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About this Learners Guide

Transport and Logistics - Stevedoring Level 1 has been produced by VUSSC. All Learners Guide produced by VUSSC are structured in the same way, as outlined below.

How this Learners guide is structured

The course overview

The course overview gives you a general introduction to the course. Information contained in the course overview will help you determine:

- If the course is suitable for you.
- What you will already need to know.
- What you can expect from the course.
- How much time you will need to invest to complete the course.

The overview also provides guidance on:

- Study skills.
- Where to get help.
- Course assignments and assessments.
- Activity icons.
- Units.

We strongly recommend that you read the overview carefully before starting your study.

The course content

The course is broken down into units. Each unit comprises:

- An introduction to the unit content.
- Unit outcomes.
- New terminology.
- Core content of the unit with a variety of learning activities.
- A unit summary.
- Assignments and/or assessments, as applicable.

Resources
For those interested in learning more on this subject, we provide you with a list of additional resources at the end of this Learners guide; these may be books, articles or web sites.

Your comments

After completing Transport and Logistics - Stevedoring we would appreciate it if you would take a few moments to give us your feedback on any aspect of this course. Your feedback might include comments on:

- Course content and structure.
- Course reading materials and resources.
- Course assignments.
- Course assessments.
- Course duration.
- Course support (assigned tutors, technical help, etc.)

Your constructive feedback will help us to improve and enhance this course.
Course overview

Welcome to Transport and Logistics - Stevedoring

The global container-shipping industry is the backbone of intercontinental supply chains, accounting for some 98% of intercontinental containerized trade volume and 60% of trade value. International trade is facilitated by freight logistics services, which provide efficient integrated management of point-to-point supply and distribution chains. Logistics suppliers manage the supply chain process by planning, implementing, and controlling the efficient and effective point-to-point flow and storage of goods, services and related information, throughout the production, distribution and delivery stages, from the initial suppliers of inputs to final consumers of products. Logistics services form a crucial and integral part of the supply chain management and a major determining factor of the competitiveness of an economy in global trade and investment.

The twentieth century was the age of machine; the twenty-first century will be the age of people (Kanter cited in Kermally, 2006). Globalisation, empowerment, cross functional teams, downsizing, learning organisation and knowledge workers are changing the way of life of managers and the way they manage people (Kermally, 2006). The shipping industry has become a prime example of a globalised industry now attached loosely to national sovereignties. Shipping differs from other examples of global business, such as fast food chain and the auto companies in that the physical capital is itself movable in a way a burger kiosk or car plant is not.

The word stevedore describes a man who stuffs, loads and unloads ships. This Loading and unloading ships requires knowledge of the operation of loading equipment, the proper techniques for lifting and stowing cargo and correct handling of hazardous materials. It is also the requirements that stevedores must be physically strong and be able to follow orders. Before the advent of containerization, stevedores are required to tie down cargoes with rope. Otherwise known as lashing. Stevedores include crane operators, truck drivers, container trackers as well as various supervisors.
Transport and Logistics - Stevedoring Level 1—is this course for you?

This course is intended for cargo handlers who are new to the stevedoring and ports industry, either in permanent or casual employment. The course focuses on the terminologies used in port and stevedoring operations, driving within a port environment, safety issues surrounding work in a port environment, communication skills, and the core knowledge and skills that relate to cargo operations. It also provides further skills in aspects of cargo operations that are location or enterprise specific, as well as in first aid.

This qualification has some standards in common with, and can lead on to Certificate in Stevedoring Levels 1 to 3, which are intended for cargo handlers and port machinery operators.

Course outcomes

Upon completion of Transport and Logistics - Stevedoring Level 1 you will be able to:

- Identify risk and apply risk management processes
- Check and evaluate records and documentation
- Organize and monitor terminal operations
- Implement and monitor stevedoring regulations
- Monitor crane operations
- Direct crane operations
- Use communication system
- Coordinate stevedoring clerical functions
Timeframe

[What is the expected duration of this course?]
[How much formal study time is required?]
[How much self-study time is expected/recommended?]

Study skills

As an adult learner your approach to learning will be different to that from your school days: you will choose what you want to study, you will have professional and/or personal motivation for doing so and you will most likely be fitting your study activities around other professional or domestic responsibilities.

Essentially you will be taking control of your learning environment. As a consequence, you will need to consider performance issues related to time management, goal setting, stress management, etc. Perhaps you will also need to reacquaint yourself in areas such as essay planning, coping with exams and using the web as a learning resource.

Your most significant considerations will be time and space i.e. the time you dedicate to your learning and the environment in which you engage in that learning.

We recommend that you take time now—before starting your self-study—to familiarize yourself with these issues. There are a number of excellent resources on the web. A few suggested links are:

  The “How to study” web site is dedicated to study skills resources. You will find links to study preparation (a list of nine essentials for a good study place), taking notes, strategies for reading text books, using reference sources, test anxiety.

- [http://www.ucc.vt.edu/stdysk/stdyhlp.html](http://www.ucc.vt.edu/stdysk/stdyhlp.html)
  This is the web site of the Virginia Tech, Division of Student Affairs. You will find links to time scheduling (including a “where does time go?” link), a study skill checklist, basic concentration techniques, control of the study environment, note taking, how to read essays for analysis, memory skills (“remembering”).

- [http://www.howtostudy.org/resources.php](http://www.howtostudy.org/resources.php)
  Another “How to study” web site with useful links to time management, efficient reading, questioning/listening/observing skills,
getting the most out of doing (“hands-on” learning), memory building, tips for staying motivated, developing a learning plan.

The above links are our suggestions to start you on your way. At the time of writing these web links were active. If you want to look for more go to www.google.com and type “self-study basics”, “self-study tips”, “self-study skills” or similar.

Need help?

Is there a course web site address?
Was the course instructor's name? Where can s/he be located (office location and hours, telephone/fax number, e-mail address)?

Is there a teaching assistant for routine enquiries? Where can s/he be located (office location and hours, telephone/fax number, e-mail address)?

Is there a librarian/research assistant available? Where can s/he be located (office location and hours, telephone/fax number, e-mail address)?

Is there a learners’ resource centre? Where is it located? What are the opening hours, telephone number, who is the resource centre manager, what is the manager’s e-mail address)?

Who do learners contact for technical issues (computer problems, website access, etc.)

Assignments

[How many assignments are there for this course?]  
[How are the assignments to be submitted?]  
[To whom should the assignments be submitted?]  
[What is the schedule for submitting assignments? End of each unit? Specific dates?]  
[What is the order of the assignments? Must they be completed in the order in which they are set?]
Assessments

- How many assessments will there be in this course?
- Are they self-assessments or teacher-marked assessments?
- When will the assessments take place?
- How long will the assessments be?
- How long will learners be allowed to complete the assessment(s)?
- How long will it take a teacher to mark the assessment(s)?
Getting around this Learners guide

Margin icons

While working through this Learners guide you will notice the frequent use of margin icons. These icons serve to “signpost” a particular piece of text, a new task or change in activity; they have been included to help you to find your way around this Learners guide.

A complete icon set is shown below. We suggest that you familiarize yourself with the icons and their meaning before starting your study.
Unit 1

Personnel safety

Introduction

This unit introduces you to the concept of safety of personnel in stevedoring. Stevedores pose a regular and significant risk to ship owners and port operators for personal injury claims not only because they conduct potential hazardous operations in an unfamiliar environment but because by its very nature stevedoring is a dangerous occupation. Loading and unloading cargo is both a tedious and dangerous operation. It requires knowledge of the operation of loading equipment, the proper techniques for lifting and stowing cargo, and correct handling of hazardous materials. Accidents and injuries to stevedores are often caused by lack of knowledge and awareness on personnel protective equipment (PPE) and procedures. It is important to pay strict adherence to the correct use of PPE.

Upon completion of this unit you will be able to:

- identify types of personnel protection equipment (PPE).
- describe the uses of the different types of PPE in the stevedoring context.
- state guidelines for using and storing PPE.
- explain the correct use of each PPE in the stevedoring context.
- demonstrate the correct use of each PPE in the stevedoring context.
- identify safety signs and symbols onboard ships.
- identify restricted and non-restricted areas.
- differentiate safety signs and symbols on dock side.
- discuss relevant safety legislations and regulations.
- describe the causes and effects of fatigue.
- identify signs and symptoms of fatigue.
- explain how organisations contribute to prevent fatigue.
**Terminology**

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatigue:</td>
<td>The degradation of human performance and the impairment of rational decision making which has implications for the overall safety of stevedoring personnel (FAO/ILO/IMO, 2001).</td>
</tr>
<tr>
<td>Dock side:</td>
<td>The area immediately adjacent to a dock.</td>
</tr>
<tr>
<td>Defibrillation:</td>
<td>Consists of delivering those therapeutic doses of electrical energy to the affected heart with a device called a defibrillator. Defibrillators can be external, transvenous or implanted depending on the type of device used or needed.</td>
</tr>
<tr>
<td>Stevedore:</td>
<td>A person employed in loading and unloading of ships.</td>
</tr>
<tr>
<td>Onboard:</td>
<td>Available and situated on board a ship</td>
</tr>
<tr>
<td>Legislation:</td>
<td>Legislation (statutory law) is the law which has been promulgated (enacted) by a legislature or other governing body, or the process of making it.</td>
</tr>
<tr>
<td>Regulations:</td>
<td>Controlling human and societal behaviour by rules or restrictions. Legal restrictions can be promulgated by a government authority, self-regulation, social regulation, co-regulation and market regulation.</td>
</tr>
<tr>
<td>Gangways:</td>
<td>Manoeuvrable ramps or ladders which are lowered from the side of the ship to allow access or Passageways along either side and throughout a ship’s upper deck.</td>
</tr>
<tr>
<td>Restricted Area</td>
<td>An area (land, sea or air) in which there are special restrictive measures employed to prevent or minimize interference. An area onboard ship in which special security measures are employed to prevent an unauthorised entry.</td>
</tr>
<tr>
<td>Confined space:</td>
<td>Dangerous or potentially dangerous work area with only restricted openings for entry and exit that will make an emergency escape difficult.</td>
</tr>
<tr>
<td>Bunker station:</td>
<td>A bin or tank used especially for fuel storage</td>
</tr>
<tr>
<td>Back brace:</td>
<td>A device designed to support and limits the motion of the spine in cases of fracture.</td>
</tr>
<tr>
<td>State room:</td>
<td>A private cabin or compartment with sleeping accommodation onboard a ship</td>
</tr>
<tr>
<td>Macro environment:</td>
<td>A company’s large societal forces that affect the company’s daily operations. These include demographic, economic, technological, political, cultural and natural forces.</td>
</tr>
<tr>
<td><strong>Galley:</strong></td>
<td>A compartment with kitchen facilities in which cooking and other food preparations is done on board ships.</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>The Bridge:</strong></td>
<td>The area of a ship from which the ship is commanded by an officer of the watch, aided usually by an able seaman acting as a watch-keeper at support level.</td>
</tr>
<tr>
<td><strong>ANSI:</strong></td>
<td>American National Standards Institute</td>
</tr>
</tbody>
</table>
1. Personnel Protective Equipment

The use of protective clothing is an important part of safe working practices. For many jobs, adequate personnel protective equipment (PPE) must be provided at work places. The use of protective equipment and clothing is an important part of safe working practices. For many jobs, adequate personnel protective equipment (PPE) must be provided at work places.

In stevedoring, knowledge of and the correct use of PPE is crucial to the safety of stevedores. If the knowledge of how to properly use PPE is lacking, stevedores will very likely commit mistakes and accidents will be prone to occur. Can you think of some of PPE a stevedore would use? These are some of the recommended PPE for stevedores to use. While some must always be worn or on hand for immediate use, the use of others will be dependent on the particular conditions under which work is being done.

- Safety vests – always worn
- Hard hats/safety helmets – always worn
- Steel toe boots – always worn
- Protective eyewear – always worn
- Ear muffs and/or ear plugs – available for immediate use
- Air respirators – work conditions
- Dust Masks – available for immediate use
- Safety harness – work conditions
- Protective gloves – always worn
- Back brace – always worn

SAFETY VESTS

A safety vest can be identified by highly visible colours made of fluorescent fabric with reflective stripes. The use of safety vests should be part of an integrated organisational approach to occupational health and safety and to complement other control methods.

1. Guidelines for storage of safety vests
   a. Must be kept clean and dry
   b. They must be properly folded
   c. The container for storage must be labelled and free of humidity

2. Donning of safety vests
Can you explain the importance of colours and reflective stripes used on safety vests?

HARD HATS/SAFETY HELMETS
The types of hard hats and safety helmets that a stevedore can use include helmet, face shield, skull buckets, Bullard, fibre glass, ANSI, wear and light weight. This device can be identified by style, colour and versatility with the Standard Series.

1. Have hard protective padding inside the hard hat.
2. Appropriate use of hard hats
safety vests?

STEEL TOE BOOTS:
The types of steel toe boots are classified using identifiable labels like green triangle, yellow triangle, white square with own symbol, yellow square with SD, red square with C and fir tree.

Read about the following symbols that are used to differentiate steel toe boots:

a. 1, 2 or O - These labels indicate if the shoe has a steel-toe cap. A metal shell is embedded on top of the toe part of the shoe.
   - 0 means there is no resistance
   - 0 means there is no resistance
   - 1 means it resists an impact of 125 joules that is 22.7 kg object falling from 56 cm above.
   - 2 in this category means it resists an impact of 90 joules.

b. P or O - These labels indicate if the shoe has soles that protect the arches of the feet from punctures. The label P means the shoe has such soles and O means the shoe has no soles to protect the arches of the feet.

c. M or O - These symbols indicate if the shoe has a metatarsus protection against shocks and collisions. M means it does and O is an indication there is no metatarsus protection.

d. E, S or C - These labels indicate the shoe’s electrical properties. E means it resists electrical shocks, S means it disperses static electrical, C means it conducts electricity.

e. X or O. These labels are found only on shoes that protect the foot from chainsaws. X means the shoe can protect the foot and O means it does not.

State the five (5) types and classification of steel toe boots
**PROTECTIVE EYEWEAR:**

Protective eyewear are used to protect the eyes against various hazards such as flying particles, dust, molten matters, gasses, vapours, and radiation (from welding, furnaces or the sun).

1. Types of protective eyewear are identified with hazards. There are three types of protective eyewear. Each type is designed for a specific purpose. For your safety you need to understand the types of situation each eyewear is most suitable.
   
   a. Perspex safety glasses. These are appropriate for low velocity flying particles.
   
   b. Goggles. These are appropriate for medium to high velocity flying particles with different work materials or metals.
   
   c. Prescription Protective Eyewear. These are designed and made available to people who are visually impaired to perform the same function.

2. Guidelines for using protective eyewear: Remember before or when using protective eyewear it is important you observe the following guidelines. The protective eyewear should:
   
   a. be part of an integrated organisational approach to occupational health and safety
   
   b. be used to complement other hazard control methods
   
   c. be provided where it is not possible for an employer to eliminate or control eye hazards via other control methods.

**State six (6) reasons for wearing protective eyewear**

**EAR MUFFS AND EAR PLUGS:**

Hearing protectors including ear muffs and ear plugs reduce the effects of noise that may lead to hearing damage if used appropriately. At this point it is important we try to differentiate between ear plugs and ear muffs, as this will help you see the specific applications of each.

1. Ear Muffs: Ear muffs are cups which fit over ears and are connected by a spring band normally worn over the head; the cups have soft
cushions around the rims which seal them to the wearer’s head; and the cups are normally filled with sound absorber

2. Ear plugs: There are four types of ear plugs each with a specific design and procedure for wearing. Let’s take a look at each type of ear plug and notice how one is different from the others.

a. Pre-moulded ear plugs – inserted directly into ear canal without the need for shaping
b. Formable ear plugs – moulded prior to insertion into the ear canal following which the compressible material expands to fit the ear canal
c. Custom made ear plugs – designed for individual’s ear canal
d. Banded ear plugs – suspended on headband

Guidelines for using ear muffs and ear plugs

Whether it is ear plugs or ear muffs it is beneficial to you and your organization to observe the following guidelines relating to the application of such devices:

a. The use of ear muffs and ear plugs should be part of the company’s comprehensive hearing protection program
b. Both devices should be used to complement other noise management control methods.

Briefly describe ear muffs as used in stevedoring
AIR RESPIRATORS:

Air respirators aid breathing in situations where they are required. Knowledge of the types and guidelines for using air respirators is very crucial.

1. Types of air respirators

There are two types of air respirators. Let’s take a look at each one.

a. Self-contained Breathing Apparatus (SCBA). These units provide the highest level of respiratory protection as compressed air is breathed in through a full face mask connected to a cylinder.

b. Supply Air Respirators (SAR). This equipment is used to supply air from a full face mask that is linked to an external air source by a hose or airline. It has a longer use period and high levels of protection.

2. Guidelines for using air respirators
To ensure the appropriate use of air respirators you need to observe and strictly abide by the following guidelines.

a. The effectiveness can be limited by improper use or selection of the correct protection for a job
b. They protect as long as they are properly sealed to the face and are worn during the entire chemical exposure.

Dust Masks - Information to be inserted

Why is it necessary to correctly don SCBA and SAR?

SAFETY HARNESS:

A safety harness is a seat belt and sometimes known as a safety belt. Types of Safety Harness:

Safety harnesses must be worn in all situations where height work is being done and the possibility of a fall exists.

1. Guidelines for the use of Safety Harness during emergency:
   a. Release all buckles
   b. Hold by Dorsal D-Rink
   c. Slide into shoulder straps
   d. Attach leg straps
   e. Connect the chest buckle
   f. Tighten straps and secure connections

NOTE

FIRST AID KIT:

All stevedores should be given practical instructions on the immediate action to be taken on encountering an accident or other emergency onboard ship and dock side. The stevedores should be familiar with the contents of the First Aid Kit and their use.

The First Aid Kit can be identified by a cross and the inscription “First Aid Kit”.

Thou shall not fall
SAFETY SIGNS:
It is important you observe and be able to respond appropriately to the following signs.

Table 1: Signs and Interpretation

<table>
<thead>
<tr>
<th>Sign</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danger 1</td>
<td>Fall protection required beyond this point</td>
</tr>
<tr>
<td>Danger 2</td>
<td>Body harness required for entry</td>
</tr>
<tr>
<td>Danger 3</td>
<td>Safety belts required in this area</td>
</tr>
<tr>
<td>Caution 1</td>
<td>Anyone entering tanks must wear body harness</td>
</tr>
<tr>
<td>Caution 2</td>
<td>Safety belt required</td>
</tr>
<tr>
<td>Caution 3</td>
<td>Anyone working over this area shall wear a safety belt and a life line at all times</td>
</tr>
<tr>
<td>Fall hazard</td>
<td>Do not start work unless guardrail, safety net or personal fall arrest system is in place</td>
</tr>
<tr>
<td>Notice</td>
<td>Use of safety belts and line required for any work beyond guarded stairs or platform</td>
</tr>
</tbody>
</table>

Note: Unit 2 will introduce you to different types of Safety Signs

FIRST AID STATION EQUIPMENT
DEFIBRILLATORS:
Equipment used for delivering a therapeutic dose of electrical energy to the affected heart. It depolarizes a critical mass of the heart muscle, terminates the arrhythmia, and allows normal sinus rhythm to be re-established by the body.
Types of defibrillators:

a. Automated external defibrillator (AED) - recommended for use by stevedores. AEDs automate the diagnoses of treatable rhythms, and then advise the user whether a shock is required.

b. Other types of defibrillators are only available at medical facilities and are not recommended for use by lay responders or bystanders.

Explain the importance and usage of a defibrillator

Additional Equipment and staffing
Qualified nurse
Equipment for taking blood pressure
Eye wash etc.
Other equipment to stabilize injured person prior to transport to medical facility

Training in the use of the First Aid Kit is recommended to enable stevedores to take immediate action upon encountering an accident or other medical emergency.

1. What is a First Aid Kit?
2. In your own words describe the contents of a First Aid Kit.
PROTECTIVE GLOVES:
When working at the seaport the use of correct type of industrial safety gloves and mittens can reduce the chances of injury to your hands from common industrial hazards. When selecting a set of gloves it is important that they are the right type for the job.

BACK BRACE

If you love your hands, let me cover them

It supports my back
2. Restricted Areas

Knowledge of “Restricted Areas” is a requirement for any practicing stevedore. The lack of such knowledge can cause accidents and major upset to the flow of work onboard ship and dock side.

The Ship Security Plan (SSP) identifies the restricted areas on board ship and specifies their extent, times of application and security measures to be taken to control access to them and those to be taken to control activities within them.

Stop for a minute and ask yourself “Why do we make known signs like “Restricted Areas as is the in the following picture”?

![Restricted Areas Sign]

Be careful!!
You can be hurt!

Here are some reasons for marking and having “Restricted Areas”

1. To prevent unauthorised access
2. To protect passengers, ship’ personnel and personnel from port facility or other agencies authorised to be on board the ship
3. To protect security-sensitive area within the ship
4. To protect cargo and ship stores from tampering

Guidelines for using Restricted Areas;

The SSP should ensure that there are clearly established policies and practices to control access to all restricted areas.

The SSP should clearly identify all restricted areas, indicating that access to the area is restricted and unauthorised presence within the area constitutes a breach of security.

Onboard ship

You will find that onboard ships restricted areas may include the following:

1. Navigation Bridge, spaces containing security and surveillance equipment and systems and their controls and lighting system controls.
2. Engine room, spaces with access to portable water tanks, pumps or manifolds, ventilation and air condition systems, spaces containing cargo pumps and their control.

3. Cargo spaces and spaces containing ship’s stores, state room and galley.

4. Any other areas as determined by Company Security Officer (CSO), through the Ship Security Assessment (SSA) to which access must be restricted to maintain the security of the ship

Dockside

You will also find that the dock side as well as certain other areas within the port facility certain are designated as restricted areas. The extent, terms of application, and the security measures to be taken to control access to them, and those to be taken to control activities within them will be specified. Each area should have clearly established security measures to control access by individuals in order to monitor or control the following:

1. the entry, packing, loading and unloading vehicles
2. movement and storage of cargo and ship’s stores, and
3. unaccompanied baggage or personal effects.

In general, the purpose of the restricted areas is to:

1. Protect passengers, ship’s personnel, port facility personnel and visitors, including those visiting in connection with that ship.
2. Protect the port facility
3. Protect ships using, and serving the port facility
4. Protect security-sensitive locations and the areas within the port facility
5. Protect security and surveillance equipment and systems
6. Protect cargo and ship’s stores from tampering

What are Restricted Areas?

For the purposes of stevedoring you will be able to locate the following restricted areas onboard ship and dock side. A visit to these sites will help enhance your understanding and feel of restricted areas.

1. Shore and water side areas immediately adjacent to the ship
2. Embarkation and disembarkation areas including gangways, passenger ship’s personnel holding and processing areas, and search points
3. Areas where loading, unloading or storage of cargos and stores is undertaken.
4. Location where security-sensitive information including cargo documentation is held
5. Areas where dangerous goods and hazardous substances are held
6. Vessel traffic management system control rooms, aids to navigation and port control buildings, including security and surveillance control rooms

7. Area where security and surveillance equipment are stored or located

8. Essential electrical, radio and telecommunication, water and other utility installations

9. Other locations in the port facility including bunker station where access by vessels, unauthorised vehicles and individuals should be restricted

All restricted areas are to be designated “No smoking areas”.

