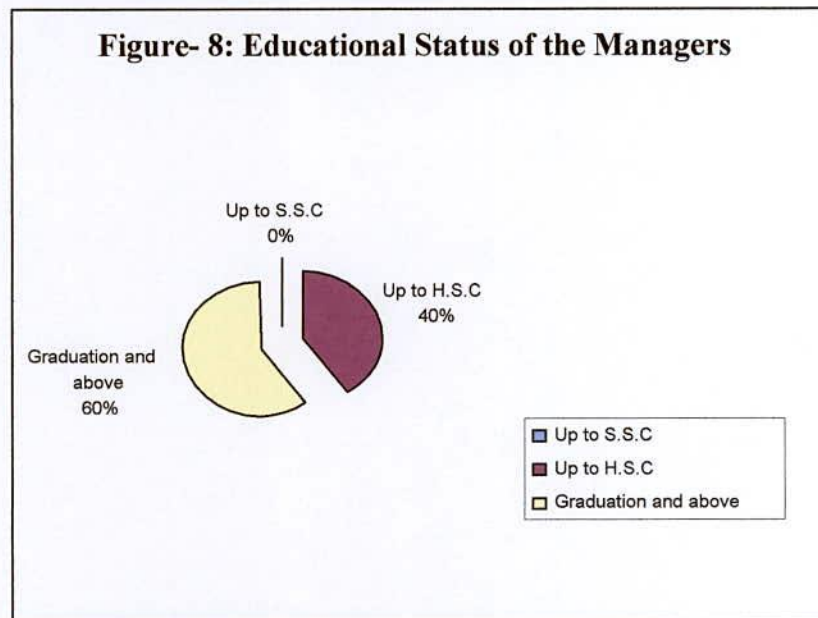
Due to weak monitoring mechanism of the concerned government departments, the rules and regulations applicable to this sector are not properly implemented yet.

4.3 Data Analysis (Based on Questionnaire prepared for Managers/Management Staffs)

Though 16 yards were taken into consideration for conducting the research, accordingly it was planned to take interview of the 16 owners/management staff one from each yards. But one of the managers lastly denied to provide any information. That is why, total respondent in case of management staff/managers were 15. It was observed that most of the managers hesitated to provide information as they are the direct employee of that particular ship breaking yards.

4.3.1 Level of Education of the Managers

Like the workers it was tried to know the level of education of the managers working in the ship breaking sector. It is observed from the **Figure-8** that 60% of the managers have graduation and above degree while 40% have higher secondary education. No managers were found below than that level.



It should be noted that no manager have the technical education where ship breaking is a highly technical oriented task. The managers are permanent staffs of the yards and employed by the owner not by the contractors. In few yards managers have the sole responsibility to run the administration as well as look after the welfare of the workers.

4.3.2 Knowledge about the Factory Act, 1965 and The Labour Act, 2006

Managers are the key persons of the ship breaking yards. They are responsible to maintain the day to day administration of the yards. So, they should have the knowledge about the national rules and regulations which are applicable to ship breaking yards. From **Table-5** it is found that the entire respondents were found well conversant about the Factory Act,1965 (which is obsolete right now) while only 47% have hard about the newly introduced Labour Act, 2006 by the GoB.

Related Act	Know about The factory Act 1965	No Idea about The Factory Act 1965	Know About the Labour Act 2006	No Idea About The Labour Act 2006
Responses	15	0.0	7	8
(%)	100.00	0.00	46.67	53.33

Table – 5: Knowledge of Managers about Rules and Regulations

Regarding implementation status (**Table-6**) of the rules and regulations stated in the Acts, about 33% managers informed that they are practicing the Factory Act,1965 and it's associated rules. About 67% of the managers said that they follow the Factory Act,1965 to some extent. On the contrary, 6% informed that they also started to follow the newly introduced Labour Act, 2006. Another 6% informed that they did not practice the Labour Act, 2006 at their yard while 33% said that they tried to follow this new Act to some extent and 53% of the Managers did not mention anything when they were asked this question.

Responses	<i>About The Factory Act, 1965</i>				<i>About The Labour Law, 2006</i>			
	Yes	No	Some Extent	No Comment	Yes	No	Some Extent	No Comment
Number	5	0	10	0	1	1	5	8
(%)	33.33	0.00	66.67	0.00	6.67	6.67	33.33	53.33

Table – 6: Implementation status of The Factory Act, 1965 and The Labour Act, 2006

Since more than 50% of the managers were reluctant to answer, it may be that they are not following the rules. They basically avoid the answer due to the reason that the concerned government departments may take necessary steps to disseminate information about the Labour Act, 2006 and also ensure its implementation by proper monitoring.

4.3.3 Main obstacles to follow the rules and regulations

Rules and regulations are the guidelines to control any sort of activity. As ship breaking is one of the hazardous job, it needs special attention to follow the rules and regulations for the smooth operation of the business. But it was come to know from the literature that both the national and international rules/regulations/conventions which are applicable to ship breaking sector are not properly implemented. It is observed from the **Table-7** that about 21% of the yard managers identified that the weak or no monitoring mechanism by the concern GoB departments is the major obstacle of implementing the rules. 19% of the respondents said that as the workers of the yards are not permanent in nature it is very difficult to follow the rules. 16% of the respondent mentioned that their management thinks to follow the rules is require to bear an extra cost. Absence of trade union is also one of the hindering points to implement the rules mentioned by 8% of the respondents. Still few of the yard managers (about 5%) thought that they are not legally bound to follow the government rules and regulations as this sector is yet to formally declare as Industry.

