“A STUDY ON SAFETY ASPECTS AND HANDLING OF HAZARDOUS MATERIALS IN SUPPLY CHAIN MANAGEMENT”

PROJECT REPORT

Submitted to the **School of Maritime Management, Indian Maritime University** in partial fulfilment of the requirements for the award of degree

MASTER OF BUSINESS ADMINISTRATION in

International transportation

&

Logistics management

Submitted by

DIVYA ANNA MATHEW

(2005305013)

Under the guidance of

Dr. Sreejith.u

School of Maritime Management

Indian Maritime University, Kochi Campus

May 2022

(Central University, Government of India)

DECLARATION

The project work titled **"A STUDY ON SAFETY ASPECTS AND HANDILING OF HAZARDOUS MATERIALS IN SUPPLY CHAIN MANAGEMENT"** has been carried out under the direction of Dr. sreejith.u in partial fulfilment of the requirements for the award of degree of Master of Business Administration in International Transportation and Logistics Management to be submitted to the School of Maritime Management, Indian Maritime University, Kochi Campus

Place: DIVYA ANNA MATHEW

Date:

INDIAN MARITIME UNIVERSITY

SCHOOL OF MARITIME MANAGEMENT

KOCHI CAMPUS

CERTIFICATE

This is to certify that the report titled "**A STUDY ON SAFETY ASPECTS AND HANDILING OF HAZAROUS MATERIALS IN SUPPLY CHAIN"** submitted to the School of Maritime Management, Indian Maritime University, kochi campus by **DIVYA ANNA MATHEW (**registration number: 2005305013) in partial fulfilment of the requirements for the award of degree of Master of Business Administration in International Transportation and Logistics Management is a record of project work done under my supervision.

Date

Place

Dr SREEJITH U

Project Supervisor

ACKNOWLEDGEMENT

I have received valuable guidance and encouragement from many quarters for the successful completion of my Project. I take this opportunity to thank them all. Firstly, I thank God, the Almighty for showering his bountiful blessings without which I could not have completed this successfully.

I express heartfelt thanks to my academic guide Dr. Sreejith.U, Assistant Professor, School of Maritime Management, Indian maritime University, Cochin Campus for his meticulous guidance and constant encouragement.

I express my sincere thanks to faculties, Indian Maritime University for helping me throughout my academics.

I'm indebted to my parents and friends who encouraged and helped me in various ways to complete the report.

I extend my sincere gratitude to all those who have directly and indirectly helped me during the course of my work.

EXECUTIVE SUMMARY

Dangerous goods, or DG, are substances which pose, a risk to human health, property, or the environment when transported. Some dangerous commodities that post risk are called hazardous materials (HAZMAT) even if they are not transported. Many businesses in a variety of industries deal with hazardous materials on a regular basis at Global Hazmat. The major goal of this research was to better understand the role of safety precautions performed when handling hazardous materials, as well as numerous methods.

Hazardous material comes under chemical regulations. Radioactive, flammable, explosive, corrosive, oxidising, asphyxiating, bio hazardous, toxic, pathogenic, or allergic compounds are treated by Hazmat teams, which are specifically trained personnel. Because of non-compliance safety procedures, the majority of the accidents occurred in warehouses. Hazardous material risks can be mitigated by using safety procedures throughout transportation, use, storage, and disposal. According to the study's findings, most countries have legal control over hazardous material movement and are bound by a number of international treaties. For the same commodity, various countries can employ distinct class kinds. Hazardous material handlers are required to wear protective equipment, and metropolitan fire departments frequently have a specially equipped response squad to deal with injuries and spills. Many accidents are caused by non-compliance with safety precautions. Laws and regulations on the use and handling of hazardous materials can vary depending on the material behaviour and status.

TABLE OF CONTENT

CHAPTER -1

INTRODUCTION

1.1INTRODUCTION

The process of designing, implementing, and controlling supply chain operations as efficiently as possible is known as supply chain management. Supply chain management spans all movement and storage of raw materials, work in process inventory, and finished goods from point of origin to point of consumptions.

Dangerous goods (DG) are substances that pose a risk to human health, property, or the environment when carried. Hazardous items are materials and products that are combustible, explosive, toxic, or damaging to humans or the environment and travel by train, ship, air, or highway.

It is important that hazardous material are detected correctly to insure proper storage, treating and disposal, federal regulatory agencies need manufacturers and distributors to recognize the physical, health and climate risks of their products in several ways. Placards, labels, marketing's, and MSDS (Material Safety Data Sheet) are just some of the means used to convey this information. Many commodities used by logistics are hazardous such things Can be serious and personals need not be aware of the domestics and international laws and regulation associated with them. These laws and regulations places special emphasis on communicating the dangerous linked with such goods because exposures can lead to severe personal injury, permanent illness and even death. It can also harm or kill Property and the environment. It is imperative that all workers know and appreciate the dangers connected with these Products. No single functional area is exempt from these risks to health, safety and property.

It is not simple to transport dangerous materials. When it comes to packaging and labelling, as well as items handled in airports, ports, and on UN vessels, there are numerous considerations. The Expert Committee has published guidelines on the subject to Hazardous material transportation. Such guidelines are adopted by the regulatory organization responsible for the different modes of carriage. All dangerous materials are recognized with a unique UN number. The regulation is based on a classification system that assigns substance or articles to one of nine classes. Class 1 is the high dangerous and least dangerous is class 9.

1.2 OBJECTIVES OF THE STUDY

- To analyze the challenges in handling of HAZMAT
- To study the various safety equipment required to be used while handling Hazardous cargo.
- To understand the role of safety in creating positive working environment
- To study the modern trends in hazardous material handling and its impacts.
- To study the feedback of the employees about handling of hazardous products and their safety.

1.3 SCOPE OF STUDY

This research was carried out to learn about the safety precautions in the transportation of hazardous goods as well as innovative techniques in this field. This study aids in getting information regarding internal and external work procedure.

1.4 RESEARCH METHODOLOGY

Research methodology is the science of how research is done scientifically. It‘s a way to systematically and logically solving a problem and helps us to understand the process and product of the research. To accomplish the above said objective the important information is being taken by utilizing both the primary and secondary data. This study uses extensive secondary data from public domain to analyze the Handling of Hazardous Cargo, safety measures implemented by companies and carry out a comparative analysis. The data has been collected from research papers, public reports, journals, company websites, reference books, newspaper articles and Industry magazines. Some information collected has been pictorially represented. The data so called is interpreted and analyzed with reference to the project tittle.

1.5 LIMITATION OF THE STUDY

The study had mainly done on the basis of the secondary data available in the reports, journals and company websites. Rather than giving a wide picture on the hazardous cargo the study is restricted only to the safety measures in movement of the hazardous materials with in the logistics companies

- Lack of time
- Limited access to the data
- Personal visit to the firm and personal interaction with the workers was not feasible.

CHAPTER -2

REVIEW OF LTRATURE

2.1 REVIEW OF LIETATURE

The below reports and articles online journals were studied and referred for the project.