3. Fatigue

Fatigue is one of the major causes of poor performance in many workplaces. The intellectual capacity of any organization or profession is negatively affected if fatigue is not seriously considered and managed.

Has there been a time you experienced tiredness, lack of motivation and exhaustion at work? If you had continued to work under such conditions what were the results of your work? Were they favourable or unfavourable?

Let’s take a look at what fatigue is.

Fatigue is a symptom, rather than a specific disease of disorder. It is a lack of energy and motivation. People who have fatigue feel tired all the time - in both body and mind. It can be a normal and important response to physical exertion, emotional stress, boredom, or lack of sleep. It can also be a nonspecific sign of a more serious psychological or physical disorder. People suffering from fatigue have slow reflexes and reduced functioning in daily life. Excessive tiredness is also a known risk factor in motor vehicle and workplace accidents.
Causes of fatigue

Fatigue can be caused by a number of factors working in combination. Following are four common factors that cause fatigue.

1. Undiagnosed medical conditions. If individuals do not ensure that they undertake regular medical check ups the possibility that they can get ill due to an undiagnosed medical condition is heightened.

2. Unhealthy lifestyle choices. Our own habits if not carefully watched and controlled could lead to fatigue. Our own choices (unhealthy ones) are definite causes of fatigue. Can you think of some of these causes? Let’s take a look at five common lifestyle choices that can cause fatigue.

a. Lack of sleep. Adults need eight hours of sleep per night. Because of work family, social commitment and other reasons, some people burn the candle at both ends and try to get by on few hours of sleep. At both ends and try to get by on few hours of sleep. New parents are commonly sleep deprived since babies wake often for food or comfort (see IMO/ILO guidelines).

b. Too much sleep. Adults sleeping more than eleven hours per day can lead to excessive day time sleepiness.

c. Alcohol and drugs. Alcohol is a depressant drug that slows the nervous system and disturbs normal sleep patterns. Other drugs such as cigarettes and caffeine stimulate the nervous system and make insomnia more likely.

d. Sleep disturbances. This may occur for a number of reasons. For example noisy neighbours, young children who wake up at night, the snoring partners or an uncomfortable sleeping environment such as stuffy bedroom.

e. Poor diet. Low kilojoules diet, low carbohydrates diet (or high energy food) that are nutritionally poor do not provide the body with enough fuel or nutrients to function at its best. Quick fixed foods such as chocolate bars or caffeinated drinks only offer a temporary energy boost that quickly wears off and worsens fatigue.

3. Workplace related issues. There are four common workplace issues that can cause fatigue. These are:

a. Shift work. The human body is designed to sleep during the night. Shift work disrupts the body clock leading to fatigue situations.

b. Poor workplace practices. This adds to a person’s level of fatigue. For example unnecessary overtime and work overload leading to less rest which eventually lead to fatigue.
c. Workplace stress. This can be caused by a wide range of factors including job dissatisfaction, heavy workload, conflicts with supervisors or colleagues, bullying, constant change, or threats to job security.

d. Burnout. This can be described as striving too hard in a one area of life while neglecting everything else.

4. Psychological effects. Studies suggest that psychological factors are present in at least 50 per cent of fatigue cases (International Maritime Organization, 2001). They may include:

a. Depression. This is characterised by severe and prolonged feeling of sadness, dejection and hopelessness

b. Anxiety and Stress. A person who is chronically anxious or stressed keeps their body in overdrive. The constant flooding of adrenaline exhausts the body, and fatigue sets in.

c. Grief. Losing a loved one causes a wide range of emotions including shock, guilt, depression, despair and loneliness.

4. Personnel Safety Management System

DO NOT GO TO WORK.
“RELAX”
A number of very serious accidents which occurred during the late 1980s, were manifestly caused by human errors. Management faults were also identified as contributing factors. Lord Justice Sheen in his inquiry into the loss of the vessel (MV Herald of Free Enterprise) described the safety management system’s failure as “the disease of sloppiness”. Occupational safety standards are usually implemented by way of regulation under relevant legislation and regulations and supported by a code of practice (COP) (refer to Unit Two on Safe Working Practices Unit below).

Unit summary

In this unit you learned four important areas in relation to personnel safety for stevedoring in the operations of shipping industry. The areas include personnel protective equipment, restricted areas, fatigue and safety management system.

Assessment will be based on the eleven outcomes stated at the beginning of this unit. Each section of the unit will be assessed on a continuous basis. The essence of the exercises and activities is to demonstrate the level of competence achieved.

Assignment

Assessment will be done on the job environment using a combination of:
Written and/or oral assignment
Practical work and Observation

1. State three (3) reasons for wearing protective eyewear
2. Explain the uses of the following protective eyewear
   a. Perspex safety glasses
   b. Goggles
   c. Prescription protective eyewear
3. Explain two (2) guiding principles in establishing restricted areas in a Ship Security Plan
4. Describe any three (3) signs of fatigue
5. Identify the various parts of safety harness and demonstrate the proper usage
All questions for assignment should be attempted and checked before any final assessment is conducted.

Assessment

In this unit, knowledge shall be assessed while work is being done under direct supervision with regular checks. Assessment also acknowledges your autonomy (independence) as a learner. Assessment shall be conducted at various stages of the job application in accordance with the learning outcomes, or shall be at the completion of each process.

Assessment will be undertaken off the job however the off the job environment will stimulate a real workplace situation using a combination of:

1. Written examination
2. Practical examination
3. Observation and oral assessment

As a distance learner you are required to attempt all questions at the end of this unit. Each section of the unit contains a set of questions which can be attempted and checked by you.

An accredited assessor is strongly recommended to conduct the assessment where appropriate.

1. Demonstrate appropriate donning of a safety vest
2. Demonstrate the correct procedure for wearing and using hard hats
3. Explain each of the following symbols used to differentiate steel toe boots (use a table)
   a. 1, 2 or O
   b. P or O
   c. M or O
   d. E, S or C
   e. X or O
4. List the four (4) types of ear plugs and explain the uses of each
5. What is the purpose of ear muffs in stevedoring?
6. State the purpose of restricted areas onboard ship and on dock side
7. Explain five (5) common causes of fatigue
8. Explain the purpose of safety harness as used in stevedoring
Unit 2

Carrying Out Occupational Health and Safety Procedures

Introduction

In the previous unit, you learnt about personnel safety for stevedores involved in cargo handling activities. In this unit you will learn how to carry out occupational health and safety procedures in connection with safe working practices onboard, ashore and on equipment that are used for the cargo handling activities at large.

“Every day in the world (on average) a seafarer or a dock worker is killed on the job” – Eddie Seymour, MUOA - 1993

It is important that all persons involved in stevedoring possess adequate training and safety knowledge and have a high degree of safety awareness so that they are able to:

- recognize the importance of safety and assign sufficient resources to handle it.
- give proper consideration to safety during planning and design stages to eliminate/reduce safety problems during later stages of the process.
- take into account potential safety problems during preparation / vetting of method statements.

a. avoid performing unsafe acts.
b. avoid creating unsafe conditions.
c. identify unsafe acts/conditions and ask for rectification.

Each port needs to develop working practices that will protect the safety and health of stevedores such as those set out on International Labour Organization (ILO) Conventions and recommendation and other codes of practice and guidelines.

In this section you will explore safety aspects of handling cargo onboard, ashore, safe operation of cargo handling equipment such as ship to shore cranes, ships derrecks, tractor trailers, straddle carriers and other equipment; including safe use of cargo gears / tools / devices for the effective and efficient cargo handling activities.

Upon completion of this unit you will be able to:
Unit 2  Carrying Out Occupational Health and Safety Procedures

Outcomes

- demonstrate knowledge of company's safety policies and procedures.
- demonstrate knowledge of occupational health and safety regulation.
- describe responsibilities and functions of employees in carrying out day to day duties in a safe manner.
- demonstrate safe practices in the use of equipment, tools and devices.
- demonstrate the importance of identifying and following safety signs and symbols.
- state guidelines for contacting appropriate personnel and emergency services.
- describe evacuation procedures in case of emergencies.
- demonstrate knowledge of workplace safety requirements.
- demonstrate knowledge of dangerous goods as a cargo handler.
- describe care and handling of cargo lifting equipment and safe slinging of loads.
- demonstrate knowledge of the tasks, terminology, jargon and signals used in port cargo operations.
- demonstrate knowledge of safely attaching loads of cargo under supervision.

Terminology

Abaft: A word used by seaferers, meaning nearer the stern. Eg: 'The cargo slings are abaft no.3 hatch'.

Abeam: In a line at right angles to the vessel's length. Opposite the centre of the vessel's side.

Aboard: In or upon the vessel

Abreast: Side by side

Aft: Short for abaft

After: Towards the stern of the vessel Opposite of 'fore'

Aloft: Overhead

Amidships: Means half way between the stem(forward or front of the ship) and the stern of the ship

Apron: Means an area on the quay, adjacent to the ship, that is used for working cargo. Where there is no shed this area may also be used for piling or
stacking cargo temporarily.

**A stern:** The rear or back of a vessel. This is the after part of a vessel.

**A thwart ship:** Means across the ship, opposite to fore and aft.

**Ballast:** Weighty material (usually water) carried to ensure the stability of the ship.

**Berth:** A place where ship is anchored or accommodated alongside the dock.

**Tween decks:** Usually the space between the upper and lower deck of a vessel, below.

**Bollard:** Short firmly anchored post on quay to which the mooring lines of a vessel is secured.

**Boatswain:** Also known as Bosun. A petty officer on vessel in charge of rigging. A leader of the crew.

**Bow:** The fore end of the ship.

**First lift:** The act of commencing to discharge a ship's cargo. Where deck cargoes are carried first lift is counted from the time the first set of cargo is lifted off the deck.

**Broads i de s** : The whole side of the vessel.

**Boatside On:** Opposite to end on.

**Broken Stowage:** Cargo carrying capacity lost when packages of cargo stored in a ship's hold are irregular in size which causes gaps to occur between them. Even when packages are regular in size obstructions in the hold, such as pillars, will still cause gaps in stowage causing loss of space.

**Bulk Cargo:** A term used to describe cargo carried in bulk, not packaged in separate units. Coal, sugar, oil and ores are example of bulk cargoes.

**Bulkhead:** A compartment separation or steel wall in a ship.

**Coamings:** Built of steel plates around the ship hatch ways. The purpose is to provide protection against water entering the hold from surrounding decks. It also prevent the workers from falling into the holds.

**Dangerous Cargo / Hazardous Cargo:** Cargo which based on its nature requires special handling and stowage precautions.
Deck Cargo: Cargo loaded or stowed on deck

Derrick: A steel boom connected to a crane on the lower end of the deck or on a platform above the deck level used in the loading and/or discharge of cargo to or from the ship.

Dunnage: Pieces of wood used onboard to securely load cargo or protect cargo from damages.

Gangway: The access point to and from a ship; thus 'gangway ladder' normally secured with a net to prevent people from falling overboard.

Gear: Rigging or any kind.

Hold: The space below deck in a ship, in which the cargo is stored.

Hull: The watertight body of the vessel.

Jib: The arm of the cranes that carry the load; it can be swung round or "slewed" to pickup or land its load.

Lasher: Stevedore who secures and unsecure containers onboard ship in the discharge and loading operation.

Lo - Lo: Lift on and Lift off.

Man-handle: To move by manual force, without tackles.

Mobile crane: A 'runabout' crane used on quays and in sheds for cargo handling. The safety of a mobile crane depends directly on the safe working load (SWL) being adhered to, weight being lifted and the angle of the jib at the time of lifting.

Outreach: The distance a crane can plumb from the body of the crane so has to reach the cargo in the hold of the ships or on the quay for the purpose of lifting them.

Outturn: The amount of cargo discharged from a ship. A hourly, daily, or total figure.

Overstowed: Goods in a hold destined for a port of discharge, but blocked in by other goods to be unloaded at the later port of discharge. To unload the goods overstowed it will be necessary to incur the expenses of removing the goods that are blocking
Pratique: The permit for a vessel to communicate (commence loading/discharging operations) with the land after a clean bill of health has been issued, or quarantine restriction have been lifted.

Quay: Part of the dock nearest to the water and situated between the ship and shed or stacking area, it is the working area for cargo from the ship to shed or stacking area and vice versa.

Rat Guards: These usually take the form of large tin discs that fit titles around the ships mooring ropes, inorder to prevent rats climbing down to reach the shore.

Ro-Ro: Roll on and Roll off.

Running Gear: Applies to all moving gear used in cargo work, i.e; topping lift wires, span chains, guys, blocks and cargo runners etc.

Safe Working Load: All gear, including derricks on ships has a manufacturer designated safe working load limit. Lifting equipment must be tested periodically for suitability for lifting its working load. This given limit, measured in tons, is painted in a location on the equipment where it can be easily seen.

Spreader: A rectangular lifting gear with four corners fitted with twist locks to lift containers.

Stevedore: Is an employee involved in loading and off loading of cargo to and from ships.

Stowage: A term denoting or identifying the position of individual pieces of cargo stowed on a ship.

Signalman: The signalman is responsible to give signals to the crane operator for lifting, swinging and lowering loads.

Turnround of a ship: The period of time that a ship spends in port.

Winch: A piece of machinery affixed to the vessel deck used for topping of derricks, hoisting and lowering of slings of cargo.
1. Procedures and policies relating to workplace safety

Dealing with emergencies;

An emergency is a crisis in which any of the following are threatening:

1. Safety of Life
2. Integrity of property
3. Degradation of the environment

It is the responsibility of each stevedore to be familiar with the different levels of alerts and evacuation procedures as it relates to their particular terminal disaster preparedness procedures.

To assist with the orderly preparation during a hurricane, typhoon, cyclone or other severe weather conditions the stevedore should be aware of the various levels of alert and what is required at each level.

Based on the location of the port the threatening weather conditions may be different but all ports should have various disaster preparedness plans in place which outlines varying levels of danger along with the actions to be taken.

For example in most ports, there are three (3) main levels of alerts posted at the port entrance which are as follows;

1. Condition Green - between cyclone seasons, ‘routine readiness’ (November to April in some countries).
2. Condition Yellow - indicate intensifying risk of a cyclone, or associated weather storm. Specific action laid down must be taken to minimise the likely consequences and all safety precautions should be completed.
3. Condition Red - will be declared when a cyclone strike is imminent or the onset of extreme, peripheral weather conditions associated with a high intensity cyclone. This alert signals immediate evacuation of the port.

Possible Types of emergencies in a port;

1. Medical Emergency
2. Bomb threat/suspicious objects
3. Fire/ explosions
4. Human fatality/ serious injury/ serious assault/ sexual assault
5. Vessel collision/ capsizing/ sinking/ grounding/ shipwreck
6. Marine pollution of waters
7. Hostage/seige/ kidnap
8. Motor vehicle accident
9. Impact by equipment/ machinery
10. Toxic fumes/ spills/ leak/ contamination by hazardous materials
11. Outbreak of diseases (quarantine)
12. Natural disasters- cyclones, huriccanes, flooding, tsunamis (tidal waves), earth quakes etc.

**Use of personal protective equipment;**

Comply with rules regarding the use of personal protective equipment such as helmets, protective shoes, harness, reflective safety vest, goggles, etc.

**Correct lifting and handling techniques;**

Many accidents in cargo handling are caused by incorrect manual lifting.

The back bone was not made to lift, but to support the head. The most important thing to remember when lifting heavy objects is that the main lifting strain should be taken by the upper leg muscles and not the back.

Seven steps to safe lifting- base movement

1. Assess the load - can you lift it safely?
2. Place your feet at 'ten-to-two'
3. Bend your knees
4. Back-keep it straight and upright
5. Neck and head-keep your chin up
6. Grip-'front knee, high hand for corner' and 'back knee, low hand, near corner'
7. Load hold it in close to your waist

---

*Stevedores at work.*

Identify all persons in breach of the safety code (safety helmet, vests & safety boots)
Always remember!
Practicing good lifting techniques does not enable you to lift more than you could before. It means that, what ever your individual capabilities, your chances of injury are reduced.

**Safety education and training;**
Effective training is a key component of any health and safety programme.
Workers often experience work-related health problems and do not realise that the problems are related to their work, particularly when an occupational disease, eg; is in the early stages.
Besides the other more obvious benefits of training, such as skills development, hazard recognition etc, a comprehensive training program in each workplace will help to;
1. recognize early signs/symptoms of any potential occupational disease before they become permanent conditions.
2. Assess their work environment.
3. Insist that management make changes before hazardous condition can develop.

**2. Potential hazards**

**Fire;**
Before attempting to extinguish a fire you should ensure that the alarm is raised. A delay of few seconds may mean the difference between a minor and major fire.
When there is an alarm you give the fire team time to prepare while you are using an extinguisher.
A good way to rememeber what FIRE means are as follows;
F - IND - upon discovery move to an area of immediate safety.
I - NFORM - Raise the alarm.
R - ESTRINGCT - confine the fire to the area of origin, closing doors, hatches etc.
E - XTINGUISH - when and if safe to do so.
How does a fire work?
For a fire to occur it needs three elements; heat, fuel and oxygen - illustrated by the fire triangle.
**FIRE TRIANGLE**

If one of these elements is absent then a fire cannot occur. It is therefore important to ensure that they are kept separated.

**HEAT** - heat sources can be many and varied, but as long as there is sufficient heat to create ignition then the potential is present for a fire to occur.

**FUEL** - in relation to fires, fuel is anything of a combustible nature. So while many people tend to see fuel as substances such as petrol, diesel etc. Items such as wood, clothing, plastics and papers etc. are sources of fuel to a fire.

However, only gases and vapours burn. With solids and liquids it is necessary to change their state, most likely by raising the temperature, so that they produce flammable vapours.

**OXYGEN** - is normally produced in air at a ratio of approximately 21 percent by volume.

This is sufficient to support the process of combustion. We are limited as to the extent that we can control the amount of oxygen present.

It is important that we concentrate on keeping the fuel and heat sources separated.

**CHEMICAL REACTION** - in addition, to having the three sides of the fire triangle present there is also a requirement for a chemical reaction, known as oxidation, to occur.

This reaction may be likened to the corners of the triangle as it holds the sides together.

Additionally, this oxidising process will consume the oxygen in a confined space and replace it with toxic gases.

**Fire Extinguishing Principles;**

A fire can be extinguished by removing one or more elements of the fire triangle. This may be achieved by one or more of the following methods.

1. **Cooling** - This will remove the heat from fire. Water, having a high capacity to absorb the heat, is very effective when extinguishing a fire by this method.

2. **Smothering** - This will remove oxygen from the fire. There are two ways of achieving this;
a. Seal the surface of a flammable liquid to prevent the vapours from escaping and mixing with surrounding air. This can be achieved with the aid of a fire blanket or a layer of foam.

b. Lower the oxygen concentration to a level that is insufficient to support combustion. This may be achieved by sealing compartments or may involve using carbon dioxide.

3. Starvation - This method removes fuel from the fire. This course of action may be used to extinguish a fire resulting from a broken fuel line. By isolating the fuel with a control valve the fuel will be removed from the fire.

4. Disrupting the chemical reaction - by disturbing the chemical reaction you separate the sides of the triangle. This then allows you to extinguish the fire. Dry chemical powder achieves its effectiveness by acting upon a fire in this manner.

Classification of fires;

To assist in selecting the correct extinguishing agent fires are classified into groups according to the nature of the material that is burning;

Class A - Carbonaceous solids, e.g.; wood, paper, carpet, plastic and rubber.

Class B - Flammable liquids, e.g.; petrol, diesel, thinners and methylated spirits.

Class C - Flammable gases, e.g.; LPG, acetylene and methane.

Class D - Combustible metals, e.g.; magnesium, aluminium and sodium.

Class (E) - Fires involving live electrical equipment. This is not a class of fire on its own, but a sub-class. This is because electricity is not the material that is burning but may be the ignition source.

A fire involving insulated wiring is a class A fire with the presence of electricity. Where possible the electricity should be isolated and the fire fought as a normal A class fire. If this is not possible then apply a non-conductive extinguishing agent.

Class F - Cooking oil fires. These are separated from other flammable liquid fires due to the potential fire ball that can occur if water is used as extinguishing agent.

<table>
<thead>
<tr>
<th>Extinguisher type</th>
<th>Colour</th>
<th>Class of Fire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>Plain red</td>
<td>A</td>
</tr>
<tr>
<td>Foam</td>
<td>Red / Blue band (plain blue)</td>
<td>A, B, F</td>
</tr>
<tr>
<td>Dry Chemical powder</td>
<td>Red / White band</td>
<td>A, B, E, F</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>Red / Black band</td>
<td>B, F, E</td>
</tr>
</tbody>
</table>
3. Occupational, Health and Safety Requirements

Occupational health and safety (OHS) encompasses the social, mental and physical well being of workers, that is the 'whole person'.

Occupational health and safety is more than accident prevention. It includes all aspects of working conditions. 'A healthy work place is a safe work place'. The opposite may not be true. Health and safety issues must be addressed.

Work related accidents or diseases are very costly for workers and their families.

Some direct costs to workers are;
1. The pain and suffering of the injury or illness
2. The loss of income
3. The possible loss of a job
4. Health care costs

An effective occupational health and safety programme covers the following:
1. safe worksite environment and working condition
2. proper use of tools and equipment
3. safe handling of materials
4. safety of other personnel

4. Employee safety responsibilities

Worker should not remove, alter, displace or interfere with any safety device provided for their protection, or the protection of others, or interfere with a method or practice which has been adopted to avoid accident or injury.

Worker should report any defective equipment or any hazardous situation to a responsible person.

Workers should work in pairs so that they can support each other in the handling of equipment as well as to ensure that at all times someone is aware of the location an wellbeing of all stevedores working.

Employee should co-operate with supervisor to comply with the safe working practices for prevention of accident or bodily injuries to himself or others.

Employees day to day safety functions includes;
1. safe use of Personal Protective Equipment (PPE)
2. safe interactive work practices (duty of care)
3. following OHS rules and regulations
4. observing safety warnings and signs

5. Safety signs, signals and symbols

Safety signs play a practical role in preventing injury and ensuring staff are aware of the dangers and hazards awaiting them at a given point in the work place.

Without safety signs many employees would lack essential direction in times of crisis.

Without safety signs employees face a minefield of danger.

Safety Signals;
In order to facilitate the task of the crane operator some safety signals are depicted below for easy understanding and safe operation.
**LOWER**: With arm extended downward forefinger pointing down, move hand in Small horizontal circles

**UP EASY**: With arm vertical, repeatedly open and close the fingers and thumb touching finger tips and thumb tips when closed

**ALL CLEAR**: Arm extended over hard hat, palm down, move hand in a forward to backward motion, repeat 2-3 times.
**HOIST:** With arm vertical, forefinger pointing up, move hand in small horizontal circles.

**STOP:** Right arm across chest, then fully extended with palm down.

**DOWN EASY:** With arm extended downward, forefinger pointing down move hand in small slow horizontal circles. Place opposite hand palm up motionless under hand giving motion signal.
Safety Signs;
Some common safety signs that are found in ports.
Permission – green squares
Prohibition – red circle

Mandatory – blue circle
Fire information – red square

First aid / Safety equipment
Safety equipment information - green square

General safety information – blue square

Caution – yellow and black triangle
6. Workplace hazards

It is important that;
1. Workplace hazards are controlled-AT THE SOURCE, wherever possible.
2. Records of any exposure are maintained for many years.
3. Both worker and employers are informed about health and safety risks in the workplace.
4. There is an active and effective health and safety committee that includes both workers and management.
5. Workers health and safety efforts are ongoing.