Cause(s)	Weak/no monitoring by the concern Govt. Dept.	Workers are not Permanent	Yard Management think this is an extra cost	It is the responsibility of the contractor to look after the workers safety and health as they engaged them
Number	13	12	10	8
(%)	20.97	19.35	16.13	12.90

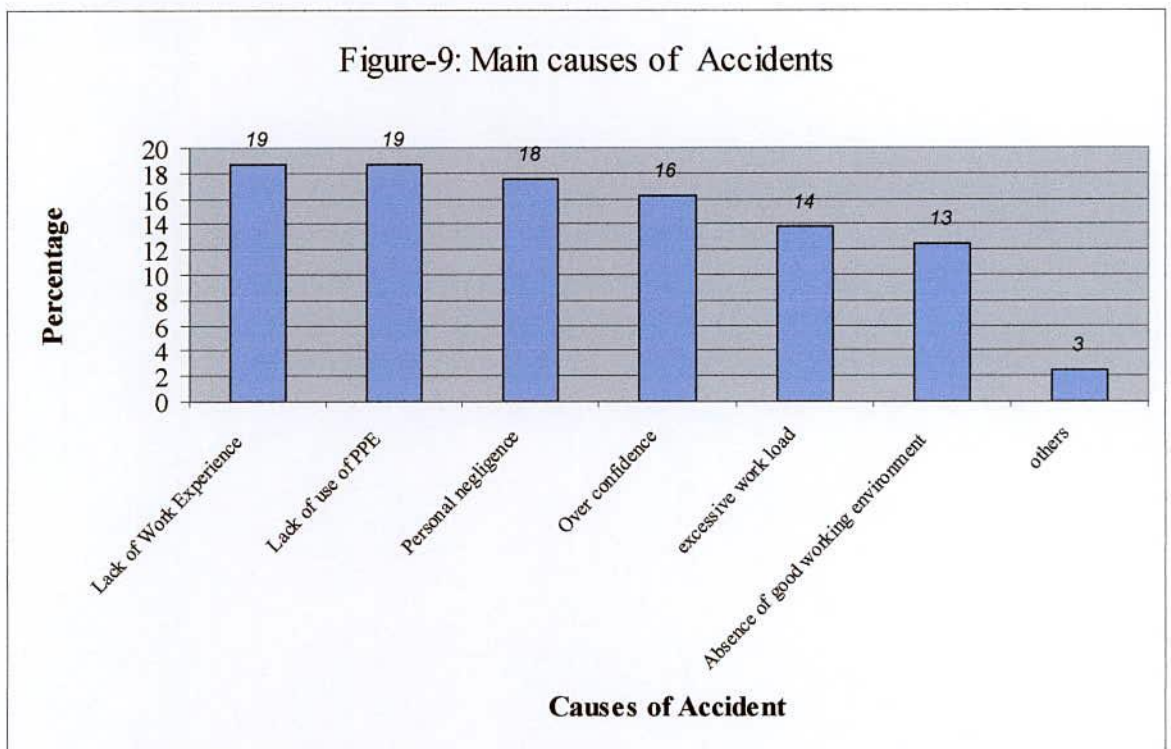
Cause(s)	Carelessness of the Yard Management	Absence of Trade Union	Others	Legally yard management are not bound to follow the Factory Act1965/The New Labour Law 2006
Number	7	5	4	3
(%)	11.29	8.06	6.45	4.84

Table – 7: Obstacles to follow the Acts and Rules

Though the few managers were said that they are following the rules and regulations but they were failed to show any document like registrar book for recording the accident or leave records etc.

4.3.4 Main cause(s) of Accidents

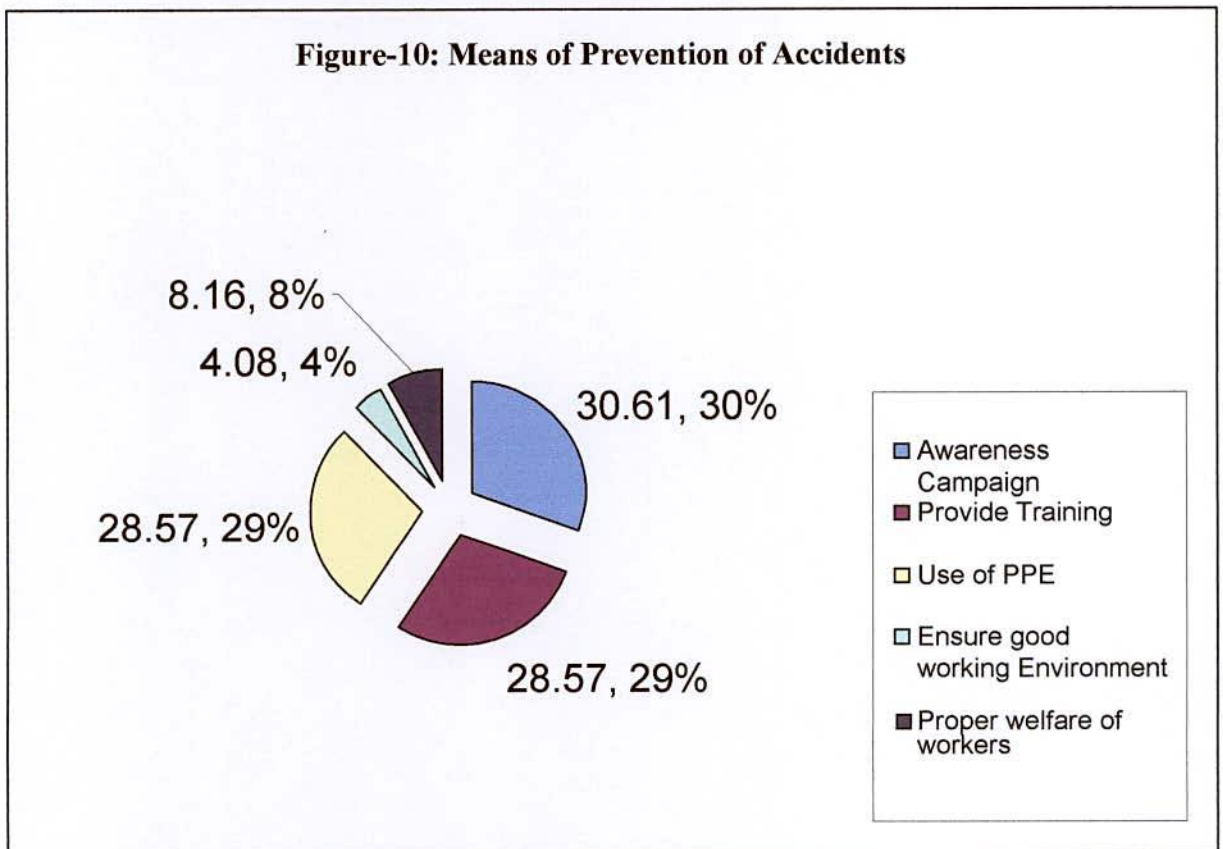
Accident is an uncertain event. It can not be predicted also. But it could be controlled by taking necessary measures in advance. Accident may cause due to various reasons. A question was asked to the Managers to know their ideas about cause(s) of accident in the yards as open ended question. Most of the managers responded more than one answer. **Figure-9** reveals that lack of Work experience and not to use PPE came up jointly as the top most reasons mentioned by 19% of respondents. The other causes of accident as mentioned by the yard managers are Personal negligence (17%), Over Confidence (16%), excessive work load (13%), absence of good working environment (13%) and different others mentioned by the 3% managers.