The source from which these information's is collected are given.

SIGNIFICANCE OF SUPPLYCHAIN MANAGEMENT

Supply chain management (SCM) is an important part of any business, no matter how big or little. SCM is the dynamic management of materials storage to improve client satisfaction and gain a competitive advantage. SCM also oversees the development and storage of resources required to manufacture a thing, similar to stock management and tracking of finished goods from production to delivery who they go to

Current supply chain management entails the critical planning of start-to-finish business cycles in order to recognise market and financial value, as well as giving a company an advantage over its competitors. Supply chain management has a significant impact on business. SCM that is effective can easily improve client care. To satisfy both makers and merchants, the proper item and the suitable amount should be conveyed in an ideal manner. Customers must be able to determine where they should go to obtain the things they require.

Customers also require a higher level of client expectation assistance. If merchandise is not distributed on time, an organization's supply chain management must assure customers that they will receive their items as soon as possible. SCM also has a significant impact on an organization's principal concern.

Plant, distribution centre, and transportation vehicle productivity can all be improved by competent supply chain management executives. The amount of money earned is directly proportional to how quickly an item is delivered and how easily customers can purchase it.

WAREHOUSE PERFOMANCE MEASUREMENT

As supply chains become more complicated, the number of metrics and methods available to assess warehouse performance has grown. Furthermore, the measures utilised for performance evaluation are reviewed in a variety of ways, and some of these indicators lack a clear meaning. This literature review focuses on operational warehouse performance measurement, which warehouse managers must conduct on a regular basis to address these concerns. Performance indicators are extracted from selected papers using the content analysis method and classified according to time, cost, quality, and productivity dimensions. The following are the contributions of this literature review: we present a synthesis of the literature on operational warehouse performance, we provide definitions for performance indicators and a framework to demonstrate their boundaries, and, finally, we provide some

discussions on current warehouse trends and future research directions on warehouse performance evaluation based on the literature analysis.

HUMAN FACTOR AS THE MAIN OPERATIONAL RISK IN DANGEROUS GOODS TRANSPORTATION

One of the most important considerations when planning safe handling and transportation of Dangerous Goods is risk management. Examining hazards using a semi-quantitative risk assessment method allows you to concentrate solely on operational risks caused by the activity of various parties involved in the Dangerous Goods transportation chain. When handling and shipping Dangerous Goods, there are several behaviours that are considered incidents but do not always result in accidents. It is difficult to satisfy both legal requirements and suggested safety measures when transporting packed dangerous goods (DG) by road in order to avoid mishaps during activities involving chemicals that are detrimental to people, property, and the environment. Because there are various parties engaged in the handling and transportation of Dangerous Goods, a variety of dangers might arise during these actions. Because the importance of the human aspect has been overlooked, this article focuses on analysing various sorts of hazards associated with specific participants within a dangerous products transportation chain. The human aspect has a significant impact on guaranteeing safety in Dangerous Goods Transportation, according to this paper. Accidents within the Dangerous Goods transportation chain are caused mainly due to the number of party's involved, repetitive nature of operational risks at parties involved and the possible consequence of an event.

FIRE SAFETY MEASURES IN WAREHOUSES

The paper discusses warehouse fire safety methods. Because of the volume of products kept, losses in warehouse fires can be exceedingly substantial. Aside from the loss of goods, warehouse fires pose a threat to the employees who work there, particularly those who are trapped in the heart of a spreading fire.

This paper first explained and listed various fire sources, such as Fuel (which represents the burning material, such as paper or gasoline), Oxygen (which is found in the air and is required for combustion), and Energy (which raises the fuel temperature to the level required for fire ignition), before examining factors that affect fire ignition, spread, and extinguishment. Finally, fire safety and health measures were implemented in warehouses to improve fire safety and health. This study offers several techniques for fire protection, the first of which is to consider the construction materials used in warehouses. Concrete and steel covered with plaster or fibrous silicate panels are the most suited materials because to their excellent heat resistance. The next step is to employ large, enormous oak beams instead of uncoated steel construction because of their slow combustion and structural durability. It also discusses warehouse ventilation systems, automatic fire detection systems, and automatic

extinguishing systems in order to provide 24 hour fire detection capability. As a result, the paper's conclusion is that fire outbreaks can have serious ramifications for warehouse management's reputation. It may jeopardise future company goals, jeopardising rehabilitation. As a result, warehouses are extremely vulnerable to fire, necessitating the implementation of special safety measures to ensure good warehouse safety.

CHAPTER -3

HAZMAT

HAZMAT is short form for ―hazardous materials‖—substances which can present a fair riskto health, property, or the climate. HAZMATs involve such substances as toxic chemicals, fuels, nuclear waste products, and biological, chemical, and radiological agents. HAZMATs maybereleased as liquids, solids, gasses, or a combination or form of all three, including dust, fumes, gas, vapour, nebula, and smoke. HAZMAT spills have caused human or animal health problems, injuries, and even deaths and damaged buildings, houses, properties, and the environment. It isfair to believe that one cannot experience such dire consequences of HAZMAT every day. Thefact is, many goods contain dangerous materials Chemicals are used and processed in homes ona regular basis and are transported on a daily basis through Highways, railways, waterways, andpipelines. HAZMAT is regulated to promote their safe handling, storage, transportation, anddisposal to help prevent HAZMAT incidents. Each year thousands of events occur in whichHAZMATs are released into the environment due to injuries or natural disasters. Besides potentially harming people and the environment, spills in coastal waters can lead to significant disruption of marine transport with potential widespread economic impact. Both coastal andinland spills are known as HAZMAT accidents, and are regularly addressed by first responderssuch as fire fighters and local law enforcement.

CLASSIFICATION OF DANGEROUS GOODS

Class1 Explosives

Class 2 Gases (flammable, non-flammable, non-toxic and toxic gases)