Common health hazards include:
1. Dust
2. Gases
3. Noise
4. Vibration
5. Extreme temperatures

Potential workplace hazards:
1. overhead services e.g. telephone, power cables
2. underground services. e.g. gas, water, pipe lines
3. Identifies a range of hazards that occur in all areas of stevedoring relating to working safely with cargo handling activities
4. environmental influences e.g. lighting, noise, wind, temperatures etc.
5. uneven or unstable ground
6. buildings and structures
7. other personnel

**Relating to safety and injuries;**

Before persons are permitted to work in a ship’s hold or other cargo space which had been previously fumigated, a qualified person should certify that the hold or space is safe to enter.

Before persons are allowed to enter into any enclosed spaces, tank, etc., in which fermentation of organic material or rusting may have resulted in a deficiency of oxygen or presence of toxic gases, such space should be tested by suitable means, such as gas detector, to check whether the atmosphere is safe.

Where stevedores are exposed to dangerous or irritating concentrations of dust, fumes etc., suitable respiratory protective equipment and eye shields should be provided and worn.

![Image](image-url)
7. General safety rules

Read and observe all safety signs and posters.

When a job or shift is completed, ensure that all gears/tools are stored in the proper place. Always leave your work area clean and free from debris.

All entrances, exits, aisles, road and access ways must be kept clear at all times.

All visitors must remain in the areas designated.

Vehicles that are not involved in port operations should not be found in the working area at any time.

All rules for working onboard ships and docks must be observed at all times.

All holds on vessels and interior of containers or any enclosed area must be checked prior to undertaking any handling operation.

All equipment for fire fighting and rescue from water must be functional and in place.

Signs must be erected where there are:

1. Open holes or excavation and cordoned off
2. Men working overhead or below
3. Loads suspended or passing overhead
4. Toxic or harmful substances being handled or stored

Warning lights must be utilized at night if lighting is not otherwise sufficient.

No one is to enter a restricted area unless so authorized by a supervisor.

Contractor personnel are required to conform to all Safety Rules and Regulations.

All cargo must be properly stored or stacked ensuring that it will not fall causing damage and injury to persons.

All flammable or toxic material must be stored in appropriate places bearing in mind: each one's reaction to others, heat, types of containers etc and as per IMDG Code.

Proper safety clothing and equipment must be used when handling toxic materials.
Mixed twist-locks is a source of danger – unsafe working practice

Automatic twist lock - Please, properly maintain me for your own safety maintenance ship responsiblity
8. Safety Procedures for Ship and Port Equipment

Shipboard crane operations;

Ship Crane as the name implies are affixed to vessels. Shore Cranes on the other hand are operated from the dock.

Safety procedures must be followed while operating the shipboard equipment.
Upon confirmation of fitness certificate by the supervisor the crane operator on entering the cab check all safety features.

Upon concluding the checks any abnormality or defects should be reported to supervisor.

Normal checks would include; S.W.L , brake systems, swinging motions, lowering and hoisting of cables, emergency close down switch and visibility.

Discharging and loading principles, same as Winch Operators.

Be familiar with all stevedoring operations and be capable of rigging derricks and other deck gear for the proper hoisting or moving of cargo.

Before commencing to hoist cargo, in conjunction with the Foreman or Ship's Officer in charge, ensure that the derrick topping lifts and derrick guides are properly secured.

Ensure that the space from the hatch coamings to the vessel's side is clear for working cargo and that the hatch beams, strong backs, fore and aft and hatch covers are stowed on deck or apron in a safe, orderly manner.

Inspect generally, as far as possible, all running gears for any defect or unsafe working condition.

Ensure that the cargo is properly slung before being hoisted, and shall control the movements of sling loads by positive signals to the winch drivers / crane operators when the load is out of sight.

Keep the sling load in sight and working area cleared of people.

Be familiar with the location of the First Aid Room.

**Ship to shore gantry crane operating procedures;**

The operator should use stairs or lift to enter his cab, which is built on the main frame of the cranes structure, unless other new accommodations are affixed or in case of damage to said stair rails, or in the case of emergencies.
On entering the cab the crane operator checks his seating, visibility, Gantry movements, hoisting/lowering, trolley movements, light controls, braking system, spreader movement, twist lock probes, warning bell.

The Gantry Crane Operator on completing his safety checks as recommended by manufacturers will place onboard lashers that performing height duties, ie working on containers stacked two high upwards.

Holders (lashers) unlock bridge fittings and twist locks/stack cones, crane operator then attach spreader into container sockets. Height holders ensure that twist locks or any other device are placed in cage or cargo baskets etc.

Ship holders or lashers proceed to remove lash bars/ change by method of twisting and rolling bars out of container sockets of the lower tiers.

The turn buckle is opened and lowered into the deck. By simultaneous removal of bar/buckle, prevention is taken that the bar does not fall or buckle is not dropped, resulting in damage or injury to either personnel or equipment.

Crane operator should not lift a container above the heads of the holders/lashers working below.

When removing a container from the vessel the Shore Gantry Crane Operator should be in radio contact, which will enable him to take instructions for safe delivery of said container on to the dock or to the trailer.

When not being in radio contact, he must follow signals from the signalman.

On landing the probes of the spreader into the corner castings of the container, the Gantry Crane Operator will see the "on container light" lit up in his cab. He will then engage the twist locks to turn the probes and lock securely onto the container. The over-ride feature will only be activated on instructions from the Engineering Department if the operator encounters a problem.

The gantry crane operator then slowly lifts the container to clear the twist locks on which it rests as there may be instances where twist locks are not properly opened. After clearing the twist locks the gantry crane operator increases the speed of the lifting and trolleying action smoothly ensuring that there is no swinging, jerking, or surging of the containers during these motions.

On clearing the vessel the Gantry Crane Operator brings the container between the legs of the shore crane and lowers his runner cables, and place the container either into a chassis/apron/back reach safely.

The dock and deck signalman plays an important part in the entire operation.

The reverse of these procedures will be applicable when loading of vessel takes place, excluding of course the removal of bridge fitting" lash bars, turn buckles etc.
These lashing devices would now be applied and locked after the container has been landed on the respective decks of the vessel on instructions from the supervisor who ensures that each container is properly secured to the vessel.

The Crane Operator should always ensure that all four twist locks are properly secured before lifting either containers or hatch covers from the vessel or from the dock. Critical to this is ensuring that all initial lifting action is done slowly and gently.

**Broken king pin – unsafe to carry loads, please fix me, don’t abuse me**

**Mobile Shore crane operations**;

Before starting operations all safety features of shore crane equipment such as Crawler, Rubber wheels, Slew Crane Operators etc, must be checked and in good working condition.

Positioning of cranes at bays, hatches, openings of ship's hold must be precisely done to prevent unnecessary movement of said crane with cargo.

The Crane Operator must obey all signals from his signalman.

Discharging and loading principles, same as Winch Operator.

**9. Safety procedures for shoreside support or back up equipment**

These include tow trucks, forklifts, Karri-lifts, straddle carriers, reach stackers, tractor trailers, chassis flatbeds and trailer trains.

Make yourself familiar with construction and safe operating procedures.

When getting in or out of machine be cautious and careful.

When leaving a cab in a designated parking area always remember to switch on the parking brakes.

Don't let outsiders handle the equipment entrusted to you. It is the responsibility of the operator to take care that the equipment does not cause damage to people or property.

Always wear the mandated safety gear and follow the documented safety requirements.
Keep the equipment clean, particularly the controls and regulating devices.

Before starting, look to front and rear to make sure no one is in your way. Avoid abrupt stopping and starting.

Stop the engine whenever you leave the equipment even for a short moment. If the equipment is laden, let the load down.

Ensure that machine is not operated in poorly lit area or areas without light.

Always observe safe distance from vehicles driving in front. Never drive side by side other vehicles.

Pay attention to signs indicating maximum height of your equipment before entering places where the headroom is limited.

Obey all traffic rules, signs and safety of other people.

Before selecting opposite direction of travel, bring the carrier to a complete halt.

Straddle carriers should always be driven with the cab in front ("cab forward") over extended or long distances.

Report all collisions and resulting damage in detail. This might prevent similar accident in future.

Remember that equipment is not intended for carrying passengers.

Do not use a bare flame to examine fuel tank or battery levels.

Know the capacity of the equipment, the total weight, if carrying a load.

Beware of driveway edges causing danger of sliding or failing.

In puzzling situations remember to keep calm. Think twice or ask for clarification before you act.
Tow trucks must be properly aligned and wheels/tyres must be threaded and inflated to their prescribed weight, brake systems must be working. Horns should be working as well.

Tractor/Trailers must be serviced for engine oil, gas oil, water tyre pressures, hydraulic fluids etc.

View mirrors must be in place, and adjusted properly by operator prior operation or driving, reflecting lights must be working, especially for night operations. Braking system must be checked before reporting to prescribed operations.

All Chassis/Flatbeds should be fitted with either rail guards or twist locks to prevent container from sliding.

Fork lifts should be tested every six (6) months by a competent authority and a certificate fitness issued.

Fork Lifts should be fitted with a sturdy overhead canopy of sufficient strength to protect the operator from object failing from above.

Fork lifts should be fitted with fire extinguishers and should be checked periodically.

Fork Lifts should be clearly marked with safe working load as determined by the tests.

Any trapping points between fork arm mechanism and other moving parts should be suitably guarded.

The tyre pressure should be clearly marked on the chassis of the vehicles and check daily.

All fork lifts operators should undergo medical tests periodically.

Before the operator begins to use his vehicle he should satisfy himself that it is in a safe working condition.

Operators obviously under influence of drugs or alchohols should not be allowed to operate the equipment. Smoking must not be allowed inside the vehicle at any time.

When the load obscures the forward vision of the operator, he should drive the vehicle in reverse.

No person should be allowed to pass or stand under elevated load or forks of the vehicle.

It is advisable that no operator works for more than sixteen (16) hours per day with adequate rest periods in between.

10. Accident Reporting

A clearly documented Accident Reporting Procedure outlining the process and the chain of reporting should be available.

All accidents, however minor, whether or not there is visible injury to the person, must be reported immediately to the supervisor.

Supervisor will make arrangements for medical treatment.

Supervisor completes Accident Report Forms.
Supervisor submits accident report forms to port management as prescribed in Accident Procedures. All accidents must be investigated thoroughly for:

1. Compilation of Data / Statistics
2. Examinations and identification of the causative factors
3. Implementing corrective and preventive measures
4. Assessment of damage or loss

An accident investigation team must be appointed with competent personnel.

If an accident takes place on board a vessel, it must be immediately reported to vessel command and a report obtained from the Captain or the Chief Officer prior to sailing of the vessel.

The manager or supervisor in charge of operations on that vessel or the Investigating team should visit the scene and begin investigations immediately. A report should be prepared and submitted within 24 hours.

Pictures of the accident site must be taken showing the relevant issues and items which contributed or caused the accident. If possible the accident site and all evidence must be preserved for further examination.
11. Handling of Dangerous Goods

Special care must be taken in the handling of dangerous goods, giving due consideration to the type of packing, the nature of the goods and the hazards associated with them.

Workers should familiarize themselves with the internationally agreed labelling scheme for dangerous goods so as to be able to recognize the hazards associated with dangerous goods of various types.

The port should have in place a team of personnel with the necessary training and equipment to respond appropriate to spillages which occur during operations. For classes of IMDG out of the scope of the port’s hazardous materials (hazmat) team response capabilities the necessary alliances with organizations with this capability should be forged and in place.

In the event of spillage or damage to a package of dangerous goods, the officer in charge of the vessel and the terminal manager in charge of operations of the vessel must immediately be informed.

Unusual smells or any effect of dizziness or illness suffered by any person should immediately be reported to the manager in charge of operations and the vessel officer in charge.

If spillage occurs or a package or receptacle is sufficiently damaged or defective that leakage or spillage of the dangerous goods is likely, the person in charge should cease cargo operation in the vicinity and all persons leave the immediate area, until further advised.
Anyone exposed should be immediately taken to the first aid station for assessment and further action if necessary.

No one should smoke, carry naked light or equipment to make fire at dangerous goods store and when handling dangerous goods.

**International Maritime Dangerous Goods (IMDG) Code;**

The objective of the IMDG Code is to:

1. Enhance the safe transport of dangerous goods
2. Protect the marine environment
3. Facilitate the free unrestricted movement of dangerous goods

The International Maritime Organisation (IMO) has developed two international conventions to address these issues.

1. The SOLAS Convention (covering safety of life at sea)
2. The MARPOL Convention (covering pollution prevention)

To supplement the principles laid down in the SOLAS and MARPOL Conventions, the IMO developed the International Maritime Dangerous Goods Code (IMDG)

IMDG Code contains detailed technical specification to enable dangerous goods to be transported safely by sea.

The IMDG Code is based on an internationally agreed system which;

1. Group dangerous goods together based on the hazards they present in transport (classified into 9 hazard classes).
2. Prescribe the appropriate packaging and handling requirements in terms of containers, tanks and other packaging materials stipulating the appropriate strength needed to prevent the goods from escaping.
3. Using hazards warning labels and other identifying marks to identify dangerous good in transport.
4. Lays down principles for ensuring that dangerous goods which will react dangerously together are kept apart.
5. Lays down principles for where to place dangerous goods onboard ship to ensure safe transport.
6. Provides emergency response advice for dangerous goods involved in a fire or spillage onboard ship.

It is important that;

The IMDG Code classifies dangerous goods into 9 hazard classes:

- Class 1 - Explosives
- Class 2 - Gases
- Class 3 - Flammable liquids
- Class 4 - Flammable solids
- Class 5 - Oxidising substances and organic peroxides
Class 6 - Toxic and infectious substances
Class 7 - Radioactive material
Class 8 - Corrosive substances
Class 9 - Miscellaneous dangerous substances and articles
**Unit summary**

In this unit you learned the occupational health and safety procedures that must be followed during stevedore operations. You have understood that occupational health and safety is more than accident prevention. It includes all working conditions relating to;

- the importance of procedures and policies relating to workplace safety
- potential hazards
- occupational, health and safety requirements
- employee safety responsibilities
- safety signs, symbols and signals
- general safety rules
- safety procedures for ship and port equipment
- understanding of IMDG Code (dangerous goods) as a cargo handler
- accident reporting

*A HEALTHY WORK PLACE IS A SAFE WORK PLACE*
Assignment

1. Explain the importance of company’s safety policies and procedures?
2. Explain two implications of not following the health and safety procedures?
3. As a stevedore, name two main tools or devices with which you are familiar and explain how you use them safely in your day to day work.
4. Assume you are a stevedore supervisor and you have a new employee, name two main tools or equipment or devices that he/she is expected to use and explain two incorrect safety procedures and consequences
5. a. Select any three safety signs listed below and explain the importance and use of each sign.

   ![Safety Signs]

   b. Explain the consequences of not following each sign selected.
6. Scenario - You are at the port on duty, half an hour away from lunch break, suddenly, the emergency alarm goes off, the supervisor shouts ‘bomb threat’. In panic, some stevedores run on to the ship, some jumped overboard.
   a. Explain the important safety steps in responding to this situation?
7. Scenario - You are onboard of a vessel, as a lasher (stevedore). The ship to shore crane operator, while attempting to lift a container with IMDG class 7 (radio active) contents when, accidentally, one of the twist locks broke loose from the spreader and the container fell into bay no.7 and broke open and created a major safety and health hazard.
   Explain the safety steps taken in dealing with this situation?
8. How many IMDG hazard classes are there and name any three?
Assessment

1. (a) Describe how you would carry out three main functions of your day to day duties safely?
   (b) Explain the consequences of not following the established procedures?

2. Scenario - You are in the port working next to the cargo shed, suddenly, you heard an explosion which is followed by a massive blaze and heavy black smokes coming from the entire shed. The fire is spreading rapidly, and you are the closest stevedore to the scene of fire.
   a. Explain what immediate steps you would take?
   b. Explain three important steps for the correct use of a fire extinguisher?

3. Scenario - You are an appointed stevedore foreman and a new employee just arrived for duty. Describe the safety procedures you need to follow in working as;
   a. Shore crane operator
   b. Ship's derrick operator
   c. Forklift operator
   d. Tracktor trailor operator
   e. Lasher
   f. Signalman

4. You are assigned to strip (destuff) a container with dangerous goods placards affixed with class 6 (skull and bone)-toxic and with class 8 (Spilling acid)-corrosive. Explain the safety steps you would follow in destuffing the container?

5. Based on the sketch showing hand signals, select any three of the hand signals and explain?
If this unit is delivered face to face the following group activities can be used:

6. Group Activity - As a group, one of the stevedore will act as a signalman and demonstrate three main hand signal given to the crane operator in lifting a container.

7. Group Activity - You are given different types of gears such as twist locks, hooks, and slings. You are required to explain the safe use of each of these in lifting loads.

Assessment Methods

The candidate will be required to:

Answer questions put by the assessors - Oral Assessment

Written tests / case studies / projects and required to answer the questions posed by the examiner.

Present evidence of credit for any off-job training related to this unit

Written statements from persons (e.g. current and/or previous employer, colleague, peer, manager, external customers) confirming competence of the learner

References, Web Resources and Resource Files

Links to Useful Resources:
Cargo Handling Operation

Introduction

Cargo (or freight) is goods or produce transported generally for commercial gain by ships, aircraft, train or truck. Our main focus in this unit will be on cargo transported by ship.

The transportation of cargo by ships is not as straightforward as it may seem at first glance.

Before cargo is actually transported by a ship from one port to another, many things must first be in place. First, the correct documents must be filled out and second, the right planning must be done before the ship arrives with the cargo.

When the ship does arrive with the cargo, certain procedures must be followed by the stevedores at the port in order to ensure a safe off-loading operation.

Similar requirements must be met for the loading of cargo onto vessels.


http://www.mornarine.com/web/m&o_charts_department_imo_signs_and_posters.htm


http://www.tpub.com/content/engine/14081/css/14081_319.htm


http://www.mega.gov.uk/c4mca/mega07-home/shipsandcargoes/mega-cargosafety/dangerousgoods.htm

These we shall elaborate on as we go deeper into this unit.

Suffice it to say at this time, though that in general, much of the cargo carriage requirements today are a result of International Codes which have been adopted by the International Maritime Organization (IMO). The safe packing and handling of cargo is a major part of most industrial processes and historically, due to the nature of the work, this has often proved to be hazardous. Most accidents and incidents involving cargo are caused by human error for example loads not being secured properly, incorrect slinging techniques, leaving loose items such as tools on top of loads, mixing hazardous cargos together and not having the proper labeling, to mention but a few.

It is therefore not by chance but rather by deliberate design that you will learn about the Codes dealing with various types of cargoes including dangerous goods in packaged form. These Codes become mandatory after they have been incorporated into the National Legislation or Regulations.

However, cargo handling operations, as usually referred to in the maritime industry, is one of the core activities in the stevedoring and transport/logistics chain of every port. It has four vital components that have been subdivided into following components for the purpose of this study as here reflected below.

- Types of Cargo
- Documentation involved in Maritime cargo transport
- Pre-Arrival Planning
- Loading and Off-loading Operations

These areas will be dealt with in the subsections which follow in the exact sequence in which they are cited above.

Upon completion of this unit you will be able to
### Outcomes

- *identify* types of cargo that are carried during maritime transport.
- *demonstrate* appropriate methods of handling dangerous (IMDG) cargo.
- *identify* the major documents used in cargo operations.
- *describe* the purpose of major documents used in cargo handling operations.
- *state* the major steps involved in pre-arrival planning.
- *explain* the communication process prior to the arrival of the vessels.
- *explain* different types of cargo handling operations.
- *identify* major international hand signals used in cargo handling operations.
- *identify* steps in securing cargo onboard vessels.
- *identify* major causes of damage in cargo handling operations.

### Terminology

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notice of Readiness (NOR):</td>
<td>A notice presented by the ship to the port stating that the ship is ready to begin loading/discharging operations.</td>
</tr>
<tr>
<td>Length Overall (LOA):</td>
<td>The extreme length of a ship measured from the foremost point to the aftermost point.</td>
</tr>
<tr>
<td>Safe Working Load (SWL):</td>
<td>The maximum load that a piece of equipment can safely lift, store or transport without the risk of deformation, compromise or fracture to the equipment and which should not be exceeded.</td>
</tr>
<tr>
<td>Deckhead</td>
<td>The underside of a deck in a ship. It bears the same relationship to a compartment on the deck below as does the ceiling to the room of a house.</td>
</tr>
<tr>
<td>Deck</td>
<td>A level surface that runs from one side of a ship to the other, forming a floor.</td>
</tr>
<tr>
<td>Twenty Foot Equivalent Unit (TEU):</td>
<td>A term used to describe a 20 feet long container which is the standard unit of measurement.</td>
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</tbody>
</table>
1. Types of Cargo

There is a wide range of cargoes transported by ships and handled at seaports or river ports throughout the world. The primary types are as follows:

- **Break bulk (General) cargo** - cargo which is typically packaged for shipping (in boxes, barrels, or bags) and stacked either loosely or on wooden pallets and lifted into and out of the hold of a vessel by cranes on the dock or aboard the ship itself.

- **Bulk Cargoes** - homogenous commodities that are not packaged. They are neither on pallets nor in containers and are not handled as individual pieces. Bulk shipments of salt, oil, tallow, scrap metal, alumina, grain, gypsum, logs and wood chips, for instance, fall into this category.

- **Containerized cargo** - cargo stored in/on standard sized units of reusable metal containers specifically designed for consolidating smaller packages of items (e.g., packages of toys, shoes, machinery components) or for holding large single pieces of cargo (e.g., heavy machinery or equipment). Containerized cargo, it is to be noted, may also be refrigerated commodities (such as frozen meats, cheese, ice cream, to name a few). In the case of refrigerated commodities, specialized containers, called refrigerated or reefer units, are utilized.

- **Roll-on / Roll-off cargo** – rolling stock cargo which does not require cranes to be loaded or off-loaded but is driven on and off the ships' decks (adapted from Business Dictionary.com)

The above categories of cargo will be further elaborated on in the sections which follow.

**General Cargo**

**a. Break-Bulk (General) Cargo**

Cargo that can be loaded in general, non-specialised storage areas or standard shipping receptacles, e.g., boxes, barrels, crates, packages, bundles and pallets is referred to as general or break bulk cargo. (Dictionary of Military and Associated Terms, US Department of Defence, 2005).

As explained earlier, general cargo is another name for break-bulk cargo - as you will see in the definition below - adapted from Wikipedia, the free encyclopaedia.

Break bulk cargo or general cargo is a term used in shipping to cover a great variety of goods that must be loaded individually, and not in intermodal containers nor in bulk as with oil or grain. Ships that carry this sort of cargo are often called general cargo ships and all conventional vessels. The term break bulk derives from the phrase breaking bulk — the extraction of a portion of the cargo of a ship at the beginning of the unloading process from the ship's holds. These goods may be in
containers (bags, boxes, crates, drums, barrels) or they may be secured to a pallet or skid as loads of items. It should be noted that this mode of transporting cargo is declining as containers provides a more efficient means of transporting this type of cargo. However not all types of cargo can be containerized and some small ports does not have the resources to invest in the infrastructure and equipment necessary to efficiently handle containerized cargo. The photograph below depicts a break bulk operation in progress.