From this result, it can be concluded that most of the reasons mentioned by the managers are similar to that of mentioned by the workers stated in paragraph 4.2.10. Lack of experience and personal negligence can be recovered by providing motivation through training and ensuring the use of PPE can protect the accident to large extent as these three components carry more than 55% causes of accident mentioned by the managers.

4.3.5 Means of prevention of Accidents stated by the Managers

Awareness campaign is the most popular and effective method for preventing accident mentioned by all the yard managers. A question was asked to them to verify their knowledge level about the measures to be taken by them to minimize the accident rate in the yard. This was an open ended question. Most of the managers informed more than single measures. So the data were tabulated accordingly. Individual awareness campaign carries about 31% weight. From **Figure -10**, it is observed that imparting training to the workers of ship breaking yards on OSH issue and use of proper PPE jointly carry of about 57% weight, where environmental issue is almost an unknown and unidentified area to them. Only 4% of the managers mentioned about the environmental issue.



Proper prevention measures can protect many accidents. Since most of the workers are illiterate in this sector, the managers can play a vital role to raise awareness campaign regarding the OSH issues amongst the workers.

4.3.6 Hazardous and dangerous materials available in the old ships

Managers of the ship breaking yards can take necessary measures to control accidents, occurred due to different activities in their yards if they have idea about the hazardous items as well as other dangerous materials available in the old ships. The prevention measures to be taken according to the nature of risks. This was an open question. Most of the managers responded more than one hazards. Gas and Asbestos were mentioned by the managers as most vulnerable hazards and both of these carry weight of about 16%. About 3% of the respondent mentioned about the fumes resulting from the cutting plates by gas due to burn of paints and iron. Other hazardous material mentioned by the yard managers are shown below in the **Table -8**:

Hazardous items	Number of respondent	Percentage
Gas	15	15.79
Asbestos	15	15.79
Chemical	12	12.63
Sludge(Oil)	10	10.53
Radioactive materials	9	9.47
Biological Hazard	8	8.42
Paint	7	7.37
Refrigerant	6	6.32
PCBs	4	4.21
Others	6	6.32
Fumes resulting from cutting plates by gas	3	3.16
Total	95	100.00

Table – 8: Hazardous and Dangerous materials available in the old ships mentioned by the Managers

It is to be mentioned here that many of them mentioned about the radio active materials; that was little bit surprising. Later on it came to know that last year (2006) Bangladesh Atomic Energy Commission organized a training course for the ship breaking yard managers about the radioactive materials, and its handling & disposal techniques. So, it can be said that training is a proven method, to enhance the knowledge of human being.

4.3.7 Suggestions provided by the Yard Managers for the betterment of the ship breaking sector of Bangladesh

At the end a question was asked to the Managers to know about their ideas, how the situation prevailing at present in the ship breaking industry could be developed. These ideas can be used for the development of this sector as bottom up planning technique. All the respondents were very cautious while answering of this question. Few managers have not much experience in this sector. They could not recommend much but most of the managers had long experience in ship breaking sector. It is observed from the **Table-9** that declaration of ship breaking sector as a formal industry mentioned by 26% of the Managers and they thought that this issue is the top most urgent for the development of Ship Breaking sector as this is also the demand of the Bangladesh Ship Breakers Association (BSBA). 24% of the respondents mentioned that proper monitoring by the concern government departments will help to develop this sector. These recommendations will help to improve this sector as many of the general provisions of OSH issues can easily be implemented in the yard by the yard management if they were properly monitored. The Labour Act, 2006, also supports these but due to absence of proper monitoring system, the owners were reluctant to practice these rules.

Suggestions / Recommendations	No. of Yard Managers Supported	Percentage
Ship Breaking Sector should be declared as an Industry	14	26.42
Proper monitoring by the concern Government Department	13	24.53
BSBA should maintain close relationship with GOB agencies to take advantages for flourishing and highlighting the activities performed by this sector	9	16.98
International compliance should be mandatory for ensuring workers safety and health	9	16.98
Owner of the yards should ensure good working environment	8	15.09
Total	53	100.00

Table -9: Suggestions provided by the yard managers



In addition to the above mentioned suggestions listed in **Table-9**, few more supplementary recommendations/suggestions were made by the managers. These are mentioned below -

- (a) Setting up a fire Service Station and a hospital for periodical medical check up of the workers.
- (b) A Comprehensive set of National Rules /Guidelines should be prepared for Ship breaking in Bangladesh.
- (c) A separate wage for the Ship breaking workers is essential.
- (d) Group Insurance for the ship breaking workers should be ensured.
- (e) Ensure implementation of the Labour Act, 2006.
- (f) Formation of Trade Union is necessary and BSBA should be pro-active in this regard.
- (g) Knowledge about the hazardous materials and dangerous materials which might affect the OSH issues should be increased by organizing training periodically.
- (h) Stabilization of the market price through Government intervention should be ensured.