Class 3 Flammable liquids

Class 4 Flammable solids

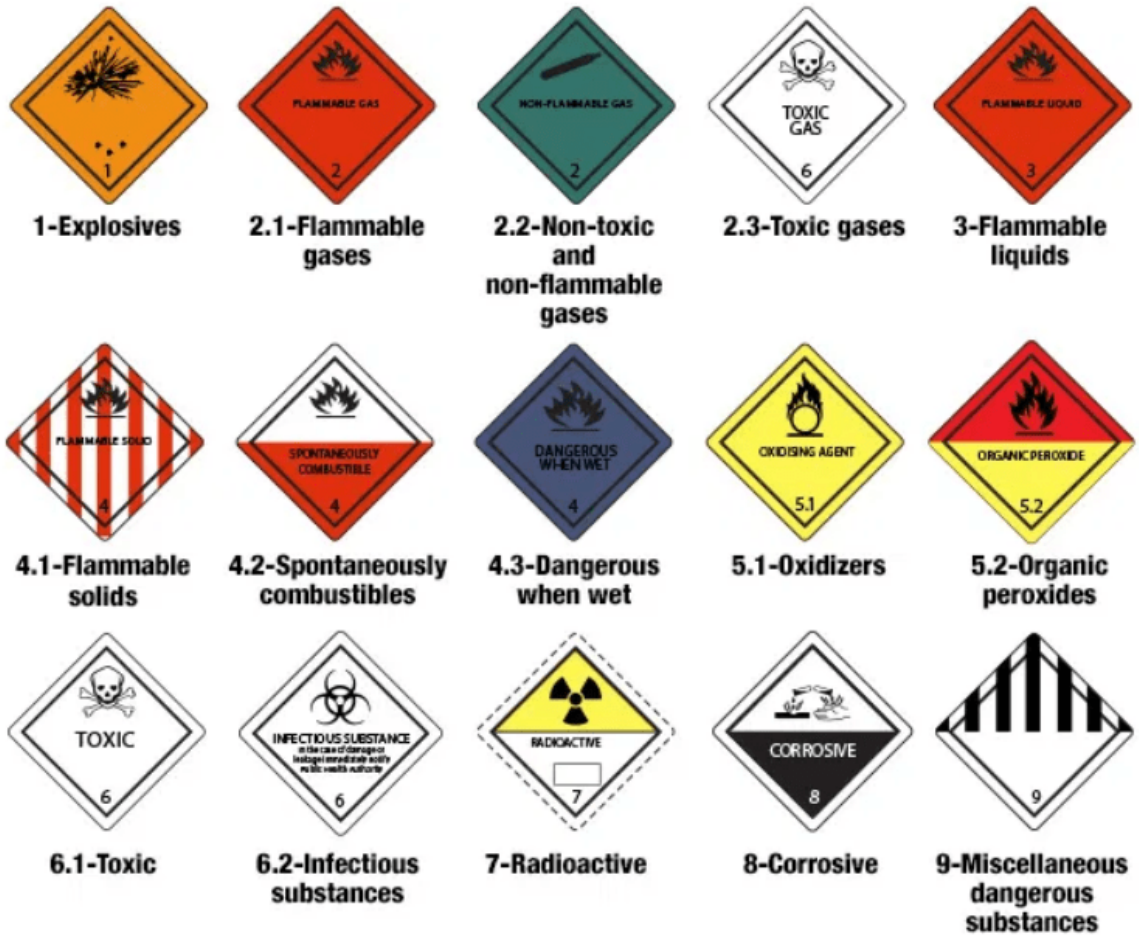
Class 5 Oxidising substances, Organic peroxides 13

Class 6 Toxic and infectious substances

Class 7 Radioactive material

Class 8 Corrosives

Class 9 Miscellaneous dangerous goods



CLASS-1 EXPLOSIVE

Explosives are materials or items which have the ability to rapidly conflagrate or detonate as a consequence of chemical reaction.

DGI are proficient in handling explosives, Class 1 Dangerous Goods. DGI have the ability to service all customer requests pertaining to the logistics of explosives; packing, packaging, compliance, freight forwarding and training.

Reason for Regulation

Explosives are capable by chemical reaction of producing gases at temperatures, pressures and speeds as to cause catastrophic damage through force and/or of producing otherwise hazardous amounts of heat, light, sound, gas or smoke

Sub-Divisions

Division 1.1:Substances and articles which have a mass explosion hazard

Division 1.2: Substances and articles which have a projection hazard but not a mass explosion hazard

Division 1.3: Substances and articles which have a fire hazard and either a minor blast hazard or a minor projection hazard or both

Division 1.4: Substances and articles which present no significant hazard; only a small hazard in the event of ignition or initiation during transport with any effects largely confined to the package

Division 1.5: Very insensitive substances which have a mass explosion hazard

Division 1.6: Extremely insensitive articles which do not have a mass explosion hazard

Commonly Transported Explosives

Ammunition/cartridges, Fireworks/pyrotechnics, Flares, Blasting caps / detonators, Fuse, Primers, Explosive charges (blasting, demolition etc), Detonating cord, Air bag inflators, Igniters, Rockets, TNT / TNT compositions, RDX / RDX compositions, PETN / PETN compositions.

CLASS-2 GASES

Gases are defined by dangerous goods regulations as substances which have a vapour pressure of 300 kPa or greater at 50°c or which are completely gaseous at 20°c at standard atmospheric pressure, and items containing these substances. The class encompasses compressed gases, liquefied gases, dissolved gases, refrigerated liquefied gases, mixtures of one or more gases with one or more vapours of substances of other classes, articles charged with a gas and aerosols.

DGI are proficient in handling gases, Class 2 Dangerous Goods. DGI have the ability to service all customer requests pertaining to the logistics of gases; packing, packaging, compliance, freight forwarding and training.

Reason for Regulation

Gases are capable of posing serious hazards due to their flammability, potential as asphyxiants, ability to oxidize and/or their toxicity or corrosiveness to humans.

Sub-Divisions

Division 2.1: Flammable gases

Division 2.2: Non-flammable, non-toxic gases

Division 2.3: Toxic gases

Commonly Transported Gases

Aerosols, Compressed air, Hydrocarbon gas-powered devices, Fire extinguishers, Gas cartridges, Fertilizer ammoniating solution, Insecticide gases, Refrigerant gases, Lighters, Acetylene / Oxyacetylene, Carbon dioxide, Helium / helium compounds, Hydrogen / hydrogen compounds, Oxygen / oxygen compounds, Nitrogen / nitrogen compounds, Natural gas, Oil gas, Petroleum gases, Butane, Propane, Ethane, Methane, Dimethyl ether, Propene / propylene, Ethylene.

CLASS -3 FLAMMABLE LIQUIDS

Flammable liquids are defined by dangerous goods regulations as liquids, mixtures of liquids or liquids containing solids in solution or suspension which give off a flammable vapour (have a flash point) at temperatures of not more than 60-65°C, liquids offered for transport at temperatures at or above their flash point or substances transported at elevated temperatures in a liquid state and which give off a flammable vapour at a temperature at or below the maximum transport temperature.

DGI are proficient in handling flammable liquids, Class 3 Dangerous Goods. DGI have the ability to service all customer requests pertaining to the logistics of flammable liquids; packing, packaging, compliance, freight forwarding and training.

Reason for Regulation

Flammable liquids are capable of posing serious hazards due to their volatility, combustibility and potential in causing or propagating severe conflagrations.

Sub-Divisions

There are no subdivisions within Class 3, Flammable Liquids.

Commonly Transported Flammable Liquids

Acetone / acetone oils, Adhesives, Paints / lacquers / varnishes, Alcohols, Perfumery products, Gasoline / Petrol, Diesel fuel, Aviation fuel, Liquid bio-fuels, Coal tar / coal tar distillates, Petroleum crude oil,Petroleum distillates, Gas oil, Shale oil, Heating oil, Kerosene, Resins, Tars, Turpentine, Carbamate insecticides, Organochlorine pesticides,Organophosphorus pesticides, Copper based pesticides, Esters, Ethers, Ethanol, Benzene, Butanols, Dichloropropenes, Diethyl ether, Isobutanols, Isopropyls, Methanol, Octanes.