![Image of break bulk operation](image)

Stevedores on a New York dock loading barrels of corn syrup onto a barge on the. Photograph by Lewis Hine, ca. 1912 (An example of a break bulk operation).

b. Bulk Cargo

Unlike break-bulk cargo, bulk cargo is cargo that is in a loose unpackaged form and has homogeneous characteristics (meaning that the cargo is the same throughout, e.g. a cargo of bulk oil or bulk wheat). Bulk cargo is without mark and cannot be counted as with individual packages.

According to Wikipedia, it is commodity cargo that is transported unpackaged in large quantities and shipped loose in the hold of a ship.

Bulk cargos are usually dropped or poured, with a spout or shovel bucket, as a liquid (e.g. molasses, soya oil) or as a mass of relatively small solids (e.g. grain, coal), into a bulk carrier ship's hold, railroad car, or tanker truck/trailer/semi-trailer body. Bulk cargos are classified as dry or liquid.

![Image of dry bulk operation](image)

The picture below is an example of a dry bulk operation
This heap of iron ore pellets will be used in steel production. (Photo courtesy Wikipedia)

Iron ore is one example of dry bulk cargo. Additional examples of dry bulk cargos include:

- coal
- grain (wheat, maize, rice, barley, oats, rye, sorghum, soybeans, etc.)
- iron (ferrous & non-ferrous ores, ferroalloys, pig iron, scrap metal, pelletized taconite), etc.)
- bauxite
- wood chips
- cement
- chemicals (fertilizer, plastic granules & pellets, resin powder, synthetic fiber, etc.)
- dry edibles (for animals or humans: alfalfa pellets, citrus pellets, livestock feed, flour, peanuts, raw or refined sugar, seeds, starches, etc.)
- bulk minerals (sand & gravel, copper, limestone, salt, etc.)

An example of a liquid bulk operation is indicated below. The port of operation is the Penny Newman, Stockton Terminal. At that terminal, molasses and other liquid feed components are unloaded from ships and stored in tanks located within the terminal’s compound.

Liquid bulk cargos ("wet" trades)
Other examples of liquid bulk cargo include:
- petroleum
- liquefied natural gas (LNG)
- gasoline
- chemicals.
- liquid edibles (vegetable oil, cooking oil, fruit juices, etc.)

c. Containerised Cargo

Containerised cargo is cargo stored in metal containers that are used over and over again in the transportation of cargo.

Containers are the largest and fastest growing cargo category in most parts of the world. Containerized cargo includes everything from auto parts and machinery components to shoes, toys, and frozen meat and seafood. Containers are standardized units of varying lengths although the standard sizes are 20ft, 40ft and 45ft and these are transported primarily by specialized container vessels.

There are also various types of containers used for the carriage of goods. Among these, dry vans hi-cubes, reefers and flat rack with the majority of them conforming to ISO standard sizes and configuration.

The standard sizes most commonly used are twenty and forty foot containers with the forty-five foot units being used mostly in Asia and the United States.

There are also open top containers used for stowing cargo with awkward shapes which extends above the standard height of the container, and flat racks commonly used for carrying heavy machinery, steel, lumber and similar types of cargo that cannot fit in the standard container.
In addition, there are also ventilated containers used for the carriage of goods that are not to be exposed to excessive heat.

Finally, the refrigerated container commonly referred to in the maritime doctrine as reefer containers are used for the carriage of perishable.

http://en.wikipedia.org/wiki/Cargo

**Container Vessel**

![Container Vessel](image)

**d. Roll – on / Roll off (Ro-Ro) Cargo**

This is the rolling stock cargo which does not require cranes to be loaded or off-loaded but is driven on and off the ships’ decks. Examples are heavy machinery type of cargo such as vehicles, tractors, trucks or any type of wheeled oversized cargo. This type of goods can be driven on and or off the Ro-Ro (Roll-on Roll-off) vessels.

http://en.wikipedia.org/wiki/RORO

Roll-on / Roll-off, or RO-RO for short, is a method by which a cargo units attached to chassis are hooked up by a semi-trailer and driven onto or off a vessel. Motor vehicles are also a major part of ro-ro traffic.

RO-RO cargo is carried on specially designed ships. These ships are characterised by bow, stern, or side ramps for providing access to the vessel and the wheeled units or motor vehicles are located at various decks levels on the ship.

**RO-RO Hazards**

1. The watertight integrity of RO-RO ships is vital. These ships have long decks which can get quickly filled with water and reduce stability. Bow, stern, and side shell doors should be maintained in an efficient condition at all times.

2. The gradient of the ship to shore ramp should be as small as possible. If the ramp is too steep, the towing unit can become uncoupled from the trailer that it is pulling. In addition, the vehicle and its load may hit obstructions above such as deckhead or become grounded on the ramp or deck when it negotiates a change in gradient.

3. Vehicle movements and exhaust create hazard to personnel. It is important that the space is adequately ventilated and people working in the area should wear helmets and high visibility clothing.

**Ro-Ro (Roll-on Roll-off) Vessels**
RORO vessels have built-in ramps which allow the cargo to be efficiently "rolled on" and "rolled off" the vessel when in port. While smaller ferries that operate across rivers and other short distances still often have built-in ramps, the term RORO is generally reserved for larger ocean-going vessels. The ramps and doors may be stern-only, or bow and stern for quick loading.

e. Refrigerated Cargo

Refrigerated cargo is the temperature-sensitive cargo that requires temperature controlled transportation. Examples of this type of cargo include meat, fruits, vegetables, dairy products and other foodstuffs.

In broad terms refrigerated cargoes fall into three major categories.

1. Frozen cargo.
2. Chilled cargo
3. Temperature regulated cargo (Cool cargo)

Frozen cargo is carried in the hard frozen condition which means that a temperature of at least -20 deg. C must be attainable if the full range of frozen cargoes is to be transported. Most frozen commodities are carried at a temperature below -7 deg C when no micro-organism growth is possible.

Chilled cargo is commodities where the outside has been frozen hard but the inside remains unfrozen. It is claimed that chilled meat textures and tastes are better than those for frozen meat. The carriage of chilled cargo
requires some considerable care due to the fact that the temperature range at which it is carried is normally very small, i.e. -2 deg C to -3 deg C.

Temperature regulated cargoes are those which are carried at a temperature which restricts processes such as ripening. Particular commodities require different temperatures so that goods such as apples can be carried as low as 1deg whilst citrus fruits such as grapefruits or lemons are carried at 10 deg C to 12 deg C.

**Transport of Refrigerated Cargo**

Refrigerated cargo is transported by sea via two main methods.

- Loose or unitised refrigerated cargo transported aboard custom built reefer ships or traditional type general cargo vessels which have a limited reefer capacity.

- Containerised refrigerated cargo transport aboard container vessels which have fully or partial refrigerated capacity.

**Carriage aboard reefer vessels:**

The cargo temperature is usually controlled by a forced draft cold air ventilation system. In a centralised system brine is pumped from the refrigeration plant to one or more small cooler rooms in each deck where the brine passes through a series of coils. Air is then blown over the coils and carried through ducting to each of the chambers served by that cooler room. The refrigerated chambers normally have temperature monitoring devices which automatically actuates or stops the cooler room fans, thus maintaining the desired carrying temperature. Decentralised systems have small refrigerating units in each of the cooler rooms but the cold air temperature control system remains similar.

**Carriage aboard Container Vessel:**

The carriage of refrigeration cargoes in containers falls into two broad categories, namely ship dependent containers and independent containers.

Ship dependent containers are the most common and they are of two distinct types. One type of container is merely an insulated box with inlet and outlet holes where the ships forced draft cold air system is plugged into the container.

The other type of dependent container is basically an insulated container with its own refrigeration plant which requires the ships electrical power to operate the plant.

Observe a cargo operation involving different types of cargo if possible.
2. Cargo Documentation

Documentation is important in international trade. It is the means by which instructions are communicated during the trade transactions; it conveys important safety warnings and it ensures that records are maintained throughout the process. The main documents used in maritime transport will be described hereunder.

a. Bill Of Lading

A bill of Lading is a shipping document that serves the following three purposes:

a. receipt of goods
b. evidence of a contract
c. the original bill of lading only serves as a document of title

A bill of lading is a type of document that is used to acknowledge the receipt of a shipment of goods. A transportation company or carrier issues this document to a shipper. In addition to acknowledging the receipt of goods, a bill of lading indicates the particular vessel on which the goods have been placed, their intended destination, and the terms for transporting the shipment to its final destination. It is a document that identifies their rightful owner of a package, goods, or consignment. (http://www.wisegeek.com/what-is-a-bill-of-lading.htm)
b. Notice of Readiness

The Notice of readiness is a document submitted by the ship to the discharge or loading port port attesting to the fact that the vessel is ready in all respects for cargo operations to commence. Whilst the owners are also usually required to serve various approximate and definite notices of expected arrival at load or discharge port to enable the charterers to make all necessary arrangement in time, the notice of readiness constitutes the contractual step which is required to trigger the commencement of laytime. Due to this, charterparties usually contain provisions which
stipulate a) when notice of readiness may be contractually served and b) when laytime commences once notice of readiness has been validly served (often a set period after tender of the notice of readiness, although commencement of laytime may be further suspended to make allowance for weekend and other periods when the port is not operative).

Requirements for a valid notice of readiness to be served:

1. The vessel is an arrived vessel
2. The vessel is ready to receive or discharge the cargo
3. The notice of readiness is tendered to and received by the proper person according to the charterparty
4. The notice of readiness is tendered in a contractual way
5. The notice of readiness is tendered at a time that is allowed by the charterparty.

Laytime

“Laytime” is the term used to refer to the time allowed to the charterers to load/discharge cargo in return for payment of freight to the owners. If the charterers are unable to load/discharge cargo within this allowed period, they will be obliged to pay demurrage (liquidated damages for break of contract) or detention (unliquidated damages for breach of contract) to compensate the owners for their loss of use of the vessel. Naturally, most charterparties contain provisions which suspend the running of laytime and/or demurrage in certain circumstances as may have been agreed between the parties. In addition, neither laytime nor demurrage will run if the loss of time is due to a breach on the owners’ part.

c. Stowage Plan

A cargo stowage plan is a diagram of a ship’s cargo space that shows the location in the ship (on and below deck) of all the cargo aboard. The stowage plan shows accurately the location of cargo by hatches. It also shows the cargo for each port en route, the location of heavy lifts, the capacity and location of ship’s booms, remarks on special items of cargo (location and quantity of mail, classified cargo, protected cargo, and so forth).

(http://www.tpub.com/content/administration/14242/css/14242_237.htm)

In the case of specialized container vessels it is a profile or outline of the bays on the container ship which shows the specific location of each individual container. The nomenclature of container ships conform to ISO standards so that there is consistency and stevedores can readily identify where a container is located by the given slot position (on deck, below deck to the port side or starboard side).
Container Stowage Plan

Position on board: 250182
d. Dangerous Cargo Manifest

Anyone who ships hazardous materials on a vessel or barge must prepare a Dangerous Cargo Manifest (DCM). On a vessel, the DCM must be kept in a designated holder on or near the bridge, in the possession of the captain or master. On a barge, the DCM must be kept in a readily-accessible location on the barge. It may be in a marked, tube-like container. It should be in the possession of the captain or master. A DCM on a vessel or barge alerts you to the presence of hazardous materials on board, and their identities.

![DCM Example](image)

e. Cargo Manifest

Document that provides full information about all cargo on board of a Ship /aircraft. It contains the number of the corresponding Bill of Lading, weight and number of parcels, description of the contents and nature of the parcels. (http://www.logcluster.org/acronyms/cargo-manifest)
f. Time Sheets

The time sheet is a document that shows the number of days (laydays) the ship remained at the port doing discharge/load operations.

For the calculation of the number of laydays it is necessary to draw up a time sheet, showing the following information:

1. Date and hour of arrival in the roads or in the port.
2. Date and hour of arrival in the loading or discharging place.
3. Date and hour on which the ship is ready in all respects to start loading or discharging, as stated in the "notice of readiness".
4. Date and hour on which the "notice of readiness" was tendered.
5. Date and hour on which the "notice of readiness" was accepted by Charterers, receivers or their agents.
6. Date and hour on which the loading/discharging really started and on which days and hours loading/discharging took place.
7. Date and hour on which, according to the charter, the laydays started.

8. Loading and discharging speed according to charter party.

9. Statement of days, which could not be worked, e.g. Sundays and holidays, strike, weather conditions (if weather working days have been agreed) etc.

10. Statement of quantity loaded or discharged per day and of the total quantity loaded or discharged.

11. Statement of the time allowed for loading and discharging, based on points 8 and 10 above in accordance with the provisions of the charter party.

12. Date and hour on which the loading/discharging was terminated.

On the basis of this "time sheet", which must be signed by the master and the shippers/receivers, the number of laydays is determined and "demurrage/despatch money" is calculated, if the permitted period is exceeded, respectively if the ship was loaded or discharged within the allowed period and according to the charter party for the gained time despatch money is due.

It is important, that in the loading and discharging port an agreement is reached between the Charterers, receivers and the master concerning the calculated demurrage or despatch money.

If it would appear that this is not possible, then the master can sign the time sheet under protest and at the same time point out the differences of opinion. In case the master is not convinced, that the "time sheet" reflects the correct position, then he can sign the time sheet with the reserve "subject to Owners' approval", and leave it to the owner to come back on the contents of the time sheet (eventually with his lawyer).

g. Statement of Fact

At the end of the stay of the ship in the port the agent will make up the history with all data which are important for the Ship Owner and for the Charterer and that are related to the loading and the discharging of the ship. This historical statement is called the "statement of facts" or "port log" and serves as basis for the drawing up of the "time sheet" used for the calculation of the laytime and demurrage and possibly despatch money. The officer on board must record all information relating to the loading or discharging (working hours, interruptions of loading and/or discharging) in the ship's log book or in a special workbook.

h. Record of Delay

In the liner trade there is no agreement regarding lay time as no contract exists between an individual shipper and charterer but between a shipping line and a port operator airport authority. During operations the stevedores will keep a record of delay which will document the activities at each hatch or crane particularly the occurrences which result in a delay in the operations. This document is used to apportion costs, which may be incurred to either the port or the shipping line based on the contractual agreement in place. This document is also used by the terminal to calculate their productivity and to identify any area of weakness which if corrected could result in the increased productivity of the port.
i. Port Delivery Order

A delivery Order is a document from a consignor, a shipper, or an owner of freight which orders the release of the transportation of cargo to another party. Usually the written order permits the direct delivery of goods to a warehouseman, carrier or other person who in the course of their ordinary business issues warehouse receipts or bills of lading. (http://en.wikipedia.org/wiki/Delivery_order)

j. Customs Entry Document

When clearing any goods, even if exempted from customs duties, a detailed customs declaration, as in the approved forms shall be submitted to the customs office containing all the information that enable in application of the customs regulations and levying applicable customs duties and for the purposes of statistics.
k. Container Interchange Report

A document executed by a truck carrier and a terminal transferring possession of a container or chassis from one to the other, and showing equipment condition at time of transfer.

(http://www.crowley.com/glossary/default.asp)

Another type of container Interchange Report is one updated at shipside by stevedores indicating the condition of the container or cargo at the time of discharge so that this record exists if any claim for damages to cargo or container arises in the future.
3. Pre Arrival Planning

Pre arrival planning is the first, and in many ways the most important, of the steps in Cargo operations. It is designed to help the planning of the organisation of berth operations to achieve the highest possible productivity and the most efficient allocation of berth resources to reduce to a minimum ship’s time in port.

Before a vessel arrives in port, a decision has to be made on which berth the vessel will go alongside for discharging and loading.

It is also essential to make a provisional plan for the labour, equipment and other resources that will be needed to load or discharge the cargo, provisional estimates of the type of resources needed, the time at which they will be required and an estimation of how long the operation will take.

This operational or working plan is just as heavily dependent on the availability of information as is berth allocation, particularly details of the type and stowage of cargo. The ultimate aim of resource allocation is to plan the resources needed on the port in such a way as to handle the
vessel operations quickly and efficiently, at the lowest cost per ton of cargo or container handled. For a discharger, the process of preliminary resource allocation could start as early as three days before the vessel is due to berth, by which time all the cargo information should have been received from the shipping line, ship owner or their agents. The transit time between the last port of call prior to arrival will however influence this timeline as the last port of call could be only one or two days away in terms of transit time.

The documents needed are a copy of the ships stowage plan, a summary of hatch breakdown if possible, a copy of the manifest, and a list of all specials including refrigerated, hazardous, transhipment or over stowed cargo, animals, and so on.

For a vessel which will be loading, basically similar information is needed- the expected tonnage to be loaded, the specific container numbers if full containers are being loaded, the empty container requirements, the preferred cargo loading sequence if this is requested, a loading prestow if the load plan is to be prepared by the terminal or a loading plan (as early as possible) if this is going to be prepared by the ship and any special working instructions issued by the ship owner or his agent.

Note that in today’s era of sophisticated ship planning systems some ports will require information regarding all of the cargo on the vessel so that at the end of the operation a file which shows the overall condition of the ship on departure from the port in terms of cargo/containers can be prepared for forwarding to the next port of call and the shipping line planners.

1. Berth Allocation

What information will be needed to make sure that the vessel is put alongside a suitable berth? First the dimensions of the vessel have to be known, in particular, length, breadth ie length overall (LOA), breadth overall (BOA) and draft (DFT) since the berth designated must be of sufficient length and depth of water to accommodate the vessel. Will the vessel need shore side cranes, or will she handle the discharge/loading herself, with her own cranes and derricks? However that is not all the information needed. The way in which the cargo is distributed among the hatches will also influence the choice of berth and the number of gangs deployed. The nature of the cargo itself, whether its containerised, in break bulk, refrigerated, hazardous, heavy lifts, packages of awkward shapes or sizes also helps in the determination of the choice of berth.

2. Resource Allocation

This is a very vital activity and is of paramount importance in the pre-arrival stages of cargo operation. At this stage the human element (i.e labour) and requisitioning of stevedoring gears like container spreaders, pallets, rope slings, wire straps, vehicle and lorry slings, just to name a few, are at this point scheduled.

In addition to that, the required mechanical equipments such as reach stackers, front end loaders, fork lifts and Tug-Masters are also scheduled to facilitate the off loading and loading operations safely and efficiently.
Eg: Car Sling

The gear seen above is an illustration of a vehicle handling sling used for the discharge and loading of cars.

3. Estimating Operating Time

An essential part of the pre planning exercise is the estimation of the time the vessel will take to complete its entire operation. The determination of the estimated completion time (ETC) is the product of a number of factors. The type of ship, the average productivity attainable on this type of ship (this will be based on the port productivity target for the class of ship and the actual productivity achieved on previous calls), the distribution of the work the available labour and equipment resources, the location and availability of the cargo, the availability and location of the storage area for the cargo being discharged. In other words any and every thing which can impact the productivity and therefore the completion time must be considered. It is critical; however that the estimated Completed time (ETC) be calculated as accurately as possible as this has implications for berth and labour utilization as well as cost. The result of hugely inaccurate ETCs can be vessel delays, idle labour, idle berth, overtime labour cost, cancellation of pilots cost among others.

Vessel Pre-Arrival Information

*The pre-arrival information in respect of a vessel calling a port is required by both the Operations and Security Departments and shall consist of the following:*

a. its name;

b. its country of registry;

c. the name of its registered owner;

d. the name of its operator;

e. the name of its classification society;

f. its international radio call sign;

g. its International Ship Security Certificate, or ship security compliance document number;
h. its International Maritime Organization number, if it is a SOLAS ship;
i. the date of issuance, date of expiry and name of the issuing body of its International Ship Security Certificate, or ship security document;
j. confirmation that the vessel has an approved vessel security plan;
k. a statement of when its last 10 declarations of security were completed;
l. details of any security threats to the vessel during the last ten calls at marine facilities;
m. details of any deficiencies in its security equipment and systems, including the communications systems, and the way in which the master of the vessel intends to correct them;
n. if applicable, the name of its agent and their 24-hour telephone and facsimile numbers;
o. if applicable, the name of its charter;
p. its position and the time at which it reached that position;
q. its course and speed;
r. its destination and estimated time of arrival at its destination;
s. the name of a contact person at the marine facility that it will visit and their 24-hour telephone and facsimile numbers;
t. the following information in respect of its last 10 marine facilities visited:
   i. the receiving facility,
   ii. the marine facility visited;
   iii. the city and country,
   iv. the date and time of arrival, and
   v. the date and time of departure;
u. a general description of the cargo, including the cargo amount; and
v. if applicable, the presence and description of any dangerous substances or devices on board.

Sample of Pre Arrival Form
Please ensure that all relevant fields are filled in.

<table>
<thead>
<tr>
<th>Name of ship</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>IMO number</td>
<td></td>
</tr>
<tr>
<td>Registered Flag State</td>
<td></td>
</tr>
<tr>
<td>Date of ship’s last visit to</td>
<td>January</td>
</tr>
</tbody>
</table>
4. Loading and Off-loading Operations

4.1 Handling, stowage & securing

Learners should learn how to plan, handle, stow and secure a range of cargoes including break bulk, solid bulk, containers, RO-RO,reefer and dangerous cargo

General Cargo

Due to the vast variety of general cargoes carried by ships, it is difficult to lay down firm rules for their handling and stowage. In general, the stowage of a particular commodity depends upon the following factors:

1. Destination
2. Quantity
3. Susceptibility to taint
4. Ability to taint
5. Susceptibility to breakage
6. Susceptibility to pilferage
7. Susceptibility to spontaneous combustion
8. Special legal requirements such as those for dangerous goods
9. Whether cargo is hygroscopic or non-hygroscopic

**Hold Preparation**

Dunnage used aboard a ship may be either of the permanent or temporary nature. Permanent dunnage includes tank top ceiling, spar ceiling and wooden deck grids. Temporary dunnage includes loose board timber of various dimensions, polythene sheeting, waterproof "kraft" or "sisal" paper, tarpaulins, cargo nets, separation cloths, bamboo mats, inflatable dunnage bags etc.

The main purpose of using dunnage is:
- To protect cargo from coming into contact with moisture resulting from sweat, leakage from other cargoes, and bilges.
- To assist in ventilation.
- To evenly spread the load of heavy stows.
- To provide separation of cargo.
- To chock off and secure cargo by filling in broken stowage.

**Deck Cargo**

The Code of Safe Practice for Carrying Timber Deck Cargo contains recommendations for stowage which can be used for other deck cargoes as well.

The requirements are:

Before timber deck cargo is loaded on any area of the weather deck:
- hatch covers and other openings to spaces below that area should be securely closed and battened down;
- air pipes and ventilators should be efficiently protected and check-valves or similar devices should be examined to ascertain their effectiveness against the entry of water;
- accumulations of ice and snow on such area should be removed; and
- it is normally preferable to have all deck lashings, uprights, etc., in position before loading on that specific area. This will be necessary should a preloading examination of securing equipment be required in the loading port.

The timber deck cargo should be so stowed that:
- safe and satisfactory access to the crew's quarters, pilot boarding access, machinery spaces and all other areas regularly used in the necessary working of the ship is provided at all times;
- where relevant, openings that give access to the areas below can be properly closed and secured against the entry of water;
- safety equipment, devices for remote operation of valves and sounding pipes are left accessible; and
- it is compact and will not interfere in any way with the navigation and necessary working of the ship.