It was also asked the managers whether they have any idea regarding any conflict between the existing national rules and regulations with the international rules, regulations and conventions signed by the Government, but no managers have any idea about the conflict with any international rules and regulations like ILO,IMO and BASEL Conventions related to ship breaking with national legislations.

CHAPTER 5

5.0 DISCUSSION AND RECOMMENDATIONS

5.1 Discussion

Ship breaking industry of Bangladesh has certain problems and issues and these are concern of national and international organizations. The issues include safety at work, working environment, amenities, health status and occupational diseases, available healthcare facilities, employee organization, environment and employee welfare etc. Workers organization does not exist and institutional welfare support by the Department of Labour could not be established due to non-availability of any registered trade union.

Ship breaking in Bangladesh started commercially since early eighty's and already passed 26 years, yet to develop as systematic. Many people died due to accident in ship breaking sector every year and thousands of workers got injured and many of them lost their working capacity due to various accidents reported in the newspaper. From the study it is found that about 20,000 -30,000 labour force directly engaged in ship breaking work. This number varies as the number of active yards changes depending on the availability of ships at the yards. Most of the workers working in the ship breaking sector came from the northern part of the country which is usually poverty stricken area locally known as *MONGA* area. Without knowing anything about this job they came to work here as they sold the labour in advance while they have nothing to do at their locality and they suffered for livelihood. The worker had to accept the low wages. The scenario of the ship breaking yard in Bangladesh is not praise worthy. The worker suffered from pure drinking water, canteen facility, good sanitation facilities, and accommodation facilities. Most of the workers engaged here through Labourer Contractor rather directly employed by the owners. Only the Managers, Accounts personnel and Security personnel are the permanent employees of the yards. The workers work on "No work no pay basis". As the workers have to work under the continuous mental pressure for both financial and physical casualty, the production would rarely meet up to the target. That is why the workers have to work on

extra time. As this is a win-win game, contractor want maximum out put, at the same time, workers demands for their benefit. The salary of the workers is not good enough to maintain the living cost. Due to this all of the workers willing to work on extra time just for earning some extra money out of his daily / monthly income. They did not get the festival bonus and even overtime payment as per government rules. Compensation due to accidents usually made by the contractors or sometimes by the yard owner depending on the agreement between the owners and contractors. But this is not institutionalized yet. Due to the frequent accident of the workers many skilled labour force lost their capability and sometimes lost their lives also. It is alarming that to avoid legal complexity and payment due to fatal accident sometimes the yard managements /contractors used the fake name and address of the workers. After the accidents, initially they tried to hide the dead bodies even sometimes threw to the sea. This is a common picture for all the yards. To ensure the workers right as well as to change the scenario of the ship breaking yards government intervention and strong monitoring mechanism is necessary.

Workers are illiterate or have education below primary level. Even they are not aware about their rights. This labour force probably has less accessibility for better opportunity. Though the business is very technical in nature but interesting is that there is no technical manpower is involved in both categories; workers or in the managers. The owners did not feel any necessity of engaging such technical manpower to the yards. But the presence of technical manpower would enhance the safety standards of the workers. For the sake of convenience, decent work practice and environmentally sound ship breaking the problems and constrained faced by the workers as well yard management may be categorized in to three natures as technical, economical and social problems.

For the interest of the study the entire workers are classified in to four clusters, such as High-skilled, Skilled, Semi-skilled and Un-skilled. 20% High-skilled, 11% Skilled, 34% Semi-skilled and 48% Un-skilled workers were selected as sample according to the staffing pattern and total number of workers. Almost all workers experienced with accidents except 2% as they came to this work recently (less than one year). There is no records of accidents was available in the ship breaking yards. Moreover, during literature review it is found that the records maintained by the explosive department based on newspaper

information available to them only. So, the reliability of that data is not accepted. Workers experienced with fatal accidents were not available in the yards as they lost their working capacity. So, it was tried to know from the frequency of the fatal accidents from the workers. They tried to reply from their memory what they could.

Amongst the different age group of workers most vulnerable group is 20-24 observed from the results and this group faced about 29% of the total accidents. This group is followed by 15-19 age group and thereafter 55-59 age group. As young workers are fickle minded and old workers are became physically weak and involved in lot of thinking regarding their families and other lead them victimized by the accidents compare to other age group. These two age group people should engage in such type of job where risk is minimum, specially the old workers.

Hand and leg are the mostly affected due to accident and cumulatively about 59% injury affected these body parts. Most of these injuries can be prevented by ensuring the use of proper PPE. Mainly Gas, Chemicals, Asbestos, Sludge were identified by the workers as most hazardous available in the old ships. Among the different activities hot work, loading operation and cleaning operation are the most important agents' causes about 77% accidents. It is interesting that the workers aware about the specific causes of accident like personal negligence, lack of working experience, not to use the PPE or proper PPE, absence of good working environment, over confidence and excessive work load and as well as they also knew the preventive actions that could save them from accidents but they were undone to prevent the same due to lack of initiative taken by the yard management and absence of trade union. The workers and managers also claimed that no effective monitoring by the government departments made yet. Moreover, the managers provided some suggestions for the betterment of this sector that include mainly declaration of ship breaking sector as industry by the government, a set of specific guidelines/rules, separate wage for ship breaking sector employees.