CLASS 4 –FLAMMABLE SOLIDS; SPONTANEOUS COMBUSTIBLES; ‘DANGEROUS WHEN WET’ MATERIALS

Flammable solids are materials which, under conditions encountered in transport, are readily combustible or may cause or contribute to fire through friction, self-reactive substances which are liable to undergo a strongly exothermic reaction or solid desensitized explosives. Also included are substances which are liable to spontaneous heating under normal transport conditions, or to heating up in contact with air, and are consequently liable to catch fire and substances which emit flammable gases or become spontaneously flammable when in contact with water.

DGI are proficient in handling flammable solids, Class 4 Dangerous Goods. DGI have the ability to service all customer requests pertaining to the logistics of flammable solids; packing, packaging, compliance, freight forwarding and training.

Reason for Regulation

Flammable solids are capable of posing serious hazards due to their volatility, combustibility

and potential in causing or propagating severe conflagrations.

Sub-Divisions

Division 4.1: Flammable solids

Division 4.2: Substances liable to spontaneous combustion

Division 4.3: Substances which, in contact with water, emit flammable gases

Commonly Transported Flammable Solids; Spontaneous Combustibles; 'Dangerous When Wet' Materials

Alkali metals, Metal powders, Aluminium phosphide,Sodium batteries, Sodium cells, Firelighters, Matches, Calcium carbide, Camphor, Carbon, Activated carbon, Celluloid, Cerium, Copra, Seed cake, Oily cotton waste, Desensitized explosives, Oily fabrics, Oily fibres, Ferrocerium, Iron oxide (spent, Iron sponge/direct-reduced iron (spent) , Metaldehyde, Naphthalene, Nitrocellulose, Phosphorus, Sulphur.

CLASS 5 - OXIDIZERS; ORGANIC PEROXIDES

Oxidizers are defined by dangerous goods regulations as substances which may cause or contribute to combustion, generally by yielding oxygen as a result of a redox chemical reaction. Organic peroxides are substances which may be considered derivatives of hydrogen peroxide where one or both hydrogen atoms of the chemical structure have been replaced by organic radicals.

DGI are proficient in handling oxidising agents and organic peroxides, Class 5 Dangerous Goods. DGI have the ability to service all customer requests pertaining to the logistics of oxidising agents and organic peroxides; packing, packaging, compliance, freight forwarding and training.

Reason for Regulation

Oxidizers, although not necessarily combustible in themselves, can yield oxygen and in so doing cause or contribute to the combustion of other materials. Organic peroxides are thermally unstable and may exude heat whilst undergoing exothermic autocatalytic decomposition. Additionally, organic peroxides may be liable to explosive decomposition, burn rapidly, be sensitive to impact or friction, react dangerously with other substances or cause damage to eyes.

Sub-Divisions

Division 5.1: Oxidizing substances

Division 5.1: Organic peroxides

Commonly Transported Oxidizers; Organic Peroxides

Chemical oxygen generators, Ammonium nitrate fertilizers, Chlorates, Nitrates, Nitrites, Perchlorates, Permanganates, Persulphates, Aluminium nitrate, Ammonium dichromate, Ammonium nitrate, Ammonium persulphate, Calcium hypochlorite, Calcium nitrate, Calcium peroxide, Hydrogen peroxide, Magnesium peroxide, Lead nitrate, Lithium hypochlorite, Potassium chlorate, Potassium nitrate, Potassium chlorate, Potassium perchlorate, Potassium permanganate, Sodium nitrate, Sodium persulphate.

CLASS 6 - TOXIC SUBSTANCES; INFECTIOUS SUBSTANCES

Toxic substances are those which are liable either to cause death or serious injury or to harm human health if swallowed, inhaled or by skin contact. Infectious substances are those which are known or can be reasonably expected to contain pathogens. Dangerous goods regulations define pathogens as microorganisms, such as bacteria, viruses, rickettsiae, parasites and fungi, or other agents which can cause disease in humans or animals.

DGI are proficient in handling toxic and infectious substances, Class 6 Dangerous Goods. DGI have the ability to service all customer requests pertaining to the logistics of oxidising agents and organic peroxides; packing, packaging, compliance, freight forwarding and training.

Reason for Regulation

Toxic and infectious substances can pose significant risks to human and animal health upon contact.

Sub-Divisions

Division 6.1: Toxic substances

Division 6.2: Infectious substances

Commonly Transported Toxic Substances; Infectious Substances

Medical/Biomedical waste, Clinical waste, Biological cultures / samples / specimens, Medical cultures / samples / specimens, Tear gas substances, Motor fuel anti-knock mixture, Dyes, Carbamate pesticides, Alkaloids, Allyls, Acids, Arsenates, Arsenites, Cyanides, Thiols/mercaptans, Cresols, Barium compounds, Arsenics / arsenic compounds, Beryllium/ beryllium compounds, Lead compounds, Mercury compounds, Nicotine / nicotine compounds, Selenium compounds, Antimony, Ammonium metavanadate, Adiponitrile, Chloroform, Dichloromethane, Hexachlorophene, Phenol, Resorcinol.

CLASS 7 - RADIOACTIVE MATERIAL

Dangerous goods regulations define radioactive material as any material containing radionuclides where both the activity concentration and the total activity exceeds certain pre-defined values. A radionuclide is an atom with an unstable nucleus and which consequently is subject to radioactive decay.

DGI are proficient in handling radioactive material, Class 7 Dangerous Goods. DGI have the ability to service all customer requests pertaining to the logistics of radioactive material; packing, packaging, compliance, freight forwarding and training.

Reason for Regulation

Whilst undergoing radioactive decay radionuclides emit ionizing radiation, which presents potentially severe risks to human health.

Sub-Divisions

There are no subdivisions within Class 7, Radioactive Material.

Commonly Transported Radioactive Material

Radioactive ores, Medical isotopes, Yellowcake, Density gauges, Mixed fission products, Surface contaminated objects, Caesium radionuclides / isotopes, Iridium radionuclides / isotopes, Americium radionuclides / isotopes, Plutonium radionuclides / isotopes, Radium radionuclides / isotopes, Thorium radionuclides / isotopes, Uranium radionuclides / isotopes, Depleted uranium / depleted uranium products, Uranium hexafluoride, Enriched Uranium.

CLASS 8 - CORROSIVES

Corrosives are substances which by chemical action degrade or disintegrate other materials upon contact.

DGI are proficient in handling corrosives, Class 8 Dangerous Goods. DGI have the ability to service all customer requests pertaining to the logistics of corrosives; packing, packaging, compliance, freight forwarding and training.

Reason for Regulation

Corrosives cause severe damage when in contact with living tissue or, in the case of leakage, damage or destroy surrounding materials.

Sub-Divisions

There are no subdivisions within Class 8, Corrosives.