- Upon completion of loading, and before sailing, a thorough inspection of the ship should be carried out. Soundings should also be taken to verify that no structural damage has occurred causing an ingress of water.

*The height of the timber deck cargo should be restricted so that:*

- adequate visibility is assured;

- a safe margin of stability is maintained at all stages of the voyage;

- any forward-facing profile does not present overhanging shoulders to a head sea; and

- the weight of the timber deck cargo does not exceed the designed maximum permissible load on the weather deck and hatches.

**Heavy Cargo**

The factors to be considered when planning the stowage of heavy cargo using the vessel’s lifting gear are summarised below.

- The weight of the cargo should not exceed the safe working load of the lifting gear.

- Heavy cargo should always be stowed at the bottom of the hatch and light cargo on top of it to give the vessel the required stability.

- The stability of the vessel at the time of loading should have been worked out (by vessel planner and confirmed by vessel command) to ensure that the shift in the vessel's centre of gravity does not make it unstable.

- The point loading limit (or stack weight limitations) should be obtained from the vessel's capacity plan. The stowage positions should be such that excess weight is not exerted on deck or tank top plating between frames and beams. If necessary, provide bearers to spread the load.

- The cargo should not block access to fire hydrants, sounding pipes, equipment and spaces necessary for the safe operation of the vessel.

- The vessel should be in an upright position with as little list or trim as possible, this is of course dependent on the approved stowage plan provided.

**Securing of General Cargo**
The following diagrams illustrate some useful concepts in cargo securing.

Figure (4.1a) Securing cargo by using timber

Figure (4.1b) Frapping and Bowsing

Frapping and bowsing are used when using fibre ropes for lashing.

Figure (4.1c) lashing a tank having no securing points
Figure (4.1d) Securing a unit load stowed free at three sides

*Note how the corners are protected against damage by wire lashings in figure (4.1e)*

Figure (4.1e) Tightening and Securing of Timber Deck Cargo

*Observe as many cargo operations involving general cargo as possible. Note the planning, preparation, handling, stowage, and securing carried out.*

Activity

Container
The International Standards Organisation (I.S.O.) containers come in a variety of sizes, but the most common sizes are given below.

<table>
<thead>
<tr>
<th>Length</th>
<th>Breadth</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 ft</td>
<td>8 ft</td>
<td>8 ft or 8 ft 6 ins</td>
</tr>
<tr>
<td>40 ft</td>
<td>8 ft</td>
<td>8 ft or 8 ft 6 ins</td>
</tr>
</tbody>
</table>

The term TEU stands for Twenty foot or Equivalent Unit.

Containers have hollow castings at each corner with holes which engage with twist locks or similar fittings, allowing the container to be secured to another container, ship’s decks and hatches, trucks, rail wagons, or to be lifted using a spreader. Containers should be lifted by using an appropriate spreader, never by attaching wire slings directly to the corner castings unless the container is damaged which prevents the use of a spreader. When wire slings are used, it is not possible to apply vertical lift at each corner casting. Therefore there will be undue strain on the container, possibly resulting in damage to the container.

On purpose built container ships, the containers are stowed in cell guides as shown in figure (4.1f)

![Figure (4.1f) Cell Guides](image)

Where cell guides are not provided, containers need to be secured by lashing equipment such as rods, wires or chains.
Container Securing Equipment

Lashings

a. Chains

Chains are flexible and do not kink when tightened around sharp corners. Their lengths can be easily varied. However, container sizes and locations are predictable and the lengths of most lashes are same. In addition, the lashing are not required to bend around sharp corners. For this reason and due to the comparatively more cumbersome handling of chains, they have largely been replaced by wire and rod lashings.

b. Wires

Wire lashings were used extensively in the earlier methods of lashing containers. The containers were stacked as solid blocks with bridge fittings connecting adjacent stacks. Long wire lashings were used from the top of the stack to the deck. However, this meant that the bottom container in each stack had a tendency to rack. Long wires were difficult to install and difficult to store without kinking. With the development of twistlocks and rods, the use of wires has steadily declined.

c. Rods

Rods in combination with twistlocks are today the most common means of lashing containers. They have the following advantages:

- They are stiffer than wires or chains.
- They can often be applied directly from deck without climbing on stacks.
- They can be used on the lower corner castings of top tier containers.
- They require less maintenance and last longer.

Rods are fitted with fixed heads or hooks, or eye ends which fit over a penguin hook. An extension handle may be provided to make handling easier.
Figure (4.1g) Types of Rods

d. Securing pads and hooks for lashes.
These connect the lashing to the corner casting of the container. They may be connected permanently to the lashing or they may be separate. Some types are shown in the figure (a.8)

![Types of hooks and securing pads](image)

Figure (a.8) Types of hooks and securing pads

**Tensioners**

a. **Turnbuckles.**
These are the oldest and most common type of tensioner found on ships. Turnbuckles can be threaded at one or both ends and can be either of open or enclosed types. Some turnbuckles are provided with a fixed or detachable hand-wheel for tensioning.

b. **Lever tensioners**
These are used only with chains and are most common on RO-RO ships where it is necessary to secure trailers as well as containers. They are dangerous to tension in rough weather because they first have to be slackened and then tightened. They can cause injury by springing when released.

c. **Quick Release Tensioners**
These are designed for use with wire lashings. They are quicker to use than turnbuckles and require less maintenance. However, they can need more room and can spring when released.

d. **Powered Tensioners**
The ‘Quick tite’ tensioner can be used with any type of lashing and can be tightened pneumatically or with a hydraulic hand pump. The tightening unit is first pre-tightened by hand and then a special pump is placed on top for further tightening. After tightening, the unit is locked and the pump removed.

The ‘Speed lash tensioner’ operates pneumatically. It is safe, quick and requires little space. However a pneumatic system needs the installation of pipes and air points along the ship. Hoses lying around can prove a hazard on RO-RO ships.
Stacking equipment

a. Non locking stackers.
These can be provided with a cone on one side; in which case they are used as base stackers, or they can have two opposite cones which fit into the corner castings of upper and bottom containers.

b. Pin locking stackers.
These are simply stacker cones which can be locked to the corner casting by a pin. The pin can be inserted from the side or from the end of the corner casting.

c. Twistlocks.
Twistlocks are stackers which are locked to the container by twisting a handle. Some twistlocks can be used upside down which can create confusion as to whether they are locked or not. To prevent this, some twistlocks are provided with the handles bent in one direction.
Bridge fittings.

These connect container stacks horizontally and are used to secure containers as a block.

Practical lashing consideration

The container securing system is primarily concerned with restraining containers against racking and tipping.

Vertical lashing provides tipping restraint to the containers. This can also be provided by twistlocks. Vertical lashings provide no racking restraint and may actually increase the likelihood of racking in the bottom container of a stack.

A lashing rod can be connected to either the top or the bottom corner of the container. Figure 3.12 illustrates 3 lashing arrangements.
Arrangement 1 provides primary racking restraint to the third high container while arrangement 2 provides racking restraint primarily to the second high container. In practice, the main concern is the racking of the bottom one or two containers.

Arrangement 2 provides a tipping restraint to the third high container that is not provided by arrangement 3.

When wires are used, they are fitted by a person leaning over the edge of a container stack from above. Hence wire lashings would be connected to the top corner castings as in 1 or 3.

When rods are used, they are usually fitted from below and can be connected to the top or bottom corners. Because of tipping restraint, they are commonly connected to bottom corner castings i.e. arrangement 2.

Figure (a.12) Lashing arrangements

It is a common misconception that the function of the tensioner is to make the lash as tight as possible. In practice, container lashings should be tightened just enough to remove slack and tension the lash.

As can be seen from the above diagrams there are different types of lashing arrangements possible and the approved lashing arrangement will differ from ship to ship. It is therefore advisable and in fact should be a requirement that on boarding a vessel to commence operations a lashing arrangement plan or “lashing diagram is secured from the vessel command. In fact the approved lashing arrangement plan is usually posted on notices on board some vessels. It is however advisable that dialogue is had with the chief officer and a lashing arrangement plan secured from him as sometimes based on the time of year and destination the vessel may request a lashing arrangement which differs from what is
the usual arrangement. Dialogue and the securing of a lashing plan at the outset of the operation will prevent disputes over lashing at the completion of the operation and avoid unnecessary delays for the correction of lashing.

Observe as many cargo operations involving containerised cargo as possible. Note the planning, preparation, handling, stowage, and securing carried out.

**Activity**

**Stowage & Securing of Vehicles**

**Stowage**
- Wheels should be chocked.
- Parking brakes should be applied.
- Vehicles with diesel engines should not be left in gear
- Free play in vehicle suspension should be removed by:
  - tightly securing the vehicle to deck, or
  - jacking up chassis prior to securing, or
  - releasing air pressure in air suspension systems.
- Semi-trailers should not be supported on their landing legs unless they are specially designed for that purpose and so marked.

**Securing**
Lashing equipment includes chains, wires, synthetic fibre ropes and webbing. Tensioning is achieved by levers and turnbuckles for chains, quick release tensioners for wires and many forms of buckles and ratchet units for webbings.

Lashing support equipment includes wheel chocks to provide longitudinal restraint, trailer horse to support the front of the trailer and adjustable trailer jacks to support the rear end. A locking stanchion (Roloc-box) can also be used.
Transport and Logistics - Stevedoring

Figure (a.13) Trailer support equipment

Securing points on the vehicle should be marked in a clearly visible colour. Only one lashing should be attached to any one aperture of the securing point.

Figure (a.14) Lashing of a road trailer

Securing Of Automobiles

Cars can be lashed by straps, wires, chains or ropes. Several patented devices for lashing automobiles are available and the manufacturer's instructions should be followed.

In general:

- All cars should be lashed with minimum 4 lashings.
- Lashings must only be attached to the points specified by the car manufacturer and not to wheel rims or bumpers.
- Cars should not be lashed to one another.
- Parking brakes should be applied, windows closed and doors shut.
Activity

4.2. Handling of Dangerous Goods

Dangerous goods, also called hazardous materials or HazMat ("HazMat teams" are personnel specially trained to handle dangerous goods), are solids, liquids or gases that can harm people, other living organisms, property, or the environment. They are often subject to chemical regulation. Dangerous goods include materials that are radioactive, flammable, explosive, corrosive, oxidizing, biohazardous, toxic or allergenic. Also included are physical conditions such as compressed gases and liquids or hot materials or chemicals, or may have other characteristics that render them hazardous in specific circumstances.

The colours of each diamond in a way has reference to its hazard ie: Flammable = red, Explosive = orange, because mixing red (flammable) with yellow (oxidising agent) creates orange. Non Flammable Non Toxic Gas = green, due to all compressed air vessels being this colour in France after World War II. France is where the diamond system of HazMat identification originated.

IMDG Code

The International Maritime Dangerous Goods (IMDG) Code published by IMO, provides guidance on the safe carriage of packaged dangerous goods.

The IMDG Code requires that dangerous goods are properly identified, packaged, marked, labelled or placarded, documented and segregated. It consists of a number of volumes which are divided into a General Introduction, a General Index, and individual Schedules for different substances and materials. In addition, the Supplement to the Code includes the Emergency Schedule, Medical First Aid Guide, and the BC Code.

Classification of Dangerous Goods
The IMDG Code divides dangerous goods into classes as follows:

Class 1 - Explosives
Class 2 - Gases: compressed, liquefied or dissolved under pressure
Class 3 - Flammable liquids
Class 4.1 - Flammable solids
Class 4.2 - Flammable solids, or substances liable to spontaneous combustion
Class 4.3 - Flammable solids, or substances which in contact with water emit flammable gases
Class 5.1 - Oxidising substances
Class 5.2 - Organic peroxides
Class 6.1 - Poisonous (toxic) substances
Class 6.2 - Infectious substances
Class 7 - Radioactive substances
Class 8 - Corrosives
Class 9 - Miscellaneous dangerous substances, being any other substances that experience has shown, or may show, to be of such a dangerous character that the provisions of this Part should apply to them.

Markings & Labelling

Each class of dangerous goods is identified by a particular label as shown in the following figures (b.1), (b.2) and (b.3)
Figure (b.1) Dangerous Goods Labels
Figure (b.2) Dangerous Goods Labels
Marine pollutants are categorised as ‘harmful substances’ in the IMDG Code.

It is the responsibility of every port to ensure that all containers with dangerous goods have the appropriate label affixed to all four sides of the container and containers should be checked on discharge and loading to ensure that this is in place. If there are any missing labels then the ship’s agent should be informed so that the situation can be corrected and records of this infraction kept for future reference if required. Vessels have been known to refuse to load containers, which were not appropriately labelled on all four sides.
4.3. Cargo Care

Earlier you have learnt that the cargo carrier is obliged to care for the cargo among other things. In this section we will examine the causes of cargo damage and how to minimise such damage. In addition, we will look at ventilation of cargo as well as the requirement to have a cargo securing manual on board.

Cargo Damage

Causes of Damage

Any cargo loaded on board a vessel should be discharged in the same state in which it was loaded. Cargo can be damaged by:

- improper handling during loading and discharging;
- rubbing and chafing with ship structures or other cargo;
- temperature fluctuations during the voyage;
- contamination with other cargo;
- dust and stain;
- moisture, rain, fresh or sea water;
- rats, mice and other vermin;
- crushing under the weight of other cargo;
- reaction with other cargo; and
- heat.

In addition, all cargo must be secured against shifting due to the motion of the vessel in a seaway. All weather deck openings such as hatches and doors should be tightly secured and maintained in good order to prevent the entry of sea water, rain or spray.

A lot of cargo carried by sea is very valuable. You should take all necessary precautions against theft of cargo. In port, adequate watch should be maintained. Unauthorised access to the vessel should be prohibited. Sometimes it may be possible to block access to a valuable cargo by stowing it under less valuable cargo.

The measures taken to protect cargo will depend upon the nature and type of cargo carried. Cargo planning should involve a careful consideration of the factors that can cause damage to a particular cargo. Cargo should then be handled, stowed and carried to minimise the risk of damage.

Minimising Damage

For obvious reasons, you have to prevent the sources of damage if you want to discharge the cargo in the same state as when it was loaded.

Mechanical Damage
- Inefficient and improper slinging of cargo is a major source of damage during loading and discharge. Slings should always have an adequate load limit. The material used for the sling should be selected so that it does not damage the cargo. For very small packages, it is preferable to use nets.

- Care should be taken when using mechanical devices such as fork-lift trucks. The rate of loading or discharging should be slowed down to a manageable level.

- To prevent chafe, stow the cargo packages tightly so that they do not rub against each other. Keep the cargo away from sharp edges and rough surfaces.

- In order to prevent damage through crushing do not place heavy cargo on top of lighter cargo.

- Secure the cargo prior to sailing so that it does not start moving when the ship rolls or pitches in a seaway.

**Pilferage**

To prevent loss of cargo due to theft:

- Cargo should be stowed in a secure lock-up.

- Where a separate lock-up is not available, valuable cargo should be overstowed with less valuable cargo.

- Adequate lighting should be provided in port.

- Access to the cargo space should be effectively closed when not in use.

- Accurate and reliable tallying should be carried out.

**Moisture and Temperature Control**

- Leakage from hatch covers.

- Leakage from other cargo.

- Green dunnage.

- Rain (when hatches are left open).

- Inadequate or incorrect ventilation.

Some cargoes are liable to spontaneous combustion. Examples include coal and copra. To avoid this hazard, stow the cargo away from local sources of heat such as engine room bulkhead and casing. Keep away from wet cargoes. Do not place the cargo in direct sunlight. Ventilate if necessary, to reduce the effects of heat build up.

**Contamination**

Different cargoes need to be segregated, particularly:

- dangerous goods
- dry cargoes
- wet cargoes
- clean cargoes
- dirty cargoes
- delicate cargoes
- tainting cargoes

The risk of cargo contamination can be reduced if the following rules are followed:
1. Keep poisons away from foodstuff.
2. Stow delicate and tainting cargoes in separate lockers.
4. Secure cargoes so that they are not free to move.
5. Do not accept leaking or damaged cargo packages for loading.
6. Put wet cargoes underneath dry cargoes.
7. Separate clean and dusty cargoes by an effective barrier such as tarpaulins.

*Observe as many different types of cargo loading operations as you can and note the measures taken to prevent cargo damage.*

**Activity**

**Cargo Ventilation**

The purpose of cargo ventilation is to:
- cool down the cargo
- remove dangerous gases collecting in the cargo space
- remove odour, and
- Prevent condensation.

In attempting to prevent cargo damage, account must be taken of the special properties of the cargo carried.

**Nature of Cargoes**

Cargoes can be basically divided into two types. These are as follows:
1. Non-Hygroscopic Cargoes
2. Hygroscopic Cargoes

Non-hygroscopic cargoes are those which neither absorb nor liberate moisture and which therefore do not influence the moisture content of the surrounding air. That is, they do not alter the Relative Humidity of the air in the cargo space.
Examples of non-hygroscopic cargoes are metals, machinery, glass and canned goods.

Hygroscopic cargoes are those which themselves contain a certain percentage of moisture and which can either absorb more moisture from the surrounding air in the cargo space or alternatively liberate moisture to the surrounding air and thereby increase its relative humidity.

Cargoes of this type include every kind of agricultural product and they in fact make up the bulk of the materials of commerce. Examples are timber, cereals, textiles, coffee, fruit, tobacco, salt, sugar, phosphates: hides and skins etc.

Moisture Content

Hygroscopic cargoes have moisture contents which vary from parcel to parcel of the same cargo and which vary between different cargoes. For example, coffee, when shipped usually has a moisture content of about 8-10% by weight; dried fruit has a moisture content when shipped of between 20 to 30% by weight and for hides and skins the moisture content by weight may be as high as 50%.

For any particular hygroscopic cargo having a specified moisture content and temperature there is a value of relative humidity at which the surrounding air will be in equilibrium. This is called the "equilibrium relative humidity".

If the actual relative humidity of the surrounding air is below this value then the cargo will give off moisture to the surrounding air. On the other hand, if the actual value of the relative humidity of the surrounding air is above the equilibrium value then the surrounding air will give off moisture to the cargo, i.e. the cargo absorbs moisture from the surrounding air.

Sweat

Ship's sweat is the condition which arises when condensation takes place on a ship's structure - deck heads, ship's side, etc. - and subsequently drips back on to underlying cargo.

Ship's sweat will result whenever the temperature of the ship's structure comprising the cargo space is below the dewpoint temperature of the air in the cargo space.

Example -

Consider a cargo hold surrounded by seawater that has a temperature of 7°C. It is reasonable to expect that the temperature of the steel structure of the hold will also be about 7°C. If the outside air has a dewpoint temperature of 10°C, and if that air is admitted to the cargo space, it will be cooled (by contact with the steel structure of the hold) down to a temperature of approximately 7°C. This temperature is below the dewpoint temperature of the air and therefore condensation will occur on the ship's structure. This is called Ship Sweat.

Cargo sweat is the condition which arises when condensation occurs on a cargo surface. Cargo sweat will result whenever the temperature of any cargo surface is below the dewpoint temperature of the air in the cargo space.
Example -

Imagine a cargo hold surrounded by sea water that has a temperature of about 15°C. It is reasonable to expect that the temperature of the steel structure of the ship's cargo hold will also be approximately 15°C. Imagine also some cargo in the hold having a temperature of 10°C and that the air outside of the cargo hold has a temperature of 18°C and a dewpoint temperature of 13°C. If this air is admitted to the cargo space what will happen?

The air that came into contact with the cargo would be cooled down to a temperature of approximately 10°C - it would have been cooled to below it’s dewpoint temperature (13°C) and as a result condensation on the cargo surface would appear. This is cargo sweat.

The air coming into contact with the steel structure of the ship's hold would also be cooled, down to a temperature of about 15°C. This air is not cooled to below its dewpoint temperature and so there would be no ship sweat.

Ventilation Procedure

The basic rule for preventing sweat is:

- continue ventilation if the dew point outside is lower or equal to that of the hold dew point;
- Do not ventilate with outside air if the dew point outside is higher than the hold dew point.

Recommended Procedure for Moisture Control

1. Measure the dewpoint and temperature of the outside air.
2. Ventilate the cargo space, unless the estimated cargo temperature is lower than the dewpoint of the outside air.
3. Shortly afterwards measure the dewpoint of the air leaving the cargo space to ensure that it shows a dewpoint that is higher than the dewpoint of air entering. If the dewpoint is in fact higher then it indicates that moisture is being removed from the cargo space.
4. Repeat Step 3 at regular intervals to ensure that moisture is still being removed.
5. At longer intervals, re-check the dewpoint of the outside air to provide a new basis for comparison.
6. If at any time, it is found that moisture is no longer being removed from the cargo space, then it will be useless and perhaps damaging to continue ventilating. Under these conditions it is best to restrict ventilation.

Following the above procedure will eliminate the possibility of ship's sweat and cargo sweat when non-hygroscopic cargoes are carried.

If a compartment has to be ventilated using natural means, remember that air in an enclosed compartment tends to flow in the opposite direction to direction of air flow outside the compartment. Figure (a.16) shows the arrangement of ventilators to take advantage of this fact.
Preparation for Refrigerated Cargo

Reefer Ships:
- Ensure that the space is clean and free of odours and microorganisms. If necessary, remove and renew the affected portions of the insulation and dunnage.
- Run fans in both directions to clear smells and dust from the air trunkings.
- Clean and test bilges and scuppers. Seal U-bend vapour traps with brine.
- Place clean dunnage in a manner that will ensure adequate air circulation under, around and through the cargo as required.
- Check thermometers, gas sampling points, fire detection and extinguishing equipment.
- Inspect any pipes passing through the space for leakage.
- Ensure that all closing arrangements and doors to the space are working efficiently.
- Cool the space down to slightly below the carrying temperature and maintain this temperature for at least 24 hours.

Container Ships:
- Record internal temperatures of the container before it is loaded and reject it if the temperature is too high. This is frequently done by observation of the container thermograph.
- Check the container/ship coupling system, ie. either electrical or cold air supply.
- In the case of cold air supply check couplings not in use to ensure no leakage of cold air.
- When coupling has been made make certain the joint is correct and that cooling commences.
- The temperature control and monitoring system should be checked to ensure it is working.

Cargo Securing Manual
A major cause of cargo damage is the insufficiency of securing to prevent cargo movement in a seaway. The IMO Code of Safe Practice for Cargo Stowage and Securing requires a Cargo Securing Manual to be provided on all ships other than cellular cargo ships.

Contents of the Cargo Securing Manual

1. Details of fixed cargo securing arrangements and their location.
   Where provided:
   - fixed securing facilities on bulkheads, web frames, stanchions etc and their types eg. pad eyes, eye bolts etc, including their strength
   - fixed securing facilities on deck and their types eg. elephant's foot, container fitting apertures etc, including their strength
   - fixed securing facilities on deckhead, their types and strength.

2. Location and stowage of portable securing gear
   Eg. bins, racks, lockers, stores etc.

3. Details of portable cargo securing gear, inventory of items provided, including their strength.
   Where provided:
   - container stacking fittings, interlocking fittings, bridge fittings etc, their strength and use
   - chains, wires, rods etc, their strength and use
   - tensioners eg. turnbuckles, chain tensioners etc, their strength and use
   - securing gear for cars and other vehicles, their strength and use
   - trestles and jacks etc for vehicles, including their strength and use
   - anti-skid material

4. Correct application of portable securing gear on various cargo units, vehicles and other entities carried on board a ship.
   Guidance as to the recommended location, method of stowing and securing containers, trailers and other cargo-carrying vehicles, palletised cargoes, unit loads and single cargo items (eg pulp, paper rolls etc), heavyweight cargoes, cars and other vehicles. These are minimum requirements.