Problems are related to production, technology, rules and regulations and efficiency which ultimately affect both owner as well as workers. The current working process still uses very traditional methods but some yards have started using modern equipment. Safety awareness

and knowledge of hazardous materials and risks are inadequate and training and awareness building programmes are extremely limited and not institutionalized. So, for safe production dependency on the manual intensive technology should be replaced by machine operated technology. That will save both times, cost and save workers potentials as well as lives.

It was come out from the discussion with the yard managers that most of the yard owner thought, they are not bound to follow the provisions stated in the Act and Rules. As a part of Law the management should provide the PPE to the workers at no cost. As a result of unsafe practice many workers died and many workers also lost their earning capacity. It should be mentioned here that ILO deals with Labour rights including OSH issues, IMO deals with maritime safety and BC deals with the trans-boundary movement of hazardous wastes and their disposal. Moreover, a systematic approach mentioned in the ILO Guidelines (**Appendix-H**) could be replicated in Bangladesh to assess risk and which enable to control the accidents. Finally it can be concluded that now in Bangladesh we do ship breaking but we would like to do ship recycling and that should definitely be in a safe and environmental friendly manner.

5.3 Recommendations

Though this research work was not rigorous but this research will definitely help the future researcher to do a better study for exploring the more information based on this and at the same time future researchers can make a comparative statement about the improvement of the status regarding safety issues. The process of improving the working conditions at the ship-breaking facility must be approached systematically in order to bring these up to a reasonable standard. Following recommendations may be considered for the betterment of this sector as a whole:

- a) As the literacy rate is very low and many young workers are involved in ship breaking activities adult literacy programme can be arranged for the workers to increase the literacy rate of the workers.
- b) Accidents are not adequately monitored and recorded by any one of the concerned department/agency or even by the yard management. For future research, forecasting, policy implications this sort of incident reports have to be recorded as well as proper

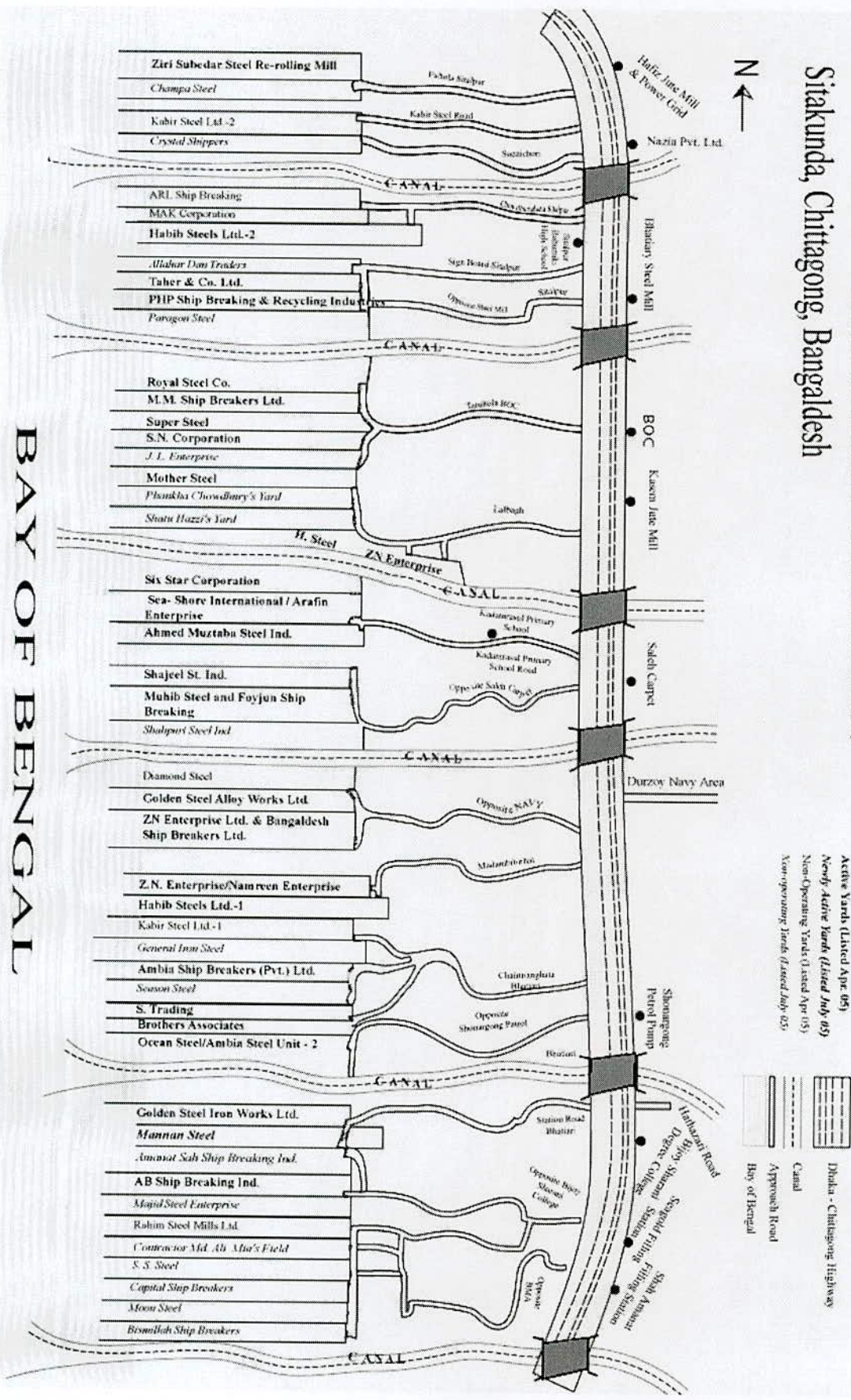
investigation of that accidents should be ensured by the competent authority decided by the government.