Commonly Transported Corrosives

Acids/acid solutions, Batteries, Battery fluid, Fuel cell cartridges, Dyes, Fire extinguisher charges, Formaldehyde, Flux, Paints, Alkylphenols, Amines, Polyamines, Sulphides, Polysulphides, Chlorides, Chlorosilanes, Bromine, Cyclohexylamine, Phenol / carbolic acid, Hydrofluoric acid, Hydrochloric acid, Sulfuric acid, Nitric acid, Sludge acid, Hydrogen fluoride, Iodine, Morpholine.

CLASS 9 - MISCELLANEOUS DANGEROUS GOODS

Miscellaneous dangerous goods are substances and articles which during transport present a danger or hazard not covered by other classes. This class encompasses, but is not limited to, environmentally hazardous substances, substances that are transported at elevated temperatures, miscellaneous articles and substances, genetically modified organisms and micro-organisms and (depending on the method of transport) magnetized materials and aviation regulated substances.

DGI are proficient in handling miscellaneous dangerous goods, Class 9 Dangerous Goods. DGI have the ability to service all customer requests pertaining to the logistics of miscellaneous dangerous goods; packing, packaging, compliance, freight forwarding and training.

Reason for Regulation

Miscellaneous dangerous goods present a wide array of potential hazards to human health and safety, infrastructure and/ or their means of transport.

Sub-Divisions

There are no subdivisions within Class 9, Miscellaneous Dangerous Goods.

Commonly Transported Miscellaneous Dangerous Goods Dry

ice / cardice / solid carbon dioxide, Expandable polymeric beads / polystyrene beads, Ammonium nitrate fertilizers, Blue asbestos / crocidolite, Lithium ion batteries, Lithium

metal batteries, Battery powered equipment, Battery powered vehicles, Fuel cell engines, Internal combustion engines, Vehicles, Magnetized material, Dangerous goods in apparatus, Dangerous goods in machinery, Genetically modified organisms, Genetically modified micro-organisms,

IMDG CODE

The International Maritime Dangerous Goods or IMDG Code was adopted in 1965 according to the 1960 IMO SOLAS (Safety for Life at Sea) Convention. The Transportation of dangerous goods by sea is governed by IMDG Code to prevent injury to individuals or harm to vessels and their cargoes. Carrying of marine pollutants is mainly regulated to avoid damage to the marine ecosystem. The aim of the IMDG Code is to improve the safe carriage of hazardous materials while facilitating the unrestricted free movement of such goods. The IMDG Code includes description of all the many dangerous cargoes available for carriage by ship and contains solid, liquid and gaseous substances. Explosive, flammable, oxidizing and radioactive compounds are also included and their containment methods recommended or .packaging are specified, as are all other related product details. The code is to be revised in the future on two-year basis, are foreseen in order to take into account technological developments

IMDG CODE GUIDELINES AND REGULATIONS

IMDG stands for International Maritime Dangerous Goods; the code provides requirements and guidelines for safe transportation of hazardous goods by sea to protect the ship's crew and prevent environmental pollution. Maintain and update of IMDG Code is the responsibility of the International Maritime Organization (IMO).

In addition to the requirements for the transport of hazardous materials by sea, IMDG code includes freight containers loading procedures, marine pollutants requirements, stowage and segregation, shipboard safety requirements and requirements to preserve the marine environment. Based on the requirements of the International Convention for the Safety of Life at Sea(SOLAS) and the International Convention for the Prevention of Pollution from Ships(MARPOL), IMDG code implementation is mandatory without unnecessarily impeding the movement of dangerous goods.

The IMDG Code provides guidelines and requirements for the transport of hazardous materials as follow:

- Categorize the dangerous goods into groups based on the hazardous level the present during transportation.

- Packing and storage requirements of dangerous goods during transportation.

- Provides identification marks and hazard warning signs of dangerous goods during transportation.
- Necessary documents and data sheets that need to be available during transportation.
- Ensuring proper separation of any dangerous goods that may dangerously react together during transportation.
- Guidelines of the storage location of dangerous goods on board the ship during transportation.

Emergency response guidelines for fire or spillage involving dangerous goods on board the ship.

SOLAS CONVENTION

The SOLAS Convention in its successive forms is generally regarded as the most important of all international treaties concerning the safety of merchant ships. The first version was adopted in 1914, in response to the Titanic disaster, the second in 1929, the third in 1948, and the fourth in 1960. The 1974 version includes the tacit acceptance procedure - which provides that an amendment shall enter into force on a specified date unless, before that date, objections to the amendment are received from an agreed number of Parties.

As a result the 1974 Convention has been updated and amended on numerous occasions. The Convention in force today is sometimes referred to as SOLAS, 1974, as amended. Technical provisions

The main objective of the SOLAS Convention is to specify minimum standards for the construction, equipment and operation of ships, compatible with their safety. Flag States are responsible for ensuring that ships under their flag comply with its requirements, and a number of certificates are prescribed in the Convention as proof that this has been done. Control provisions also allow Contracting Governments to inspect ships of other Contracting States if there are clear grounds for believing that the ship and its equipment do not substantially comply with the requirements of the Convention - this procedure is known as port State control. The current SOLAS Convention includes Articles setting out general obligations, amendment procedure and so on, followed by an Annex divided into 14 Chapters.

Chapter I - General Provisions

Includes regulations concerning the survey of the various types of ships and the issuing of documents signifying that the ship meets the requirements of the Convention. The Chapter also includes provisions for the control of ships in ports of other Contracting Governments.

Chapter II-1 - Construction - Subdivision and stability, machinery and electrical installations

The subdivision of passenger ships into watertight compartments must be such that after assumed damage to the ship's hull the vessel will remain afloat and stable. Requirements for watertight integrity and bilge pumping arrangements for passenger ships are also laid down as well as stability requirements for both passenger and cargo ships.

The degree of subdivision - measured by the maximum permissible distance between two adjacent bulkheads - varies with ship's length and the service in which it is engaged. The highest degree of subdivision applies to passenger ships.

Requirements covering machinery and electrical installations are designed to ensure that services which are essential for the safety of the ship, passengers and crew are maintained under various emergency conditions.

"Goal-based standards" for oil tankers and bulk carriers were adopted in 2010, requiring new ships to be designed and constructed for a specified design life and to be safe and environmentally friendly, in intact and specified damage conditions, throughout their life. Under the regulation, ships should have adequate strength, integrity and stability to minimize the risk of loss of the ship or pollution to the marine environment due to structural failure, including collapse, resulting in flooding or loss of watertight integrity.

Chapter II-2 - Fire protection, fire detection and fire extinction

Includes detailed fire safety provisions for all ships and specific measures for passenger ships, cargo ships and tankers.

They include the following principles: division of the ship into main and vertical zones by thermal and structural boundaries; separation of accommodation spaces from the remainder of the ship by thermal and structural boundaries; restricted use of combustible materials; detection of any fire in the zone of origin; containment and extinction of any fire in the space of origin; protection of the means of escape or of access for fire-fighting purposes; ready availability of fire-extinguishing appliances; minimization of the possibility of ignition of flammable cargo vapour.