   The following factors should be taken into account when applying portable securing gear:
   - duration of the voyage
   - geographical area of the voyage
   - expected sea conditions
   - size, design and characteristics of the ship
   - dynamic forces under the expected weather conditions
   - type of cargo units including vehicles to be carried
- intended stowage pattern
- mass (weight) of the cargo units and vehicles.

5. Indication of the magnitude of forces expected to act on cargo units in various positions on board the ship
   - tables and diagrams outlining accelerations experienced in various positions on the ship in adverse weather conditions
   - examples of forces acting on typical cargo units under the above mentioned accelerations
   - examples of number and strength of portable secureings required to counteract the above mentioned forces
   - formulae for calculating forces
   - where only a limited number of cargo unit types is intended to be carried, eg. trailers on a short sea-trade RO-RO ship, the information may be limited to the number and disposition of securing of a given strength required for various stowage positions and for variations in GM or roll period.

The below is being repeated from Unit 2 and should be compared for deletion or retention

4.4. Communication Signals

Signals indicate instruction to the driver of a crane or derrick gear for the safety of the cargo, ship and the environment.

Signals

In order to convey an instruction to the driver of a crane or derrick gear, it is recommended that the hatchman should use the following signals.

<table>
<thead>
<tr>
<th>Union Purchase</th>
<th>UP</th>
<th>DOWN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>UP</strong></td>
<td><strong>DOWN</strong></td>
</tr>
<tr>
<td></td>
<td>First finger pointing. Rest of fingers closed. The whole hand to be moved to indicate upward movement.</td>
<td>Hand fully extended. Palm down. Move downward.</td>
</tr>
</tbody>
</table>
STOP
Hands held high. Palms towards driver.

DIRECTION
First finger pointing in direction required. Rest of fingers closed. Move hand in direction required.

Figure 2.7 Union purchase signals

Cranes

UP
First finger pointing up. Rest of fingers closed. The whole hand to be moved to indicate upward movement.

DOWN
Hand fully extended palm down. Move in downward direction.
STOP
Hand held high.
Palm towards driver.

DIRECTION
First finger pointing in direction required.
Rest of fingers closed. Move hand in direction required.

Figure 2.8 Crane signals
Unit summary

In this unit you learned the basics of what is involved in the cargo handling operation. The Unit was divided into four sub-sections.

In sub-section 1, you were introduced to the different types of cargo that are carried during maritime transportation. You learnt, also, of the different types of ships that are used in the carriage of these cargoes. You should be able, just by a description of the packaging used, to identify the type of cargo.

In sub-section 2, the various documents used in cargo transportation were described. You learnt of the Bill of Lading, the Notice of Readiness, the Cargo stowage Plan, the Cargo Manifest, the Dangerous Goods manifest, the Delivery Order, and the Customs Document. You should be able to describe what each of these documents is used for during the transportation process.

Sub-section 3 dealt with pre-arrival planning. The need to prepare for the arrival of every vessel in advance of its arrival was elaborated on in this sub-section. Activities such as resource allocation (providing berthing space, appropriate equipment and the right manning levels) were described. You also learnt, in this section, how to estimate working time of a given vessel.

The final sub-section, dealt with the loading and off-loading operations. You learnt how these two processes actually are conducted from a theoretical point of view. Particular points to note are the importance of doing the operations safely, the different hand signals that are used and all that is involved in the practical receipt of cargo from a ship to the dispatch of that cargo to the shore.
Assignment

1. Describe 3 major types of cargo carried by ships?
2. What are the two main types of bulk cargo and give one example of each?
3. Identify three classifications of IMDG Dangerous Goods?
4. How many hazard classes of dangerous goods under the IMDG Code are there?
5. Name three documents use in cargo operations.
6. Explain the purpose of the documents named in question 5 above.
7. What is Laytime?
8. What is Demmurage?
9. What is an arrived ship?
10. Describe two important steps you take in planning for the arrival of the vessel?
11. Name two important factors in determining where a vessel should be berthed?
12. Name the two most important documents that are needed to comments discharging a vessel?
13. Name four different gears used in loading and offloading operation?
14. Describe the function of a signalman.
15. State the importance of observing safe working load in cargo operations.
16. Why do you need dunnage prior to loading of cargo?
17. Why should heavy cargo be stowed under the ship's hold and lighter cargo on top?
Assessment

1. Identify the various types of cargo carried by ships and describe how these are loaded and off-loaded.

2. You are a stevedore working on a Ro-Ro vessel in a confined space. Describe the precautions you would take to avoid hazard while working.

3. You have been given a ship storage plan for a break-bulk vessel expected at your port. Explain what you will use it for and describe the steps involved.

4. Explain why Cargo documentation is important in sea transportation of cargo. Identify four of the documents and describe their purpose.

5. A vessel is working at your port and there is heavy cargo to be stored on the vessel. Describe the factors to be considered in this operation.

6. In which type of vessels will you find each of the above gears?

7. Based on the sketches below showing hand signals, explain what each means.

8. Explain the function of a twistlock in container operations.

9. List three steps when preparing for receiving refrigerated cargo on a vessel?

10. Explain the precautions to be taken to avoid damage when slinging cargo.
Identify The Jinx

As a student of Port Operations, you have been called in to do some preliminary diagnostics at the port of Pain in the island of Paradise where shipping agents are threatening to remove their business to a competitor port on the other side of the island.

The situation seems hopeless to the stevedore team since the new government has given them an ultimatum:

*Get your act together or else the port will be closed down and operations will be shifted to the competing port on the other side of the island!*

*You have been asked to do some diagnostics on behalf of the stevedores.*

In their hearts, the stevedores want to improve because they want to keep their jobs. But everything seems to be going wrong for them. They feel that they are jinxed.

You arrive at the Operations Office of the port at 0600 hrs. The phone rings and the Operations Planner answers it.

From the trend of the conversation, you gather that a shipping agent is on the other end and that he has told the planner that, two of his vessels will be coming to the port today – a break-bulk vessel with 90 tonnes of general cargo to discharge and a ro-ro vessel with 60 vehicles to discharge and 20 to load.

The break-bulk cargo is expected at 1500 hrs. and the ro-ro vessel at 2300 hrs.

You hear the Planner telling the shipping agent that it is not necessary to give any more information now about any vessels expected in the next three days.

The Planner puts down the phone and then requests from the Stevedore Foreman that, standard-sized gangs be booked to start work on the break-bulk vessel at 1500 hrs and to start the container vessel at 2300 hrs.

You return to the port at 1430 hours and go to the quayside where a well-organised team of stevedores seems ready to begin work.

The vessel arrives.

Pratique is over and promptly, at 1500 hrs, the stevedores mount the gangway of the vessel in order to begin the discharge operations but…..the ship has no cranes!!! The stevedores will have to use the port’s mobile crane to off-load the cargo.

WHERE IS THE MOBILE CRANE? The stevedores are enraged. Doesn’t the Equipment manager know that he is supposed to have the
crane available for situations like this one, when ships come to the port and have no cranes?

The Equipment Manager arrives and says that he never knew that the crane would have been needed. Nevertheless, he will make it available.

The crane arrives. Operations eventually begin at 1645 hrs. with stevedores shouting orders from the deck of the to the crane operator whenever they wanted him to lift, swing or lower the crane boom.

A while later the stevedores shout to the shore foreman that they will need special gears to remove a few bundles of pipe that “appeared from no where”. The stevedores complained that they were told that it was a break-bulk vessel and so they never expected to see bundles of pipe. That should be for a specialist “pipe” vessel. ‘Break-bulk is break-bulk’, they grumbled…..packages, crates, a few boxes, maybe a pallet or two, or a skid but….bundles of pipe?? No! That is definitely NOT break-bulk.

*And where were the slings?..........They found out that no slings were in place.*

The ro-ro vessel arrived at 2319hrs and, after about 55 minutes, began to discharge vehicles. A new gang of stevedores are working. They move swiftly. You see that they have on their helmets and their safety boots. Many of them are “bare back” because the vehicles are in the lower hold of the vessel and it is really hot and humid in that area.

Nevertheless they work quickly and within 2 hours have finished the discharge operations.

The loading begins. Vehicles are driven on and parked neatly. The foreman instructs that chucking may not be necessary for some smaller vehicles ‘as long as we are sure that their brakes are working well’.  

A short while later, a worker faints from inhalation of exhaust fumes in the hold of the vessel and the stevedores lament disappointingly that the port must be “jinxed” because they did “everything right” and yet misfortune seems to be “coming their way”.

What is your diagnosis? Can you identify everything that the stevedores did wrongly?
Unit 4

Cargo Handling Equipment

Introduction

The Standard of maintenance in ports must keep pace with the demands of modern plant and equipment. There are few ports in developing countries which have managed to avoid accumulating a permanent pool of equipment awaiting repairs. In some cases the reactivation of such equipment would give the biggest single gain in performance that management could achieve.

Some of the Cargo Handling Equipment are designed for use in construction. The manufacturer tends to design for that industry’s need producing equipment which can be used reliably and intensively (providing it is regularly maintained) for a short life before being scrapped.

Many port authorities through out the world own all the equipment used in cargo handling. However, in some ports Stevedoring companies own cargo handling equipment.

In this unit, you will learn about different types of cargo handling gear fitted on ships approved for use onboard ships.

It is important you check with your Marine Department with reference to National Legislation and Regulation on Cargo Handling Equipment.

Major cargo types carried by ships:

1. Bulk Solids
2. Bulk Liquids
3. Containerised
4. Roll On - Roll Off (including cars, semi-trailers and other vehicles)
5. Refrigerated
6. General or Break Bulk

Most vessels are designed to transport a particular type of cargo. Therefore, it is essential that you should become familiar with the different types of cargo handling equipment.

Upon completion of this unit you will be able to:
Outcomes

- identify the major equipment used for stevedoring operations.
- state the limitation of different types of equipment used in cargo handling.
- identify markings on cargo handling equipment.
- select the most appropriate equipment for the cargo.
- use the equipment safely and effectively.
- explain the importance of proper maintenance of cargo handling equipment.

Preventer Guy:  
Is a preventer wire with the correct safe working load to secure the two derrick booms when lifting weights from wharf to ship and vice versa.

Union purchase:  
When the two derrick booms are used for cargo operation. The two derrick booms will share the cargo weights, hence its name, so however the weights should not exceed its SWL (safe working load).

Ship structure:  
From the keel to the uppermost continuous deck of the vessel is called the ship's hull and any structure above that deck is called the superstructure of the vessel.

Cargo runner:  
Wire rope used to attach a cargo hook for lifting cargo with emphasis of the SWL and the right diameter for the cargo blocks.

Rig / fast:  
To tie up strongly using any knot.

Slewing or schooner guy:  
For slewing the derrick boom to its correct position for cargo operations.

Span block:  
Blocks at the derrick head and the Samson post for span wire.

Span wire / topping lift:  
This is the topping wire for topping and lowering of derrick boom.

Gin block:  
Cargo runner block at the derrick head.

Heel block:  
Cargo runner block at the heel of the derrick boom.

Cargo triangle plate:  
Where the cargo runners and the cargo hook are
This activity should be carried out prior to starting this unit.

Visit a port and observe cargo gears available, take notes and make a list of cargo gear, their importance and functions.

1. Ships’ Lifting Equipment

Derricks

A derrick is a boom used for raising or lowering loads, pivoted at its heel, the head of which may be swung (within the limits imposed by the heel pivot and/or the operating machinery) in a horizontal and vertical plane. The boom may be slewed into any position by means of guys as desired. The operating machinery is fixed to the ship’s structure and is independent of the boom.

Union purchase is a rig in which a pair of derricks is used in combination, the derricks being fixed and the cargo runners being coupled in such a way that the load may be swung from a position vertically under one derrick to a position vertically under the second.
Figure 4.1  Derricks rigged to “Union Purchase”
Activity 4.2 Label the following diagram

Derrick Booms

The safe working load is indicated clearly on the derrick for single lifting and underneath this the S.W.L (U) for union purchases working.

The topping lift is shown as a single span with chain. Other types consisted of a purchase between the topping block and the spider-band, or a single span and purchase between the topping block and the deck.
NOTE: The safe working load of the system depends upon its weakest part.

Cranes

Many ships carry their own cargo lifting gear. There is a wide variety of cargo handling gear available, dependant mainly upon the type of service a vessel is designed to provide.

The sequence of changes in the kind of traffic arriving at ports, as a result of growth and transport economics, cannot be over emphasized. The need for a multi purpose terminal to handle both break bulk cargo and a variety of unit loads during the transitional is important. The role of the multi purpose terminal is to provide efficient handling facilities for the period which may last many years when general cargo ships calling at the port may carry a variety of cargoes transported in modern ways: containers, flat, pre-slung cargoes, large units of iron and steel, large units of packaged timber, as well as cars and heavy machinery.

In order to be able to handle all these cargoes efficiently, the terminal needs to have a great variety of mechanical equipment that is required for a conventional break-bulk terminal, and a different range of equipment that is normal for a specialise container terminal.

The main method of ship handling is either by ship’s gear or by mobile tower crane. No rail-mounted portal cranes are normally provided and only one gantry crane in the first instance. The standard method of transfer for virtually all classes of cargo is by tractor/trailer combinations, using trailers of a size generally associated with container operation but without corner fixing, of a low profile design, and equipped for easy coupling and uncoupling.

Pedestal Cargo Cranes

There are many varieties of cargo cranes. The most common type of crane is one which is fixed on to a pedestal. Modern ship’s cranes rely on Ship’s power to electrically or hydraulically operate winch drums and slewing gear. Each crane is usually positioned to serve one or two hatches.

Three motions are possible with pedestal cargo cranes - lifting, luffing and slewing. Luffing is the up and down motion of the jib of the crane. Slewing refers to the rotating sideways movement (i.e. movement in azimuth) of the crane.
Activity 4.4 Divide in two groups and discuss how derrick and crane works; and explain the difference between the two. At the end of this activity each student will write with a minimum of 150 words the results of their discussion and his/her own views.

Crane Components

1. Level luffing jib.
   The jib is usually of the level-luffing type, which allows it to be raised or lowered but ensures the weight remains at the same level until hoisted or lowered by the lifting control. In the event of power failure each motion of the crane will stop by the activation of automatic brakes. When not in use the jib rests in a ‘jib-cradle.’

2. Limit Switches
   Most lifting appliances and in particular ship's cranes have limit switches designed to shut the crane down when it exceeds its safe working parameters.

   In normal operations when a limit switch is activated and the crane shuts down the operator MUST NOT ATTEMPT TO CONTINUE LIFTING until the cause is found and the condition rectified.

   The most common limit switches are:
• Maximum Hook Height Limit
• Minimum turns of wire left on the winch drum.
• Maximum jib Elevation Limit
• Ship Out-of-Trim Limit
• Dancing Roller Arrangement.

3. Maximum Hook Height Limit
This prevents hauling the hook and connecting gear through the jib head sheave

![Figure 4.6 Maximum Hook Height Limit Switch](image)

4. Maximum Jib Elevation Limit
When the jib is angled well-up, the change in distance between jib-head and mast-head becomes negligible. A limit stops the hauling gear overstressing the luffing wire. In addition, a high jib elevation may allow the load to approach unacceptably close to the crane post.

As the jib elevation decreases, the stress on the luffing wires increases. In addition the jib is more likely to strike obstructions. A limit similar to Maximum Jib elevation limit is used.
5. Ship - Out- of - Trim Limit

An excessive trim or list may cause the cranes' slewing motion to over-run the slewing gear, thus damaging the gear and losing control of the load. A sensor switch (e.g. mercury filled) activates automatically once the limit is reached.

6. Dancing Roller Arrangement

The crane operator, positioned in a cabin in the forepart of the structure, is unable to see the winch drums and so detect foul turns or slack runner wire. Hence the drums are usually grooved, and an overhauling weight (ponder ball) fitted to the runner to ensure a steady winching weight to remove any slack when unloaded.

A device to detect runner slackness is fitted. Known as a 'Dancing Roller’ it is held against the runner by spring tension. Excessive movement (eg. slackness in the runner) will cause limit switches to stop power.

7. Limit By-Pass

It may be necessary from time to time to by-pass limits when minimum jib elevation limits must be exceeded, such as stowing the jib in its cradle. Limits can be by-passed by use of a key-switch at the discretion of the crane operator.

SWL Markings

The rated (approved) Safe Working Load (S.W.L.) of the crane must be marked on the jib and next to it the maximum corresponding jib outreach. Often the angle of elevation of that maximum outreach is also marked.

The cranes' arrangement details will be kept in the ship’s Rigging Plan. These will include strength ratings and dimensions of wire rope and small components, and working arcs and limits of the jib.
1. Cab Controls

Activity 4.5 Explain the difference between the hand signals of a derrick and the crane. And repeat the activity 4.3

2. Safety in lifting

There is always an inherent danger whenever weights are to be lifted or moved by means of cranes, booms, tackles, topping lifts or other appliances due to the unevenness of the working platform and changes in dynamic loadings on the gear. Therefore the correct and safe use of the gear, machinery and associated hardware is of vital importance, as is its care and maintenance.

- Stay out from under a loaded boom.
- All motion with heavy weights should be slow.
- Heavy weights should never be allowed to drop.
- Never keep a load in the air any longer than necessary.
- Avoid swinging the load. If you're lifting something off a wharf, drag it until the load is directly under the head of the crane or boom. Do not use the crane to drag the load.
- Attach tag lines to loads to prevent swinging.
- Avoid sudden shocks or strains, and be aware of side pulls. These put great stress on a boom or crane.
- Never use running gear as a handhold.
- Determine weight of load and position of the centre of gravity in relation to the lifting points.

At No Time Must The Load Exceed The Safe Working Load (SWL) Of The Equipment In Use

- Inspect all equipment for defects before and after using
- Ensure the load is free to be lifted i.e., not still bolted down or lashed, and any loose parts secured or removed.
- Make sure there is a clear method of communication between the operator and the signal man.
- The greatest force must be applied at the time of starting a load, in order to overcome inertia. Apply the load gradually to avoid exceeding the S.W.L. Check the load's balance and general security. If this is satisfactory speed may be increased once the load is moving.
- When lowering, stop a short distance above the landing site to allow steadying, to check position for landing, dunnage, and to make sure the slings will not be caught under the load.
Activity: Write a brief abstract of at least 100 words of how important to know all safety precautions prior to commencement of cargo operations.

2. Shore Lifting Equipment

Ports operate and maintain a vast range of cargo handling and other mobile equipment and fixed plant. Which types of equipment are in use at a particular port or terminal will, clearly, depend on the traffic handled and on the methods of cargo handling adopted, particularly the degree of mechanisation achieved. Trade in raw and refined bulk commodities, both liquid and dry bulk, forms a significant role in the economies of many countries, and port frequently undertake the handling, storage and transfer of those materials on behalf of importers and exporters. Containerised, roll-on-roll-off and break bulk general cargoes each demand their own types of handling equipment. The major ranges of equipment used, and their significance in terms of maintenance, will be considered briefly under the headings of dry bulk trades, liquid-bulk trades, containerisation and other unitised traffic, and break bulk cargoes.

Shore Crane

With the exception of those ports where there is a large tidal range, or where the volume of ships and cargo transiting the port demands it the use of shore cranes usually offers little handling advantage over the use of ship’s gear while entailing heavy capital expenditure and additional maintenance problems. For smaller ports where the volume of traffic is limited and the size of the ships calling the ports are relatively small the more prudent and sensible decision would be to rely on ships crane and mobile land cranes rather that incurring the major expense associated with the purchase and maintenance of expensive ship to shore gantry cranes. It should be recognized however that larger modern ships are concentrating more and more on cargo carrying capacity rather than on providing ship's gear to handle cargo. If a port has ambitions to become more than a domestic operation therfore investments in ship to shore gantry cranes is inevitable.

If conventional rail-mounted quay cranes are not to be provided, a small number of mobile cranes on pneumatic tyres will be needed to lift heavy items including containers carried on deck. If the volume of containers or heavy cargo being transported is minimal then , these special cranes will be needed for only a fraction of the ships working time but with containers becoming the most popular means of transporting general cargo the need for these type of equipment is growing. When not required however , they can supplement the mobile cranes working in open storage areas. These heavy mobile cranes with high towers for ship working are less expensive as conventional quay cranes, and much more flexible.
Shore Mobile Cranes

The main method of ship handling in most small ports is either by ship’s gear or shore mobile crane. No rail mounted portal cranes are normally provided and only one gantry crane is usually introduced in the first instance. The standard method of transfer for virtually all classes of cargo is by tractor/trailer combination, using trailers of a size generally associated with container operations.

Hoppers & Conveyor Belts

Dry-bulk installation have specialised grabbing cranes or continuous unloaders linked by conveyors belt to silos, sheds or open storage areas. At the storage point the equipment is needed for receiving and stacking cargo, retrieved and loading it to the ship, rail, or road transport, and
possibly for bagging it before despatch. Such systems are often required to work continuously in a harsh environment for long period with the minimum of maintenance. Highly automated, integrated berth handling system, link ship loading/discharging directly to storage areas, feeder vessels and inland transport, handle many thousands of tonnes per working hour, and are designed to keep ship’s turn round time to a minimum.

Figure 4.11 Grap and Hopper

Pipe Lines

Like dry-bulk terminals, the pipeline system and pumping stations linking the tankers to the extensive tanks farms are in constant use for very long periods, and for maintenance is difficult. The commodities handled vary from the relatively innocuous palm oils and molasses to the highly corrosive liquid fertilisers and the very inflammable petrochemicals and other liquid chemicals. Segregation of cargoes is a particular operational problem, and special maintenance problems are posed by such relatively new practices as single-buoy moorings for large tankers, involving off shore pumping and long pipelines to bring the liquid ashore.
3. Cargo Moving Equipment

The most important development in the shipping industry has been specialisation, with the conventional general cargo liner or tramp vessel rapidly being replaced by a range of new ship designs, each carrying a particular commodity or type of packaging.

When traditional handling methods are used in conventional break-bulk operations, the equipment allocated for the transfer of cargo to and from the quayside is often insufficient to permit the transfer operation to keep up with the hoisting of loads in or out of the ship’s hold. This is demonstrated by the frequent sight of a stationary crane or derrick waiting for a load to be hooked on or off.

*Cargo moving equipment operators shall be qualified and licensed to operate the equipment before he/she is allowed to operate the equipment.*

**Forklifts**

A heavy duty forklift truck with a capacity of 42 tonnes and a top-lift spreader is capable of stacking fully loaded 40ft containers two or three high, with the most common stacking height of two high. A side spreader can be used for 20ft containers both full and empty, and for 40ft empties. Empty containers can be stacked four high. Most port authorities and cargo handling companies have experience in both the operation and maintenance of forklift trucks. Such trucks can transfer containers from the ship’s side to the stacking area.
Straddle Carrier

At the moment, the straddle carrier system is the predominant one. Straddle-Carriers can stack containers two to three high, move them between quay crane and storage area, and load or unload them to or from road transport. Safe operation demanded that straddle carriers should operate within a restricted area and that workers on foot should be kept out of the working area. The fact that despite these drawbacks the straddle carrier is so widely used is a testimony to its flexibility and its ability to meet peak demand.