- c) Awareness raising campaign on OSH issue is required to organize by the yard management and from the concern government departments as the worker is frequently changing.
- d) Man intensive technology should be replaced by machine for both the safe and higher production.
- e) Establishment of a specialized hospital cum research centre for the treatment of ship breaking workers is a common demand. This centre can also be treated as training centre. Periodical occupational health surveillance can be ensured for conducting research work in future. Necessary steps should be taken jointly by SBBA and government.
- f) Government should take necessary steps to disseminate the information about the formation of new Labour Act, 2006 through the news and electronic media.
- g) A set of rules and guidelines should be made which will dictate the ship breaking sector and control the safety as well as health of the workers and other welfare.
- h) Environmental aspect of ship breaking is not taken into account at present though ship breaking is categorized as Orange B category (meaning very harmful). But proper steps should be taken care of to set compliances and these compliances can be implemented step by step rather in a single step.
- i) A fire brigade station should be set up within the area (8-10 km) of ship breaking yards to minimize the losses as fire as well as explosion is a common phenomenon in the ship breaking sector.
- j) Government should bargain with international agencies working for Ship Breaking like ILO, IMO and Basel Convention. All should jointly constitute a set of rules for ensuring a clean ship to be sent to the recycling state.
- k) Strengthen the inter-agency cooperation and linkage among the several government agencies are involved in regulating and monitoring of the ship breaking activities.
- l) Government should established a separate wage board for the ship breaking workers.
- m) Last but not least a very important issue upon which many other issues can be settled easily that is the formal declaration of the ship breaking sector as industry by the government.

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LOCATION MAP OF BANGALDESH SHIP RECYCLING YARDS Siakunda, Chittagong, Bangladesh



BAY OF BENGAL

Ship Recycling Statistics 2002-2007

Country	2002		2003		2004		2005		2006		2007 (Till September)	
	Ships	LDT	Ships	LDT	Ships	LDT	Ships	LDT	Ships	LDT	Ships	LDT
Bangladesh	85	1,659,448 (24%)	51	782,014 (13%)	105	1,294,411 (40%)	69	795,028 (59%)	128	1,181,160 (57%)	73	594,148 (47%)
India	314	2,892,111 (41%)	324	2,606,185 (44%)	157	971,712 (30%)	53	373,830 (28%)	50	321,492 (16%)	55	400,051 (32%)
Pakistan	9	358,408	18	195,521	14	77,041	1	7,352	13	56,789	10	74,528
China	108	1,466,781 (21%)	119	1,985,073 (34%)	62	716,357 (22%)	10	56,507 (6%)	11	112,951	2	9,129
Turkey	15	89,368	10	56,558	-	-	4	12,663	34	230,000 (11%)	3	2,676
Others	71	523,619	30	260,590	23	126,488	11	72,989	21	149,742	16	167,298 (13%)
Total	601	6,959,735	552	5,888,922	368	3,210,135	148	1,348,569	220	2,052,134	159	1,247,828

Source : www.cotzias.gr

Role of Important Government Departments related to ship breaking activities

Department	Role	Remarks
Department of Inspection for Factories and Establishments	Registration of yards under The Factories Act, 1965, Monitoring Safety and compliance of registration requirement as per law and The Factories Rules, 1979 such as amenities, employee welfare, safety and health etc.	Not very effective, compliance is partial and only recently have the yards in operation been registered under The Factories Act, 1965. Incident monitoring and safety measures are rarely monitored.
Department of Labour	Workers' rights including right to organize in trade unions, trade union registration, employer-employee relations, mitigating conflicts etc and workers' health and welfare	Involvement is nearly zero, as the recycling yards have no registered trade unions. But welfare measures can be initiated even without having registered unions. That too is not being done due to "lack of manpower".
Mercantile Marine Department	Safety in navigation: Makes sure that the vessel is fit for safe navigation with valid documents and competent crew members until it is beached at the recycling yard	There is court injunction on the issuance of clearance by the MMD as the ship breakers challenged its role.
Department of Environment	Regulation and monitoring with respect to protecting environment: Making sure that water, soil and air are not polluted by any action. DoE issues environmental clearance certification for establishing and operating "factories" but this is not yet applied in ship recycling.	The DoE is yet to start playing their role in the sector. They made brief guidelines for environment friendly ship recycling and placed an awareness-raising billboard in the recycling area.
Chittagong Port Authority	Provides tug if needed and beaching permission subject to production of relevant documents and paying of taxes.	Effective
Customs Department	Inspects, charges and collects taxes related to taxable items	Effective
Explosive Department	Checks vessel and each tank to make sure that they are free of gas, oil and other explosives and provides gas free certificate to that effect.	Effective
Bangladesh Navy	Checks vessel to make sure that communication equipment, radio, VHF, wireless, walkie-talkies etc. are returned to the government on safety and national security considerations.	Effective

Different Steps of Ship-Breaking in Bangladesh
(Photographs shows series of sequential activities for dismantling a ship)



Picture-1 : Ship waiting at the outer anchorage



Picture -2 : After Beaching protection is taken care



Picture -3 : Dismantling starts from the nose



Picture - 4 : Cylinders are collecting from ships



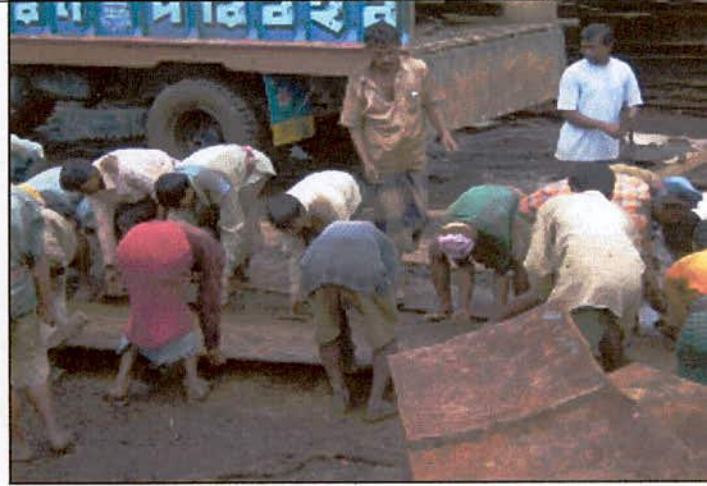
Picture -5 : Winch through which big parts pulls