Chapter III - Life-saving appliances and arrangements

The Chapter includes requirements for life-saving appliances and arrangements, including requirements for life boats, rescue boats and life jackets according to type of ship. The International Life-Saving Appliance (LSA) Code gives specific technical requirements for LSAs and is mandatory under Regulation 34, which states that all life-saving appliances and arrangements shall comply with the applicable requirements of the LSA Code.

Chapter IV – Radio communications

The Chapter incorporates the Global Maritime Distress and Safety System(GMDSS). All passenger ships and all cargo ships of 300 gross tonnage and upwards on international voyages are required to carry equipment designed to improve the chances of rescue following

an accident, including satellite emergency position indicating radio beacons (EPIRBs) and search and rescue transponders (SARTs) for the location of the ship or survival craft.

Regulations in Chapter IV cover undertakings by contracting governments to provide radio communication services as well as ship requirements for carriage of radio communications equipment. The Chapter is closely linked to the Radio Regulations of the International Telecommunication Union.

Chapter V - Safety of navigation

Chapter V identifies certain navigation safety services which should be provided by Contracting Governments and sets forth provisions of an operational nature applicable in general to all ships on all voyages. This is in contrast to the Convention as a whole, which only applies to certain classes of ship engaged on international voyages.

The subjects covered include the maintenance of meteorological services for ships; the ice patrol service; routeing of ships; and the maintenance of search and rescue services.

This Chapter also includes a general obligation for masters to proceed to the assistance of those in distress and for Contracting Governments to ensure that all ships shall be sufficiently and efficiently manned from a safety point of view.

The chapter makes mandatory the carriage of voyage data recorders (VDRs) and automatic ship identification systems (AIS).

Chapter VI - Carriage of Cargoes

The Chapter covers all types of cargo (except liquids and gases in bulk) "which, owing to their particular hazards to ships or persons on board, may require special precautions". The regulations include requirements for stowage and securing of cargo or cargo units (suchas containers). The Chapter requires cargo ships carrying grain to comply with the International Grain Code.

Chapter VII - Carriage of dangerous goods

The regulations are contained in three parts:

Part A - Carriage of dangerous goods in packaged form - includes provisions for the classification, packing, marking, labelling and placarding, documentation and stowage of 28 dangerous goods. Contracting Governments are required to issue instructions at the national level and the Chapter makes mandatory the International Maritime Dangerous Goods (IMDG) Code, developed by IMO, which is constantly updated to accommodate new dangerous goods and to supplement or revise existing provisions.

Part A-1 - Carriage of dangerous goods in solid form in bulk - covers the documentation, stowage and segregation requirements for these goods and requires reporting of incidents involving such goods.

Part B covers Construction and equipment of ships carrying dangerous liquid chemicals in bulk and requires chemical tankers to comply with the International Bulk Chemical Code (IBC Code).

Part C covers Construction and equipment of ships carrying liquefied gases in bulk and gas carriers to comply with the requirements of the International Gas Carrier Code (IGC Code).

Part D includes special requirements for the carriage of packaged irradiated nuclear fuel, plutonium and high-level radioactive wastes on board ships and requires ships carrying such products to comply with the International Code for the Safe Carriage of Packaged Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes on Board Ships (INF Code).

The chapter requires carriage of dangerous goods to be in compliance with the relevant provisions of the International Maritime Dangerous Goods Code (IMDG Code).

Chapter VIII - Nuclear ships

Gives basic requirements for nuclear-powered ships and is particularly concerned with radiation hazards. It refers to detailed and comprehensive Code of Safety for Nuclear Merchant Ships which was adopted by the IMO Assembly in 1981.

Chapter IX - Management for the Safe Operation of Ships

The Chapter makes mandatory the International Safety Management (ISM) Code, which requires a safety management system to be established by the ship owner or any person who has assumed responsibility for the ship (the "Company").

Chapter X - Safety measures for high-speed craft

The Chapter makes mandatory the International Code of Safety for High-Speed Craft (HSC Code).

Chapter XI-1 - Special measures to enhance maritime safety

The Chapter clarifies requirements relating to authorization of recognized organizations (responsible for carrying out surveys and inspections on Administrations' behalves); enhanced surveys; ship identification number scheme; and port State control on operational requirements.

Chapter XI-2 - Special measures to enhance maritime security

Regulation XI-2/3 of the chapter enshrines the International Ship and Port Facilities Security Code (ISPS Code). Part A of the Code is mandatory and part B contains guidance as to how best to comply with the mandatory requirements. Regulation XI-2/8 confirms the role of the Master in exercising his professional judgement over decisions necessary to maintain the security of the ship. It says he shall not be constrained by the Company, the charterer or any other person in this respect.

Regulation XI-2/5 requires all ships to be provided with a ship security alert system. ,Regulation XI-2/6 covers requirements for port facilities, providing among other things for Contracting Governments to ensure that port facility security assessments are carried out and that port facility security plans are developed, implemented and reviewed in accordance with the

ISPS Code. Other regulations in this chapter cover the provision of information to IMO, the control of ships in port, (including measures such as the delay, detention, restriction of operations including movement within the port, or expulsion of a ship from port), and the specific responsibility of Companies.

Chapter XII - Additional safety measures for bulk carriers

The Chapter includes structural requirements for bulk carriers over 150 metres in length.

Chapter XIII - Verification of compliance

Makes mandatory from 1 January 2016 the IMO Member State Audit Scheme.

Chapter XIV - Safety measures for ships operating in polar waters The chapter makes mandatory, from 1 January 2017, the Introduction and part I-A of the International Code for Ships Operating in Polar Waters (the Polar Code)

DANGEROUS GOODS REGULATIONS (DGR)

The IATA Dangerous Goods Regulations (DGR) is the trusted source to help us to prepare, Manage or approve shipments of hazardous goods by air. Some objects can endanger the safety of an aircraft or individuals on board, and the transport of these hazardous materials by air maybe prohibited or limited. The IATA DGR manual is the global guide for the transportation of hazardous goods by air, and the only Standard that airlines accept. The content contains up-to- date information on effective and efficient regulations, which ensures the safe transport of hazardous materials by air. This manual is the Product of IATA working closely representatives of the airline members, local governments and ICAO. All parties involved in the carriage of dangerous goods by air such as airlines, freight forwarders, ground handlers, manufacturers, and shippers may benefit from the use of the DGR. The aim of DGR is preventing undeclared dangerous goods from being loaded on an aircraft and passengers from taking on board those dangerous goods which they are not permitted to have in their baggage, cargo and passenger acceptance staff should seek confirmation from shippers and passengers about the contents of any item of cargo or baggage where there are suspicions that it may contain dangerous goods.

GLOBALLY HARMONIZED SYSTEM OF CLASSIFICATION AND LABELLING OF CHEMICALS (GHS)

The Globally Harmonized Chemicals Classification and Labelling System(GHS) is an globally accepted system administered by the United Nations, developed to replace the multitude of commonly used hazardous material classification and labelling systems around the world. The Key elements of the GHS include standardized hazard check standards, common warning pictograms, and harmonized safety data sheets that provide variety information to consumers of hazardous goods. The system acts as a complement to the UN Numbered system of regulated hazardous material transport. Implementation is managed through the UN Secretariat. The objective with GHS is to develop a single, globally harmonized system to address classification of chemicals, labels and safety data sheets. It aims at ensuring that information on physical hazards and toxicity from chemicals is available in order to enhance the protection of human health and the environment during the handling, transport and use of these chemicals.

INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY RAIL (RID)

New legislation relating to International Carriage of Dangerous Goods by Rail (RID) was created. The Latest regulation comes in to effect on 1 January 2019. The latest legislation involves revised classification codes, new packing instructions and testing of specific gas cylinders. The objective was to maintain the safety of persons and property in rail operation. The2019 edition is a replacement for the 2017 edition. However, a transitional period allows the provisions of RID 2017 to be used until 30 June 2019. RID refers to the international carriage of dangerous goods by rail between the existing RID Contracting States in Europe, Asia and North Africa.

CHAPTER-4

PROCEDURE OF TRANSPORTATION OF CARGO

PRE-HAZARDOUS APPROVAL

The process begins when the shipping line is approached by the customer for Hazardous cargo approval. Most lines have their own unique models for Hazardous cargo applications. Customer need to fill in every fields in the specific template sheet and send to the shipping line. It is necessary for the shipping line to ensure the acceptance of the hazardous goods at trans-shipment or ports that the vessel calls because some ports do not welcome vessels carrying high risk cargoes like Class 1 or Class 7 to access their ports or enter without taking safety precautions. Only after these procedures are done and confirmation is received from all quarters, the dangerous booking can be approved by the shipping line and client will be given the booking and empty container release.

The shipping line, most of which currently have a specialized Dangerous desk or Dangerous cargo center will verify that all the information provided by the shipper is correct (The shipping lines would use the IMDG Code to verify the accuracy of the information submitted). The DG Desk will search for hazardous cargo space on the vessel assigned to carry this Dangerous cargo

once the information provided by the client have been checked and found to be correct. Typically, every vessel has a set limit on how many and what sort on hazardous cargoes can be carried on board a ship. This may vary from vessel to vessel, line to line, port to port and also depends on the cargo already on board. If the hazardous desk in coordination with the operating desk ensure that there is adequate capacity on the ship to hold the particular type of hazardous cargo, and that this cargo is allowed to Pass through the various ports that it may call, it will give the go ahead to the export desk/client that the Hazardous cargo is acceptable.

POST-HAZARDOUS APPROVAL

When the container is assembled in compliance with the hazardous requirements, the container will be transported as normal to the container terminal during the stack period. Certain ports may require special documentation for all dangerous goods entering their gates/stacks. It is for the port to check that this container is a dangerous container and move it to the designated dangerous stacking spot within the port area. The Required hazardous labels must be placed to all 4 sides of the container without fail. Port and ship do not approve any Dangerous container into the port without the labels.

The dangerous packing declaration must be filled in by the customer and sent to the shipping line before the container is loaded onto the ship. This all the information relevant to the dangerous Cargo being Transported. The shipper must be patient and vigilant in filling up because misrepresentation of dangerous goods has severe consequences for the lives of many in the people in the port, ship and carriers who manage this container along their route from Point A to Point B. If by any chance there was a difference between the cargo details during the time of application and during the time of packing, it is the shipper‘s obligation to verify

that the shipping line is informed of this change immediately. Dangerous approvals may be reapplied before the vessel arrives for loading. If not, it will need to wait for the next ship.

POST LOADING

One copy of the Dangerous packing declaration is always available on board the ship. The shipping line also submits a separate Dangerous cargo manifest detailing ALL dangerous cargoes that are on board each of which will have its own dangerous packing declaration. It is necessary to aware that there is a difference between stowage and segregation and this can only be done effectively once the shipping line, port and transporter have all the information correctly provided. It is very essential for the line to know what the cargo is and how it is packed not only to know that the cargo is well protected for transportation but also to find out what kind of actions to take should something happen on board. This form of action may depend on materials involved.

COMPANYS HANDLING HAZARDOUS GOODS

KUEHNE+NAGEL INTERNATIONAL

Kuehne + Nagel International is a global transport and logistics company based in Switzerland. It was founded in 1890, in Germany, by August Kühne and Friedrich Nagel. It provides sea freight and airfreight forwarding, contract logistics, and overland businesses to ensure the safe and compliant handling of dangerous goods, kuehne + Nagel use robust processes, clear instructions, training, and monitoring. This ensures that employees of Kuehne + Nagel‘s have the expertise and knowledge required to carry out their duties in a secure and professional manner, in compliance with all relevant legislation. The company‘s global Hazardous goods guidelines are enforced by a network of experts located in all business units around the world. The guidelines are aimed at reducing or minimizing the risk of all forms of hazardous goods, both in transport and storage.

APL LOGISTICS LIMITED APL

Logistics Ltd is a wholly owned subsidiary of Kintetsu World Express, Inc. (KWE), a Japan-based freight forwarding and transportation company. As a global supply chain specialist, APL Logistics does business in more than 60 countries. Headquartered in Singapore, APL Logistics has locations across the globe. In 1980, in response to the increasing importance of Asian imports, U.S.-based container transportation and shipping company APL has created American Consolidation Services (ACS) to meet the needs of importers seeking assistance in managing the flow of their Asian goods.

APL Logistics specialized in Transportation of Hazardous goods which many other forwarders cannot manage. APL team of specialized professionals who have worked for established airlines and shipping lines within the dangerous goods freight industry. To handling of dangerous cargo requires a very professional approach, which requires experienced employees. APL Logistics has trained and skilled staff to handle this shipping.

There are several companies in India that are producers, as well as importers and exporters for chemicals and other hazardous equipment and APL gives more importance to handling these risky shipments

FEDEX

FedEx Corporation is an American multinational delivery services company incorporated October 2, 1997. The company is known for its overnight delivery service and pioneering a program that can monitor shipments and provide real-time alert on package position, a feature that most other carrier companies have now introduced. FedEx is also one of the top contractors of the US government. In January 2000, FDX Corporation changed its name to FedEx Corporation and re-branded all of its subsidiaries FedEx Express is a world leader in the shipment of Hazardous goods and has specialists on staff to assist with dangerous goods questions. Dangerous goods transport must be tendered to FedEx Express in compliance with existing International Air Transport Association (IATA) legislation for air transport and the FedEx Express Terms and Conditions. It is necessary regardless of the routing, and whether the shipment ends up physically moving by air , land or a combination of these.

HANDLING OF DANGEROUS GOODS

Dangerous Goods are substances which put people, property and the environment at immediate risk. These substances can be explosive, flammable, oxidising, toxic, radioactive or corrosive. Since hazardous goods pose a variety of risks to individuals, property and the environment, it is very important that you treat them safely and in a manner that minimizes the risks they can pose to your workplace.