Tractor/Trailer

Transfer and stacking operations are carried out with large variety of equipment. The tractor will have the ability to haul a fixed load up a specified gradient at a certain speed, as well as a port-adapted, heavy duty fifth wheel to allow crossing ramp connections. The import containers discharged from the ship by crane are placed on a road trailer, which is towed by the tractor head to an assigned position in the storage area.
Gantry Crane

Gantry cranes may be on rubber tyres, which allow them to move to another task at a different part of the site. It can also be used in the container yard, where they combine the mobility of straddle carriers, although slower, with the wide span and height of the ship-to-shore gantry-crane. Rubber-tyre gantry-crane can normally stack containers two to three high. This system is economical in land because of the high stacking, and is suitable for varying degrees of automation.

Activity: The entire container handling system was discussed in this section. The essential features of each of them was also mentioned.

Explain in details the four most commonly used container handling methods in operation today. There can also be various combinations of these type of equipment, describe
4. Cargo Handling Gears

Spreaders

The introduction of the container has resulted in the weight of unit lifts increasing. This has had a major impact on the type of equipment needed in ports. Instead of level-luffing or slewing dockside cranes, spreaders are fitted to the crane to lift containers. Gantry Cranes are specially designed for container traffic. Spreaders are mounted on rotating tables so that containers can be aligned straight into the stack. Ports and operators equip their fork-lift trucks with top-lift or side-lift spreader beams. The use of these attachments for container movement by fork-lift trucks removes the risk of damage by forks.

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Figure: 4.17 (c) Mechanical
Activity 4.8   This activity requires a visit to a port facility if there is no vessel with a gantry crane available. Identify three types of spreader used for loading, discharging and stacking containers.

Slings

Slings are used for assisting with a lift. They are generally shackled to or wound around a load to assist the lift. They can be made from:
- Fibre rope;
- Web slings;
- Wire rope;
- Chain.

Fibre Rope Sling

Advantages:
- lifts without scratching;
- protects load surfaces;
- flexible.

Figure: 4.18   Typical fibre rope slings are shown above.

Web Slings

Web Slings are made of synthetic materials like polypropylene or similar materials. It has a superior strength to rope slings and the advantage of wider band than Rope, Wire and Chain Slings which help protect the load from the sling damaging the Load when the slings start to take up the weight of the Load.
Web Slings.

Check the Safe Working Load of the sling before using.

Wire Slings
Steel wire rope slings are more suitable for lifting machinery or material that will cut easily into fibre ropes. Size for size they are much stronger than fibre rope slings but are more expensive.

Check the Safe Working Load of the sling before using.

Chain Slings
Chain slings are stronger than both wire and fiber rope, and are often used in combination with them, especially the two, three and four legged variety, when lifting bulky loads and machinery.
The 'Collar' sling can have different sized end links so that one may be roved through the other to act as a Choke Hitch.

Figure:4.21  Chain Slings

Activity 4.9  Collect all slings (wire/ropes) at your facility and identify its validity from its certificate in the cargo register book.

**Hooks, Blocks and Shackles**

These are equipment used for lifting of cargo and care should be taken to check the equipment before it is used for cargo operation by checking the condition of the equipment and checking the SWL (Safe Working Load) and check the equipment after cargo operation. If any defects found on the first check or the second check, then that piece of equipment shall be removed and a report shall be given to the
stevedore foreman.

Shackles

Shackles are used to connect objects: one wire to another, a sling to a load, a hook to a block or a hook to a wire rope eye. They are usually made of forged alloy steel, high tensile steel, or mild steel. The nominal size of a shackle is given by the diameter of the material in the shackle body.

Loading on a Shackle

When using a shackle the load shall be on a straight line not on an angle, as this will distort (twist or bend) the shackle.
The Bow shackles are used when there are more than 2 sling eyes are attached to the shackle. See below for the applications of the load on a Bow shackle.

Other types of shackles are usually named in relation to the pin type. Forelock - used for standing rigging, or where vibration is present. If the pin is unthreaded, it has a flat split pin as a keeper to keep the shackle’s pin in place.
Figure 23: A Forelock “D” shackle.

Forklift Adaptor

These are attachments that are interchangeable with the Forklift’s forks. These attachments will be used according to the type of cargo to be handled. (See below for the different adaptors used on Forklifts)

Figure:4.24 Forklifts Adaptors

Personnel Cages (PC)

P.C used to transport stevedores to and from container on the ship to lock and unlock twist locks and take off twist locks from top of containers to
be discharge or put twist locks on top of containers where other containers are to be loaded on top of it.

![Personnel Cages](image1.png)

**Figure 4.25 Personnel Cages**

Activity 4.10 Explain in your own words two important ways of using personal cages in cargo operation.

**This is already documented may be able to use pictures**

**Twist locks**

Device used on the bottom corners of the containers to lock containers to another container or on to the deck to prevent movement of container from the designated slots.

![Twistlocks](image2.png)

**Figure 4.26 Twistlocks**

**Lashing Equipment**

1. **Lashing bars, Turn buckles and lashing hooks**

Lashing bars, Turn buckles and lashing hooks are pieces of equipment designed specifically for lashing of containers. (See below pictures)
2. Web Lashing:
Web lashing are used for lashing of cars and other items that requires non abrasive lashing gears.
3. Lashing Chains

Chains are used to lash heavy cargoes and any other cargo requiring strong lash equipment.

Figure 29: Lashing chains and tensioner.

Tensioners

Tensioners are levers or Turn buckles used to pull the Lashing Chains when lashing cargo. (See below for different types of tensioner)

Figure 30: Typical Lashing Chains Tensioner

Activity 4.10 Explain why it is important to keep the container intact and secured, from the loading port to the discharging port.
5. Limitations of Cargo Handling Equipment

Limitation of Spreaders
- Safe Working Load (SWL) of the spreader shall not be exceeded when using it.
- Spreaders shall only be used for lifting containers and shall not be used for any other operation.
- Do not put loose equipment on top of the spreader as it might fall on somebody.
- Susceptible to mechanical, electrical or hydraulic breakdowns.
- Requires checks before and after use.
- Requires regular maintenance.

Limitations of Slings
- SWL of the Sling shall not be exceeded when using it.
- The angle between parts of the sling shall not be greater than 120°.
- Susceptible to wear and tear of normal operations.
- Requires regular checks for defects before and after use.

Limitations of Hooks
- SWL of the hook shall not be exceeded when using it.
- Hooks can easily be over crowded when using more than 2 slings.
- Hooks are heavy, do not drop hooks on cargo or equipment or personnel.
- Susceptible to wear and tear of normal operations.
- Requires regular checks for defects before and after use.
- Requires regular maintenance.

Limitations of Forklifts Adaptors
- SWL of the adaptor and Forklift shall not be exceeded when using it.
Use the adaptor as it is designed to do. Do not use it for any other operation other than it was designed to do. Means different cargoes different adaptors.
- Only one cargo per adaptor not multiple cargo per adaptor.
- Susceptible to mechanical, hydraulic or electrical breakdowns.
- Requires checks for defects before and after use.
- Requires regular maintenance.

Limitations of Personnel Cages
- SWL of the cage shall not be exceeded when using it.
- Use the cage for carrying personnel only not for anything else.
- Susceptible to normal wear and tear of normal use.
- Requires regular checks for defects before and after use.
- Requires regular Maintenance.

**Limitations of Twist locks**
- Twist lock levers if broken there is no use for the twist lock.
- Twist locks has both left hand and right hand locking so easy to mix both type together and create problems when locking or unlocking. People who are checking whether the twist lock is locked or not are unsure of the condition of the twist lock. ]
- Susceptible to normal wear and tear of normal use.
- Requires regular check for defects.
- Requires regular maintenance.

**Limitations of Lashing Equipments**
- Use the right Lashing equipment to the right cargo is very important for the effectiveness of the lashing.
- Use right tension on the lashing is very important in keeping cargo in place and not moving while the ship is in transit.
- Requires regular checks for defects before and after use.
- Requires regular maintenance required.

**Limitations of Cranes**
- SWL of the crane shall not be exceeded when using it.
- Right attachment shall be use for the right cargo or else the crane or the cargo will be damaged.
- Excessive swinging of the cargo can affect the operation of the crane or even damage the slewing gear.
- Do not apply sudden load shock on the crane runners it break the runner or any part of the lifting gears.
- Only one move at a time per crane.
- Requires regular checks for defects before and after use.
- Requires regular maintenance. ]

**Limitations of Forklifts**
- SWL of the Forklift shall not be exceeded.
- Use the right adaptor for the right cargo, never use the wrong adaptor as this might cause an accident.
- Do not over load forklift this might cause the forklift to loose steering.
- Unstable when lifting cargo high up, easily tip over.
- Susceptible to normal wear and tear.
- Check for defects before and after use.
- Requires regular maintenance.

**Limitations of Trailers**

- SWL shall not be exceeded.
- If containers are not loaded on to the trailer properly it might cause damage to the trailer framings or the trailer might tip over causing an accident.
- Susceptible to normal wear and tear.
- Check for defects before and after use.
- Require regular maintenance.

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### 6. Safety and Maintenance of Cargo Handling Equipment

**Safety while operating cranes - Revisited**

- All motion with heavy weights should be slow.
- Heavy weights should never be allowed to drop.
- Never keep a load in the air any longer than necessary.
- Avoid swinging the load. If you're lifting something off a wharf, drag it until the load is directly under the head of the crane or boom. Do not use the crane to drag the load.
- Attach tag lines to loads to prevent swinging.
- Avoid sudden shocks or strains, and be aware of side pulls. These put great stress on a boom or crane.
- Do not rush the moving of cargo as this will cause an accident.
- Only one signal man to direct the crane driver so as not to confuse the crane driver.
- Check for defects before and after use.

**Safety while operating Forklifts**

- Do not stand on the forks of the Forklifts while it is moving.
- Do not stand under the fork of the Forklift while it has cargo on its forks.
- Do not lift the fork of the Forklift too high while carrying cargo on the fork as this will make the forklift unstable.
- Do not exceed the SWL (Safe Working Load) of the forklift as this will cause the forklift tip forward causing the forklift to loose control.
- Do not ride on the forklift especially when the forklift is working cargo. The forklift was design to carry only 1 person not more.
- Do not drive the forklift at high speed, as the forklift is a heavy vehicle can cause a lot of damage if is involved in an accident.
- Check for defects before and after use.

Safety while operating Tractor Trailers
Do not exceed the SWL of the Trailer as this will bend the frames on the trailer or the tyres might burst and the tractor will have difficulty in trying to tow the trailer or the tractor and trailer might flip over on its side.
- Do not ride on the trailer as the trailer was not designed for joy rides and you might fall and hurt yourself.
- Make sure the trailer is secured properly to the tractor.
- No one is to ride in the tractor driver’s cab other then the driver.
- Do not drive tractor and trailer at high speed as the tractor and trailer are heavy equipment and it has a high centre of gravity and it is not wide enough, it can cause the tractor trailer to tip over when turning in high speed or have an accident.
Check for defects before and after use.

Safety on using Cargo handling equipments
1. Safety in slinging
Safe slinging of loads depends on:
(a) having slings with the correct SWL;
(b) Connecting the load securely to the lifting point;
(c) Keeping the load safe when suspended.

Under NO circumstances must the angle between the parts of a sling exceed 120°

![Diagram](image)

Figure: 4.31 Maximum angle between the sling legs.
- Where a sling assembly is marked with a SWL this relates to angles up to 90 0 and in general this angle should NOT be exceeded.
- Thoroughly inspect slings for damage before and after use. Store in suitable place where damage cannot occur.
- Too many sling eyes on a hook is dangerous. Use a shackle or ring.
- When slinging a load, pack between slings and load at all points where load has sharp corners, so as to prevent damage to slings.

- Do NOT attempt to adjust packings or slings when the crane is tightening the load; fingers and other parts of the body are to be kept clear.

- Stand well clear from under a load. Do NOT approach it until you can reach it.

**Safety on using Lashing Equipment**

Faults in rope sling can easily be identified by visual examination of the rope sling itself.

- Do not exceed SWL of rope.

- Check for defects before and after use.

- Keep any synthetic ropes indoors or shade away from the sun as the sun deteriorates synthetic materials.

- Do not spill chemicals on the rope as the chemical will damage the slings.

- Keep the rope in a dry cool place so humidity won’t damage the ropes.

- Coil ropes after use for ease of storage.

**Safety and care of Web Lashing**

Web Lashings are used for lashing of cars and any cargo that requires non abrasive lashing material.

- Do not exceed SWL of Web sling.

- Check for defects before and after use.

- Do not spill chemicals on the rope slings as the chemical will damage the slings.

- Keep Web lashings indoors or shade away from the sun as the sun deteriorates synthetic materials which the Web lashings are made of.

- Keep the rope in a dry cool place so humidity won’t damage the Tensioners of the Web lashings.

- Roll up the Web lashings and remove the tensioners for ease of storage.

**Safety and Care of Chains**

Faults in chain are not easily seen and should be examined frequently for wastage due to:

- rust;
- cracks;
- distortion.

- Do Not cross, twist, knot or kink a chain.
- Do Not drag from under a load.
- Do Not use around sharp corners, without protective padding.
- Do Not use bolts or 'bull-dogs' for joining or shortening.
- Do Not use if over 10% wear in links.
- Do Not use if links are elongated.
- Do Not use any chain for slinging unless it has the approved S.W.L. tags.
- Do Not make up a sling assembly from separate components, unless you are sure which components are the correct ones.

Chains of mild steel should be checked for the flexing or bending of links. Damage to links where a chain has been used around sharp edges, causing cuts or nicks, is a good reason for condemning.

High tensile and alloy chain have great ability to stretch under shock loads and revert to normal size. If elongation is apparent while not under load, it has been seriously overloaded and should be discarded.

**General Safety during Cargo Operations**

1. **Safety in lifting - Revisited**

**Cautions in Lifting operations**

There is always an inherent danger whenever weights are to be lifted or moved by means of cranes, booms, tackles, topping lifts or other appliances due to the unevenness of the working platform and changes in dynamic loadings on the gear. Therefore the correct and safe use of the gear, machinery and associated hardware is of vital importance, as is its care and maintenance.

- Stay out from under a loaded boom.
- All motion with heavy weights should be slow.
- Heavy weights should never be allowed to drop.
- Never keep a load in the air any longer than necessary.
- Avoid swinging the load. If you're lifting something off a wharf, drag it until the load is directly under the head of the crane or boom. Do not use the crane to drag the load.
- Attach tag lines to loads to prevent swinging.
- Avoid sudden shocks or strains, and be aware of side pulls. These put great stress on a boom or crane.
- Never use running gear as a handhold.
- Determine weight of load and position of the centre of gravity in relation to the lifting points.

**At No Time Must The Load Exceed The Safe Working Load (SWL) Of The Equipment In Use**

- Inspect all equipment for defects before and after using
- Ensure the load is free to be lifted i.e., not still bolted down or lashed, and any loose parts secured or removed.
- Make sure there is a clear method of communication between the operator and the signal man.
- The greatest force must be applied at the time of starting a load, in order to overcome inertia. Apply the load gradually to avoid exceeding the S.W.L. Check the load's balance and general security. If this is satisfactory speed may be increased once the load is moving.

- When lowering, stop a short distance above the landing site to allow steadying, to check position for landing, dunnage, and to make sure the slings will not be caught under the load.

**Unit summary**

In this unit you learned about some of the basic Cargo Handling Gears which you will be using when you complete this course.

You can now be able to identify, use and explain some of the care and maintenance of the basic Cargo Handling gears to prolong its life and avoid extravagant expenses on repair work.

**Remember:** “Your safety is your first priority when it comes to cargo handling equipment”
Assignment 1

1. Identify the equipment used for stevedoring work
   - equipment:
     - Derricks
     - Union purchase
     - Cargo runners
     - Heel pivot

2. Correct demonstration of Hand signals or “Union Purchase”
   - Up
   - Down
   - Stop
   - Direction

3. Identify the Safe Working Load (S.W.L) for the following:
   - Derrick booms
   - Cranes
   - Pedestal Cargo Cranes
   - Ship’s traveling gantry crane
   - Bulk solid self discharger

4. Identify the following cranes components and limits:
   - Level luffing
   - Limit switches
   **Limit Switches Range:**
     - Maximum hook height limit
     - Maximum jib elevation limit
     - Ship out-of-trim limit
     - Dancing roller arrangement
     - Limit by-pass

5. Identify the markings on the equipment
   The rated (approved Safe Working Load (S.W.L) of the crane must be marked on the jib with the maximum jib outreach:
   - The crane’s arrangement Details in the Ship’s Rigging Plan
   - Strength ratings and dimensions of wire rope
- Working arcs and limits of the jib.

6. **Identify cab layouts according to crane types**

- Familiarize with jib and runner controls, alarms, by-pass switches and location of emergency stop button.

7. **Demonstrate the correct crane hand signals that a crane operator must be familiar with during cargo operation:**

- Up & jib up
- Down & jib down
- Stop
- Direction

8. **State the correct and safe use of these lifting gears and machineries:- Cranes, Booms, Tackles, Topping lifts etc..**

- Stay out from under a loaded boom
- All motion with heavy weights should be slow
- Heavy weights should never be allowed to drop
- Never keep a load in the air any longer than necessary
- Avoid swinging the load.

If you’re lifting something Off a wharf, drag it until the load is directly under the head of the crane or boom. Do not use the crane to drag the load.

- Attach tag lines to loads to prevent swinging
- Avoid sudden shocks or strains, and be aware of side pulls
- Never use running gear as a handhold.
Assessment 2

SHORE LIFTING EQUIPMENT:

Identify what these equipment are:
- Portainers
- Shore Mobile Crane
- Hoppers and conveyor Belts

Identify the Safe Working Load of these equipment:
- Portainers
- Shore Mobile Crane
- Hoppers and Conveyor Belts.

Find out Rate of Discharge & Loading
- Portainers
- Shore Mobile Crane
- Hoppers and Conveyor Belts.
Assessment 3

CARGO MOVING EQUIPMENT:
Identify what these moving equipment do in cargo operation;
- Forklift
- Straddlers
- Tractor trailer
- Containers stackers
- Gantry crane

Does these cargo moving equipment have the authority to uplift any cargo weights etc;
- Forklift
- Straddlers
- Tractor trailer
- Containers stackers

Assessment 4

4.4 CARGO HANDLING GEARS
Who approved these cargo handling gears before it is used for cargo operation;
- Spreader
- Slings
- Hooks
- Forklift adaptors
- Personnel cage
- Twist locks
- Lashing equipment

During the absence of a port state inspector to do the survey of the above gears, which other authorized organization can you hire or contracted to survey the above cargo gears.
Assessment 5

**4.5 LIMITATION OF CARGO HANDLING EQUIPMENTS.**

Why are limitations on these cargos handling equipment?

How do you identify these limitations on these cargo handling gears.

How often do you inspect these cargo handling gears.

Assessment 6

**4.6 SAFETY AND MAINTENANCE**

Who is responsible for safety of cargo equipment on the ship?

How often does the cargo handling equipment on the ship, surveyed

How often does the cargo handling gears on the dockyard, surveyed?

Students Name : __________________________

Date : __________________________

Assessor : __________________________

Checked by : __________________________
Unit 5

Maritime Security

Introduction

In today’s world, security is everyone’s business. Although the Maritime Industry like all other industries was mindful of security it was the events in the United States of America on 11 September 2001 that propelled the focus on security to the level that it is today.

After these attacks, the United Nations called on the international community to redouble its efforts to prevent and suppress terrorist acts, including full implementation of all anti terrorist Conventions. Simultaneously, the Secretary General of the International Organization (IMO) proposed to the Member States that the Organization should review, as a matter of utmost urgency, all of its Conventions and other instruments that have a bearing on the prevention and suppression of unlawful acts, including terrorism, which may affect the safety and security of shipping and port operations.

The proposal was made because terrorist acts against shipping and ports for example, the use of a gas tanker as an explosive device in a major port city, an attack on a large cruise ship, or the explosion or deliberate sinking of vessels in canals or heavily trafficked shipping lanes would have enormous commercial, environmental and public health consequences. Moreover, such incidents could have a significantly adverse impact, for a considerable period of time, on the transportation of the world’s trade, over 90% of which is carried by merchant ships and passes through ports, and therefore on the global economy.

In the Maritime Industry maritime security is focus particularly in the area where the interface occurring between the ship and the port facility takes place. At the center of this ship/port interface is the cargo operations carried out by stevedores.

This unit is designed to teach the stevedore about maritime security affiliated with his functions at the port facility. Each individual will learn about maritime security as it relates to the duties and responsibilities of a stevedore.

Upon completion of this unit you will be able to:
Outcomes

- explain the maritime security threat levels required under the international ship and port facility security (ISPS) code.
- describe the security responsibilities of the major stakeholders surrounding ship and port facility cargo operations.
- demonstrate the procedures governing security reporting and record keeping.
- explain the security requirements in dealing with the various types of cargo handling operations.

Terminology

ISPS Code: International Ship and Port Facility Security Code means the International Code for the Security of Ships and of Port Facilities consisting of part A (the provisions of which shall be treated as mandatory) and part B (the provisions of which shall be treated as recommendatory), as adopted, on 12 December 2002, by resolution 2 of the Conference of Contracting Governments to the International Convention for the Safety of Life at Sea, 1974 as may be amended by the Organization.

Ship/port interface: the interactions that occur when a ship directly and immediately affected by actions involving the movement of persons, goods, or the provisions of port services to or from the ship.

Port Facility: a location, as determined by the Contracting Government where the ship/port interface takes place. This includes areas such as anchorages, waiting berths and approaches from seaward, as appropriate.

Security Incident: any suspicious act or circumstance threatening the security of a ship, including a mobile offshore drilling unit and a high-speed craft, or of a port facility or of any ship/port interface or any ship-to-ship activity.

Security Level: the qualification of the degree of risk that a security incident will be attempted or will occur.

Declaration of Security: an agreement reached between a ship and either a port facility or another ship with which it interfaces, specifying the security measures each will implement.

Port Facility Security Plan: a plan developed to ensure the application of measures designed to protect the port facility and ships, persons, cargo, cargo transport units and
Transport and Logistics - Stevedoring

ship's stores within the port facility from the risks of a security incident.

**Ship Security Plan:** a plan developed to ensure the application of measures on board the ship designed to protect persons on board, cargo, cargo transport units and ship's stores within the port facility from the risks of a security incident.

**Ship Security Officer:** the person on board the ship, accountable to the master, designated by the Company as responsible for the security of the ship, including implementation and maintenance of the ship security plan, and for liaison with the company security officer and the port facility security officers.

**Port facility Security Officer:** the person designated as responsible for the development, implementation, revision and maintenance of port facility security plan and for liaison with the ship security officers and the company security officers.

**Company Security Officer:** the person designated by the company for ensuring that a ship security assessment is carried out; that a ship security plan is developed, submitted for approval, and thereafter implemented and maintained, and for liaison with port facility security officers and the ship security officer.

1. **ISPS Familiarization Training**

**Historical Perspective**

Since the terrorist attacks in the United States on 11 September 2001, the world has a heightened sense of security awareness. The maritime industry is no longer considered a safe, non-political, global transportation system that moves goods by sea harmlessly from one place to another. Instead it is now viewed as a liability that exposes all nations, maritime and non-maritime alike, to the threat of terrorist attack.