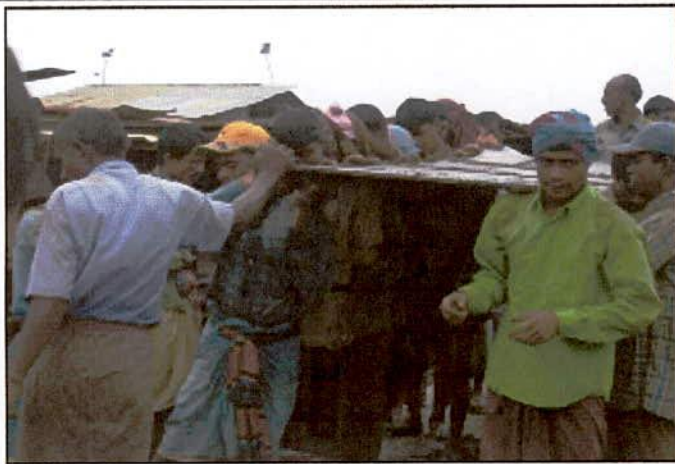
Picture -6 : Big parts are cutting into small pieces



Picture -7 : Stacking of Metal Plates according to size and Quality



Picture – 8 : Workers are used to do this dangerous tasks without using any PPE



Picture – 9 : Heavy metal plates are carrying on shoulder.



Picture -10 : Use of Magnetic Cranes has started in some of the ship breaking yards.



Picture -11 : Loading operation is carried out manually.



Picture -12 : Loaded truck in weighing Machine, ready for delivery.

Survey Data Sheet

Prepared for the Project Work of M. Engineering Degree

Instrument for the Workers

1. Name of the Ship Recycling Yard :
- 2.(a) Name of the Interviewee :
- (b) Father's Name of the Interviewee :
- (c) Designation of the Employee :
- (d) Level of Education :

No Education	Below Primary	Up to S.S.C	Up to H.S.C	Graduation & Above
--------------	---------------	-------------	-------------	--------------------
- (e) Home District :
3. Category of the Employee :

High Skilled	Skilled	Semi-Skilled	Un-Skilled
--------------	---------	--------------	------------
- 4.(a) Age Group :

10- 14	15 - 19	20- 24	25 - 29	30 - 34
35 - 39	40 - 44	45 - 49	50 - 54	55 - 59
- 4 (b) Have you observed any accident ? (within the last one Year) :

Yes	No
-----	----
- 4 (C) If yes, was it Fatal or Minor? :

Fatal	Minor
-------	-------
5. Working Experiences in this job (Years) :

Below 1	1-5	6-10	11-15	16+
---------	-----	------	-------	-----
6. Did you experienced with accidents/injury?

Yes	No
-----	----
7. Was it fatal or minor ?

Fatal	Minor	Both	N/A
-------	-------	------	-----
8. If the answer of Q.5 is yes, which body part is usually get injured?
- | | | | | | | | |
|------|----------|----------------|-----|-----|------|------|-------|
| Hand | Feet | Chest to Thigh | Arm | Eye | Face | Head | Ankle |
| Knee | Shoulder | Leg | N/A | | | | |
9. Do you have any idea regarding the dangerous and hazardous materials exist in the old ship?
- | | |
|-----|----|
| Yes | No |
|-----|----|
10. If yes, please mention few names of them.

11. Would you please tell us, which agent is responsible for maximum accident ?

Hot Work	Mishandling of Wire	Cleaning operation	Carelessness during Loading Operation
Cylinder Handling	Other :	N/A	

12. What do you think about the main cause of accident?

- a. Due to personal negligence.
- b. Due to lack of work experience.
- c. Due to lack of use of PPE or improper use of PPE.
- d. Due to absence of good working environment.
- e. Due to over confidence.
- f. Due to over load of work.
- g. All of the above.
- h. Others (Please Specify)-

13. How you can minimize/prevent the accidents?

14. Do you know anything about The Factory Act, 1965? Yes No

15. Do you know about the provisions related to safety, health, Compensation and welfare stated in The Factory Act, 1965 / The Labour Act 2006 ? Yes No N/A

16. Do you think the rules; regulations mentioned in the Factory Act, 1965 is being followed in this yard / The Labour Act 2006? Yes No To some extent N/A

(Signature of the Interviewer)

Name : Abu Sayed Md. Kamruzzaman
M.Engineering Student, KUET

(Signature of the Interviewee)
(Optional)

Note :

High Skilled : Ship In-Charge, Supervisor
Skilled : Foreman, Assistant Foreman, Winch operator.
Semi-Skilled : Cutter, Fitter
Unskilled : Loader, Cleaner and workers in Wire-group.

Survey Data Sheet
Prepared for the Project Work of M. Engineering Degree

Instrument for the Yard Owners/Yard Managements

1. Name of the Ship Recycling Yard :
- 2.(a) Name of the Interviewee :
- (b) Father's Name of the Interviewee :
- (c) Designation of the Employee :
- (d) Level of Education :

No Education	Below Primary	Up to S.S.C	Up to H.S.C	Graduation & Above
--------------	---------------	-------------	-------------	--------------------
- (e) Experience in this Sector (Years) :

Up to 5	6-10	11- 15	16- 20	20+
---------	------	--------	--------	-----
3. Age Group (Years) :

21- 30	31 -40	41-50	50-60
--------	--------	-------	-------
4. Do you know about The Factory Act, 1965 and The Labour Act, 2006?