Due to the higher use of Hazardous products in the previous century, chemical Producers now package their Hazardous goods in much bigger packages. Now a days it is not rare to see Hazardous goods such as acids and flammable liquids in packages as big as 205L drums and 1000L Intermediate Bulk Containers. Failure to handle these large packages with the right equipment can affect severe damage to people and property.

SAFETY DATA SHEETS

To ensure that everyone on the job is aware of the particular risks related with the hazardous substances that they are deal, it is very necessary to have a copy of the safety data sheets for each Hazardous substance. Safety data sheets are documents that outline the specific reactivity, fire, health and environmental dangers related with a particular substance. The safety data sheet will also outline the basic storage and handling requirements for the particular substance. Before a dangerous substance is dispensed or used, the safety data sheet for the substance must be consulted to ensure that the dangerous substance is managed in the safest manner.

FORK LIFTS

A forklift (also called lift truck) is a powered industrial truck used to lift and move materials over short distances.

If the company procures their Hazardous goods in 1000L intermediate bulk containers (IBC's), a forklift must be used to lift these IBC's in and out of chemical storage containers. 205L drums have a rounded shape and are much more difficult to handle. Forklift attachments must be used when moving these drums in and out of chemical storage containers.

PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (like gloves, Respiratory Equipment) is another form of protection that can be used to protect people and properties from the risks Hazardous goods. The use of personal protective equipment when dispensing and handling toxic and corrosive substances is particularly important. Toxic substances are substances which damage human health when they enter the body. The means by which harmful substances come into the body are called exposure paths. There are 3 principal routes of exposure. They are Ingestion, Skin contact, Inhalation. Among these three inhalations is the most common type. To minimize the risk of exposure to toxic substances, it is necessary to use the appropriate personal protective equipment such as respiratory equipment and gloves while handling and dispensing toxic substance.

SAFETY MEASURES REQUIRED IN WAREHOUSE

SAFE LIFTING TECHNIQUES

If a load needs transporting, firstly decide what approach is the best choice for its movement. If lifting is the most suitable method check the route to ensure that there are no obstacles in the way and ensure that there is an adequate room for loading at its destination. Safe lifting procedures should always be carried out and the load does not block the view of the lifter. Using all materials handling equipment carefully and follow the appropriate operating procedures including pushing instead of pulling, wherever possible and lean in the direction you are going. Also, never operate a forklift or use other driven equipment without training or permission.

LABELING HAZARDOUS ZONES

Hazardous equipment should be stored away in a place that is clearly labeled and secure walk ways should be highlighted by appropriate signage. The best way to highlight dangerous zones is by using tape or painting black and white lines on the floor of the specified area. This allows staffs to be aware of dangerous environment and can be helpful in preventing incidents that can cause severe injury.

USE OF SAFETY EQUIPMENT

Forklifts or hydraulic dollies are used to lift objects that are too heavy is very important equipment in the warehouse. proper eyewear and hard hats should also be worn when needed. Employees should be mindful of emergency exits and the sprinklers built in the roof should not be blocked at any time. Safety equipment is installed in order to reduce workplace injury. it may be time consuming to initiate its use but it does pay off in the long run.

HAPTER 5

5.1 FINDINGS

Based on the data and information collected in the course of study the observations are summarized below as findings .

• Carriage of Dangerous Goods by Rail (RID) and IATA Dangerous Goods Regulations (DGR)

• Most of the Accidents happened in warehouses due to the non-compliance safety measures

• Hazardous goods are classified into 9 classes where Category 1 is the most dangerous and category 9 is the least dangerous. Classification of hazardous materials can help in controlling accidents at work place.

• Lack of regular training and inspection also lead to non-compliance of safety.

• Another reason for accidents is Mis-declaration of cargo. The owner of Cargo may not describe the cargo is dangerous goods, so that the shipper store that cargo with general cargo. General cargo sometimes react with general cargo or the stored area does not have the featuretokeep that dangerous goods so that it will cause for accidents.

• The Warehouse should have a basic safety feature like compartmentalize chemical substancesfor keeping large quantities of highly inflammable chemicals separately .

• Lack of Training Personnel is also another reason for accidents because the accident is happened first due the negligence of personnel or unawareness of personnel.

5.2 SUGGESTIONS

• Don’t over load material handling equipment’s. Adequate guards and safety devices can help to provide safety to the material handling equipment

• Material handling equipment’s’ operator should be properly trained; - Before handling material, the operators must be trained.

• Keep material handling equipment’s in proper condition and don’t use defective equipment.

• Use proper personnel protective gears while handling hazardous materials.

• Avoid excessive weights In this case of material handling one of the important things to provide safety is avoid excessive weights it can lead difficult to handling material.

• Carefully consider feedback and suggestions from staff concerning practices that could further improve logistics efficiency.

• Always use cranes for lifting heavy hazardous equipment’s.

• Use mechanical handling equipment for difficult handling activities and to handling dangerous/hazardous material; -In the case of difficulties, handling must be use mechanical handling equipment

5.3 CONCLUSION

After considering many assumptions and study, it is assumed that the importance of safety measures in hazardous materials plays a vital role in today's world. There are numerous firms in various industries that deal with hazardous materials on a regular basis at Global Hazmat. From corner stores to home cleaners, mechanical factories to shippers, labourers are frequently exposed to hazardous items that jeopardise their safety and the safety of others around them if not handled properly and in accordance with regulations. This is why hazardous material safety precautions are so important. The primary motivation for security measures in hazardous products and merchandise is to ensure the health and safety of workers, working environments, properties, and the environment. Each risk has its own set of consequences and damage potential. Many accidents are caused by non-compliance with safety procedures, according to case studies, news reports, and journals. The authority's norms and principles should be followed by warehouses and businesses. When accidents damage not only the company but also the people and the environment, safety precautions in the dangerous commodities handling become more important. While using safety measures, you will not only reduce incidents, but also increase efficiency, increase business, and reduce environmental contamination. The study finds that organisations dealing with hazardous materials should closely adhere to the requirements, and cargo movement should follow IMDG guidelines. It is clear that the majority of organisations follow the guidelines outlined above, and that knowledge of HAZMAT is growing.

BIBILOGRAPHY

- https://en.wikipedia.org/wiki/Category:Hazardous_materials
- https://iopscience.iop.org/article/10.1088/1755-1315/214/1/012052/pdf
- https://www.supplychainbrain.com/articles/29327-the-true-impact-hazmat-shippingcompliance-can-have-on-your-business
- https://media.ifrc.org/ifrc/wpcontent/uploads/2020/12/CaseStudy_BeirutExplosion_TechBioHazardsweb.pdf
- https://en.wikipedia.org/wiki/2020_Beirut_explosion
- https://www.google.com/search?q=safety+equipment&oq=saf&aqs=chrome.0.69i59j69i57j69i59j46i131i433j0i433j69i60j69i61l2.1299j0j7&sourceid=chrome&ie=UTF8
- https://www.aljazeera.com/news/2021/6/20/un-office-says-sri-lanka-ship-fire-causessignificant-damage
- https://www.arabnews.com/node/1870251/world ¬ www.nmpt.gov.in ¬ www.nmpt.guidelines.com