<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
------------------------------	-----------------------------	------------------------------	-----------------------------
5. Do you know about the provisions related to safety, health, Compensation and welfare mentioned in The Factory Act, 1965 and The Labour Act, 2006?

<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Some Extent	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Some Extent
------------------------------	-----------------------------	--------------------------------------	------------------------------	-----------------------------	--------------------------------------
6. Do you think the rules; regulations mentioned in The Factory Act, 1965 / the Labour Act, 2006 is being followed in this yard?

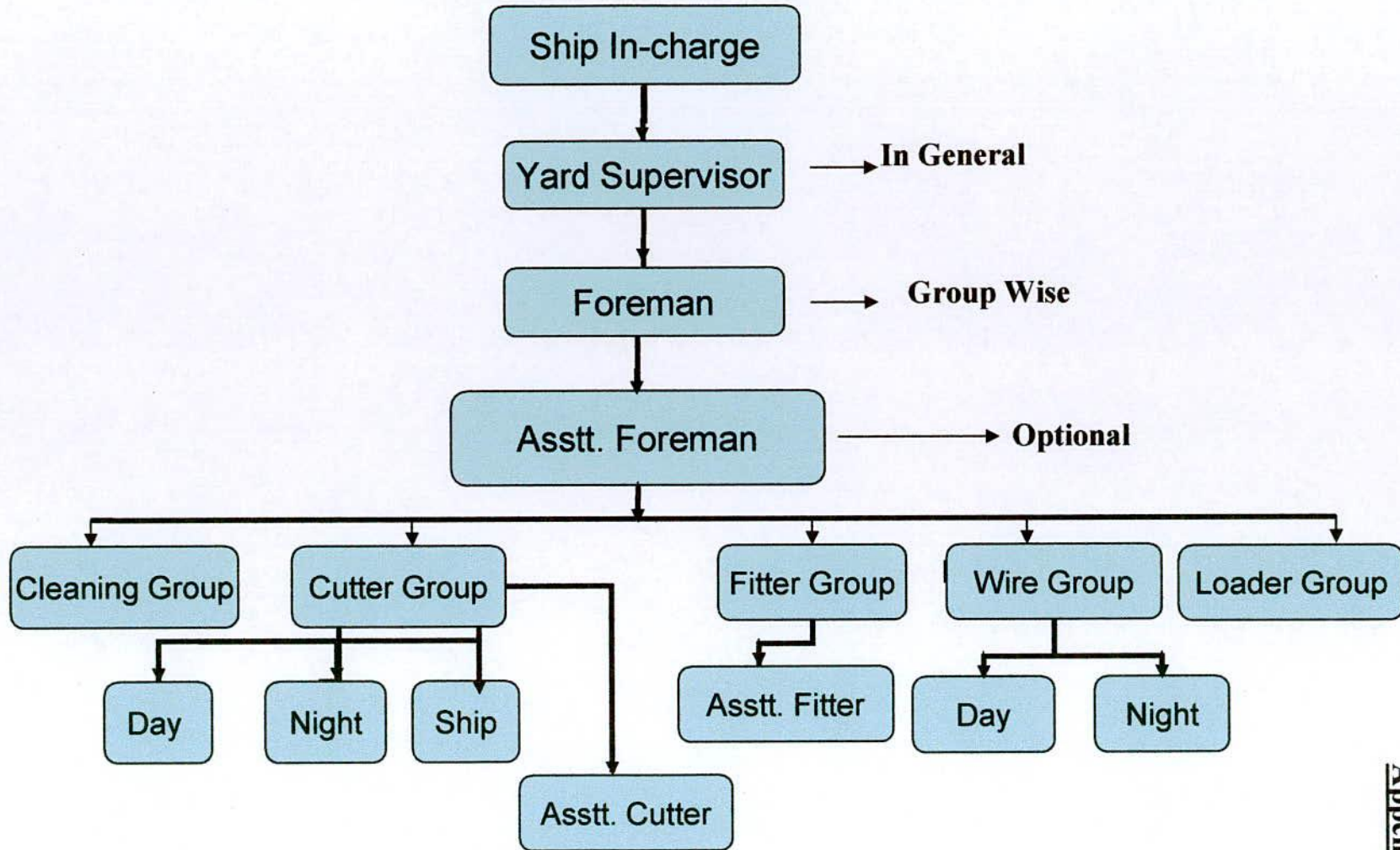
<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Some Extent	<input type="checkbox"/> N/A
------------------------------	-----------------------------	--------------------------------------	------------------------------
7. If not, why, Please mention what is the main obstacle for practicing that?
8. What do you think about the main cause of accident?
i. Due to personal negligence.
ii. Due to lack of work experience.
iii. Due to lack of use of PPE or proper use of PPE.
iv. Due to absence of good working environment.
v. Due to over confidence.
vi. Due to over load of work.
vii. All of the above.
viii. Others (Please Specify)-

9. How you can minimize/ prevent the accident ?
- 10.(a) Do you have any idea about the regarding the Hazardous and dangerous materials available in the old ships? Yes No
- 10.(b) If yes, What are the dangerous and hazardous materials available in the old ship?
11. Do you think for the betterment of this sector a separate set of rules to be introduced in light of National and International rules and conventions like ILO, IMO and Basel? Yes No
12. Is there any contradiction of rules/regulations exists in Bangladesh with International rules/ regulations and conventions?
13. Do you think this new Labour Act, 2006 will help to create better environment in the ship breaking industry and will be more beneficial to the workers?
14. Specific any recommendation for the betterment of this sector in light of National and International rules/ regulations and conventions, if any, please mention?

(Signature of the Interviewer)
(Abu Sayed Md. Kamruzzaman)
M.Engineering Student, KUET

(Signature of the Interviewer)
(Optional)

**Staffing Pattern of ship Breaking Yard
(Specially for the Technical Personnel)**



Flow Chart of Hazard Analysis