Following these events, the International Maritime Organization (IMO) adopted in December 2002 a number of amendments to the 1974 Safety of Life at Sea Convention (SOLAS). The most far-reaching regulation enshrines the new International Ship and Port Facility Security Code (ISPS Code), which contains detailed security-related requirements for Governments, port authorities and shipping companies in a mandatory section (Part A), together with a series of guidelines about how to meet these requirements in a second, non-mandatory section (Part B). The requirements in the ISPS Code are identical for ships and port facilities.
The ISPS Code was established to provide a standardized, consistent framework for evaluating risk, enabling governments to offset changes in threat with changes in vulnerability for ships and port facilities. As a result, all activities around a ship and port facility, including stevedoring, must adhere to security standards that meet international expectations.

**Maritime Security Threats**

Traditionally, there are six (6) maritime security threats that affect every port and every vessel in varying degrees. They are as follows:

- Pilferage & Theft
- Illicit Drug Smuggling
- Illegal Migrants & Stowaways
- Armed Robbery
- Piracy
- Sabotage

**Recognition and Detection of Weapons, Dangerous Substances and Devices**

The following are examples of weapons which may be shipped illegally.

![A-K 47 Rifle](image1)

**Figure 5.1.3a** A-K 47 Rifle

![Pipe Bomb](image2)
package bomb
figure 5.1.3c

Grenade Launcher
figure 5.1.3d

handguns/rifles - AK-47, M16
UZI submachine guns
Grenade Launcher
Package Bomb
Pipe Bomb
Nonmetallic knives
Dynamite
Explosive Components
Explosives with nails
Weapons of mass destruction (WMDs)

Techniques Used to Circumvent (Avoid) Security Measures

Even though security measures and equipment may be in place they are still subject to human error and malfunction. It is possible that faulty alarm systems, broken locks, and radio jamming may not be coincidental.
They may in fact be intentional acts used to distract and confuse individuals. Below are some other techniques used to circumvent security measures:

- Electrical Outages
- Loss of Communications
- New Employees
- False Identification
- Excessive Innocence
- False Distress
- Overt Acts of Diversion

**Maritime Security Levels**

The ISPS Code identifies three security levels which are applicable to both ships and port facilities.

**Level One:** Ships and Port Facilities operate at ISPS Level 1 during normal day-to-day operations. This is the lowest level, where minimum security measures should be maintained at all times.

**Level Two:** Ships and Port Facilities move to ISPS Level 2 if a threat is likely. This occurs when information has been gathered suggesting that there is a possible threat. Level 2 includes all measures from level one and additional security measures as a result of a heightened security level decided by the government.

**Level Three:** Ships and Port Facilities move to ISPS Level 3 if a threat is imminent. This occurs when information has been gathered suggesting that a security incident is probable or imminent. Level 3 includes all measures from level one and two and additional measures as a result of a heightened security level decided by the government.

**Port Facility Security Plan (PFSP)**

The ISPS Code requires that both ships and port facilities have a security plan. The security plan for the port facility directly relates to the stevedore in the performance of his duties.

Preparation of an effective PFSP will rest on a thorough assessment of all issues that relate to the security of the port facility, including, a thorough appreciation of the physical and operational characteristics of the individual port facility.

Contracting Governments should develop procedures to assess the continuing effectiveness of each PFSP and may require amendment of the PFSP prior to its initial approval or subsequent to its approval. The PFSP should make provision for the retention of records of security incidents and threats, reviews, audits, training, drills and exercises as evidence of compliance with those requirements.

The primary components of the PFSP that are required to be addressed in dealing with ISPS compliance at port facilities are:

- Access to the port facility
- Restricted areas within the port facility
Handling of cargo
Handling of ship’s stores
Handling unaccompanied baggage; and
Monitoring the security of the port facility

Handling of Cargo is the primary component which directly affects the stevedores. However, Access to the port facility and restricted areas within the port facility is also important for stevedores.

Access to the Port Facility
Access Control: Operational Security Measures

Operational Security consists of the actual activities carried out by the security personnel; these include:
- security patrols
- random searches
- visitor processing
- identification checks
- communications
- cargo inspection
- investigations
- drills and exercises

In addition, vehicle access points must be monitored by Security Guards.

All employees are required to wear visible badges at all times within the port facility or aboard a ship. Access will be denied to anyone who refuses to identify him or herself to the port or ship security officer. Stevedores must comply with all access control procedures by the port and ship, this includes being challenged by and submitting to random searches by security personnel.

All employees, including longshoremen, stevedores, ship representatives, etc, must have their ID badges provided by the company or port authority, the team leader may sign in/out the whole crew. The gangway watch and stevedore team leader would verify the entry/exit using the approved access list.

All visitors with special passes must be readily identified by visibly displaying their visitor pass at all times. All employees should report any person in the facility without proper identification.

Procedures must be in place to identify, challenge and address unauthorized/unidentified persons.

Any suspicious circumstances should be reported immediately to the Security Guard, the Guard Supervisor or the Port Facility Security Officer. Radio communications should not be used to make reports of suspicious activities.

The person involved should make all reports so that there is no miscommunication.
Access Control: Physical Security Measures

Physical security is the actual measures that impedes or minimize free movement within or around the ship or port facility. These include but are not limited to:

- fencing
- lighting
- signage
- buffer zones
- alarm systems
- locks
- CCTV
- crossbars
- turnstiles
- Automatic Intrusion Detection Devices
- Automatic Ship Security Alert System
- Automatic Identification System

Stevedores are not expected to know detailed technical knowledge of physical security measures; however, the stevedore should ensure familiarity with the handling of such devices and systems.

Restricted Areas

The purposes of restricted areas are to:

- protect passengers, ships personnel, port facility personnel and visitors, including those visiting in connection with the ship;
- protect the port facility
- protect ships using, and serving, port facility
- protect sensitive security location and areas within the port facility.
- protect security and surveillance equipment and systems; and
- protect cargo and ships stores from tampering.

Marking of restricted areas

All restricted areas should be clearly marked by signs indicating that access to the area is restricted and that unauthorized presence within the area constitutes a breech of security. ‘Restricted Areas’ should be bounded by fencing or other barriers to a standard which should be approved by the Contracting Government.

Any one who is not authorized to go into any restricted areas should be escorted by a crew member or security of the Port Facility ensuring he or she has a visiting pass for the time of visit.

It is mandatory that badges/passes issued by the port facility or ship be visibly worn at all times
Stevedores, dockers and visitors must be advised of the sign and rules governing all restricted areas.

**Typical Restricted Areas at a Port Facility**

shore and waterside areas immediately adjacent to the ship embarkation and disembarkation area, passenger and ship personnel holding area including search point loading, unloading or storage of cargo and storage of cargo and stores area.

area where security sensitive information, including cargo documentation, is held

area where dangerous goods and hazardous substance are stored

aids to navigation and port control building, vessel traffic management system control room, including security and surveillance control room.

electrical radio and telecommunication, water and other utility installation.

These security measures may extend, with the agreement of the relevant authorities, to restricted on unauthorized access to structures from which the port facility can be observed.

**Typical Restricted Areas onboard ship.**

Navigation Bridge, machinery spaces of category A and other control stations.

space containing security surveillance equipment and system and their controls and lighting system controls.

ventilation and air conditioning systems and other similar spaces

spaces with access to portable water tanks. Pumps or manifolds

spaces containing dangerous goods or hazardous substance

space containing cargo pump and their controls

cargo spaces and spaces containing ships stores

crew accommodation and

any other areas as determined by the CSO, to which access must be restricted to maintain security of the ship.
Figure 5.1.8a

Figure 5.1.8b
Drills and Exercises

The objective of drills and exercises is to ensure that Port Facility Personnel are proficient in all assigned security duties at all security levels and in the identification of any security related deficiencies, which would need to be addressed.

Effective implementation of the provisions of the PFSP requires that drills be conducted at least once every three (3) months unless the specific circumstances dictate otherwise. Drills should test individual elements of the plan such as:-

- Damage to, or destruction of, the Port Facility or the ship (e.g. By explosive devices, arson, sabotage or vandalism, etc)
- Hijacking or seizure of the ship or of persons onboard
- Tampering with cargo, essential ship equipment or systems or ship’s stores
- Unauthorized access or use including presence of stowaways
- Smuggling weapons or equipment, including weapons of mass destruction
- Use of the ship to carry persons intending to cause a security incident and their equipment
Use of the ship itself as a weapon or as a means to cause damage or destruction, blockage of port entrances, locks, approaches, etc.

ISPS Drills are to be carried out at least once in every three months. Drills should test the ability to change security levels without delay, and may include simulation of evacuating the ship and/or facility.

Various types of exercises that may include the participation of PFSO (s) in conjunction with relevant authorities of Contracting Governments, Company Security Officer (CSO), or Ship Security Officer (SSO), if available, should be carried out at least once each calendar year with no more than eighteen (18) months between the exercises.

These exercises should test communication, coordination, resource availability and response. These exercises may be:

- Full scale or live
- Tabletop simulation or seminar or
- Combined with other exercises held such as emergency response or other Port State Authority exercises.

**Communications**

Stevedores should understand that certain information and communications will be considered security sensitive and that the level of sensitivity may change, as do levels of security.

All personnel should appreciate the risk of security leaks through communication by improper methods or to the wrong persons. Seemingly benign conversations, therefore, may result in disastrous consequences.

Some communication of information considered sensitive may be:

- Ship movement
- PFSP details
- Information about cargo
- Security Intelligence received, etc.

### 2. Security Responsibilities

#### 5.2.1 Contracting Governments

The Contracting Government shall set security levels and provide guidance for protection from security incidents. It is also responsible for communicating information to the IMO and to the shipping and port industries.

The Primary Responsibilities of Contracting Governments includes:

- Security of Assessments and Plans
- Establishment of Designation Authorities
- Authorization of Recognized Security Organizations
- Setting the ISPS Security Level for flagged Ships and Port Facilities
- Arranging alternative security agreements when necessary
Maintaining the manning level for ships under its flag

Establishing Control and compliance measures

**The Ship**

The ship carries an International Ship Security Certificate (ISSC) indicating that it complies with the requirements of chapter XI-2 and part A of the ISPS Code. The verification and certification of the ship’s compliance with the requirements are done on an initial, renewal and intermediate basis.

Prior to entering a port or whilst in a port within the territory of a Contracting Government, a ship shall comply with the requirements for the security level set by that Contracting Government.

**Ship Security Officer (SSO)**

Every ship requires a designated Ship Security Officer. This is the person on board the ship, accountable to the master, designated by the Company as responsible for the security of the ship, including implementation and maintenance of the ship security plan, and for liaison with the company security officer and port facility security officers.

**The Port Facility (PF)**

A port facility is required to act upon the security levels set by the Contracting Government within whose territory it is located. Security measures and procedures shall be applied at the port facility in such a manner as to cause a minimum of interference with, or delay to, passengers, ship, ship’s personnel and visitors, goods and services.

The Contracting Government/Designated Authority located within its territory approves a Port Facility Security Assessment (PFSA) and a Port Facility Security Plan (PFSP) for every port facility. A designated PFSO shall maintain ISPS security measures at the port facility, based on the approved assessment and plan.

**Statement of Compliance of a Port Facility (SoCPF)**

A Statement of Compliance is issued by the Contracting Government within whose territory the port facility is located to indicate: the port facility, that the port facility complies with the provisions of chapter XI-2 and part A of the Code, the period of validity of the SoCPF which should not exceed five years, and the verification arrangements established by the Contracting Government.

**Port Facility Security Officer (PFSO)**

Port Facility Security Officer (PFSO) is the person designated as responsible for the development, implementation, revision and maintenance of the PFSP and for liaison with the SSO and CSO. A person may be designated as a PFSO for one or more port facilities. The PFSO shall be given the necessary support to fulfil the relevant duties and responsibilities.

**Personnel with Specific Security Duties**
Port facility personnel having specific security duties is the security force employed by the port facility to carry out the necessary operational security measures outlined in the port facility security plan.

**Other Port Facility Personnel (including Stevedores)**

Other Port facility personnel are all personnel engaged with non-security port activities on a routine basis. Since security is everyone’s business, other port facility personnel, including stevedores share the responsibility in maintaining security awareness and reporting suspicious activities to security.

### 3. Documentation and Records

Some of the main documents of concern are as follows:

- TRAINING DRILLS/ EXERCISES
- SECURITY THREATS/ INCIDENTS
- MAINTENANCE/ CALIBRATION OF EQUIPMENT
- BREACHES OF SECURITY
- CHANGES IN LEVELS OF SECURITY

**Reporting security incidents**

The purpose of a report is to recount certain facts/occurrences, in an orderly sequence so that the person it is address to will be fully informed of the incident and would be able to make recommendation or take what ever action is necessary.

It is a requirement that, ship owners, stevedores, and crew report any incident or suspicious activity they observe to the ship security or supervisor during the process of the handling of cargo, followed by a written report within 24 hrs.

When there is a confirmed report of a suspicious item or package, the PFSO/SSO will decide what action is to be taken with regard to evacuation from the area.

**If a suspicious item/package is found:**

- Do not attempt to move or interfere with it in any way.
- Do not put water over it.
- Do not cover it.
- Bear in mind that there may be more than one bomb.
- Inform the authorities of the suspicious item/package, its description and location.

Reports of suspicious packages, behaviour and activities are only examples of what types of events to report. The report itself however, should be factual, accurate, objective, complete, concise, clear, correct, legible and on time. It should also answer effectively the six (6) interrogatives of who, what, where, when, how and why.
Stevedores must ensure that all security incidents are reported in accordance with specific reporting requirements.

It is always good to write reports when the incident is fresh in your mind.

Thing to be written in detail in a report:

When it happen (date, day, time)
Where did it happen (place)
Who or what it happen to
What happen
Who did it
Why did it happen
Who saw it happen

**Company Policy and Responsibility:**

When vessels are carrying dangerous goods, it is the responsibility of the owner of a vessel to inform stevedore workers and other person working on board, about its stowage location, potential hazards and safety measures needed to be observed.

Stevedores should not remove, alter, displace or interfere with any safety/security device provided for to avoid security incidents.

4. Security of Cargo

**Maintaining Security of the Ship/Port Interface**

Ship/Port Interface means the interactions that occur when a ship is directly and immediately affected by actions involving the movement of persons, goods or the provisions of port services to or from the ship.

This interface between the ship/port determines that a port facility exists and therefore determines the need for a PFSP and the interaction with the Ship Security Plan. The setting of security levels by the port or by the ship, with liaison services provided by the CSO, will allow the PFSO and the SSO to understand their duties and constraints.

**Usage of the Declaration of Security (DOS)**

Declaration of Security means an agreement reached between a ship and either a port facility or another ship with which it interfaces, specifying the security measures each will implement.

The PFSP should establish details of the procedures and security measures the port facility could adopt if the port facility is at a lower security level than that applying to a ship.

**Security Measures for Cargo Control**

Guard surveillance
Control system
Parking areas
Screening
Investigations
Key control
Security patrol
Detection and surveillance systems
Perimeter fencing and access controls
Accounting procedures
Secure storage areas
Liaison

**Actions Required at Different Security Levels**

There are three tiers or levels of security within the ISPS security system. Each level specify what is expected in relation to security when handling cargo.

**Level One:** During cargo handling operations it is recommended that a port facility implement the following measures:
- Routine checking of cargo, cargo transport units and cargo storage areas within the port facility prior to, and during, cargo handling operations
- Checks to ensure that cargo entering the port facility matches the delivery note or equivalent cargo documentation
- Checking of seals and other methods used to prevent tampering upon entering the port facility and upon storage within the port facility
- Visual and physical examination of cargo

**Level Two:** During cargo handling operations it is recommended that a port facility implement the following measures at level 2:
- Detailed checking of cargo, cargo transport units and cargo storage areas within the port facility prior to, and during, cargo handling operations
- Intensified checks, as appropriate, to ensure that only the documented cargo enters the port facility, is temporarily stored there and is then loaded onto the ship
- Increased frequency and detail in checking of seals and other methods used to prevent tampering upon entering the port facility and upon storage within the port facility
- Increase frequency of Visual and physical examination of cargo
- Increase frequency of the use of scanners/detection equipment, mechanical devices and dogs

**Level Three:** At security level three the port facility should implement the following:
- Restriction or suspension of cargo movements or operations within all or part of the port facility or specific ships
Verify the inventory of dangerous goods and hazardous substances held within the port facility and their location.

The security of different types of cargo:

**General Cargo:**

General cargo is usually shipped in manageable quantities that can be easily checked. However, the larger the overall quantity and the smaller the individual cargo units, the greater the problems associated with verification and security.

Undetected tallying errors may result in what is termed theoretical loss of cargo. Actual loss may result due to pilferage or theft.

The security measures at the different security levels apply. In addition, stevedores should be watchful and report any suspicious activities they observe. Suspicious packages should also be reported.

**High value cargo:**

This type of cargo include mostly currency, artwork election ballot or diplomatic bag when loaded in containers, must always be stow on the third or forth tier (depending on how many tier the vessel can stack its container on deck) on board the carrying vessel and they should be stowed door to door.

High value cargo must be discharge in the presence of armed port security or other armed security personnel. The security measures at the different security levels must be adhered to without compromise.

High-value items demand uncompromising standards of security and confidentiality.

**Refrigerated Cargo:**

Refrigerated cargo usually comes in reefer containers and can be stowed either on deck or under deck of the carrier. They consist mostly of perishable goods such as fruits, vegetables or frozen sea food. The temperature is regulated by electric motors at the rear end of the container.

The security measures at the different security levels apply. However, stevedores should perform the following checks:

- check that electric cables of the containers are connected
- check that the temperature is properly regulated
- check that there is a valid sea lock (seal)
- check the motor area for suspicious activity and packages
- keep a constant watch of the container

**Dangerous cargo (IMDG):**

Dangerous cargo poses a significant risk to health, safety, property or environment. Therefore it requires the maximum security.

The Master of the ship should ensure that the cargo is properly labelled. Stevedore and other persons working on board should be advised of the presence and location of the dangerous goods. They should also be
reminded of the precautionary measures associated with the particular cargo to minimize the risk involve when handling such cargo.

Stevedores should following the handling procedures associated with the labelled cargo and apply the recommended security measures at the different security level.

**Bulk Cargo**

Unsegregated mass commodities including, without limitation, items such as petroleum products, coal, natural gas, grain and bulk salt. Loading and discharge are normally performed at specialized terminals, using cargo handling systems that are designed for the specific commodities.

The security measures at the different security levels apply.

**Roll-on, Roll-off (Ro-Ro) Cargo**

Roll-on, Roll-off (Ro-Ro) cargo is generally rolled on and rolled off of the ship. Vehicles have many areas where illegal contraband could be stored and shipped.

In light of this, the security measures at the different security levels should be adhered to with vigilance. Stevedores should ensure that a proper inspection of the vehicle is conducted.

**Containerized cargo**

Containerized cargo is a major part of international trade. Packages which would have otherwise been general cargo may be grouped and placed in a container for easier handling.

However, container security has been an issue because of an inherent flaw in the design of their sealing mechanism and the construction of the container. As a result, container integrity may be comprised by the introduction of unauthorized material and/or persons.

There is a possibility of weapons, dangerous substances and devices stowaways and/or drugs being transported in containers. Therefore, containers should be stored in a secure area to prevent unauthorized access and/or manipulation.

Despite these limitations, it is possible to get a general idea of the integrity of a container by examining the seal which is now affixed to containers to verify their security. A high security seal should be affixed to all loaded containers. There should be a thorough inspection of the structure of the container prior to sealing.

The following seals maybe used on containers:

**Ringlock seals**
Figure 5.4.1 - The ringlock seal provides a positive barrier against unauthorised tampering or entry. Once the seal is closed, it is impossible to open without destroying or damaging the seal or leaving visible signs of damage. The ringlock seal is a quick, economical way of providing security. These ringlocks are a one piece 'snap fix' seal, they can be barcoded, colour-matched or logo embossed and can be easily attached or removed by hand. Standard length is 217mm and standard colours are red and green, other lengths and colours can be ordered in. Standard number is sequential alphanumeric with seven spaces. Packed in boxes of 1000 pcs.

**Posicheck metal seals**

Figure 5.4.2 - Sophisticated design ensures a high level of security and maximum protection against tampering. Visual indicator and alignment holes help to aid the sealing process. They are serial numbers permanently embossed with individual alphanumeric numbering. They fit through extremely thin slots. The Posicheck comes in boxes of 1000 pcs.

**Tyden Brammall seals**
Figure 5.4.3 - The Tyden seal has a unique patented locking ball head. The Tyden seals are manufactured from tin plate and are sequentially numbered. The seals have a usable length of 177mm and are packed in boxes of 1000 pcs. Also available as pictured are 50m rolls of Aluvin 4mm wide slotted extension tie wire suitable for Tyden Brammall and other seals.

**Omega seals**

Figure 5.4.4 - Plastic and metal assembly gives maximum physical security. They can be used quickly by hand and can only be removed by scissors. A Stepless grip design produces a smooth strap, narrow strap suitable for small apertures down to 2.0mm. They are available in 160mm operational length, in white, and packed in boxes of 1000 pcs.

**Snapper Bolt seals**
Figure 5.4.5 - This is a high security metal and plastic bolt seal. These seals are specially designed for sealing containers and doors of all descriptions used for shipping, airfreight, roadfreight and railfreight. The Snapper Bolt seal comes in high visibility yellow, they are shatter resistant and the plastic covering gives a clear evidence of tampering as well as providing corrosion resistance. These seals have pull strength of approximately 1720kg and shear strength of approximately 2000kg. Numbering is available on both bolt and body. The seals are fully lubricated to prevent friction attack and are removable only with bolt cutters. These seals come in boxes of 250 pcs.

Cable seals

Figure 5.4.6 - These seals are available in a variety of cable sizes and lengths. They can only be removed with wire cutters. Standard seals are sequentially number. They are ideal where hasps and latches are not properly aligned and where flexing of the seal is required. These seals come in boxes of 1000 pcs.

The security measures at the different security levels apply. Additionally, stevedores should:

- inspect the container carefully before discharging
- check containers for damaged seals, fresh welding, cut lock bar, unauthorized marks or a false compartment.
Empty containers should be re-sealed when being loaded onto a ship
Empty containers are to be sealed when being stored at a port facility

Unit summary

In this unit you learned about maritime security as a stevedore in a port facility. This was achieved through a number of minimum functional security requirements for ship and port facility operations. The successful participant should therefore be well poised to conduct his duties with a security conscious frame of mind.

Assignment

1. List the six (6) major maritime security threats.
2. List five (5) breaches of security on board a ship and at a port facility.
3. Outline the basic procedures for reporting security incidents.
4. Explain the detailed requirements of the three (3) security levels in relation to handling of cargo.
5. Explain what is considered a ‘Restricted Area’ on board ship and at the port facility.
6. Explain the stevedore’s role in security drills and exercises.
7. Explain the requirements to wear identification badges and visitor passes while at the port facility.
8. While off loading cargo from a container vessel at the port of Basseterre, a Stevedore observed at about 1800hrs on the 12th November 2009 that there were two container seals broken and the door lids were slightly ajar, with a cell phone lying on the deck next to the container.
9. Utilizing the standard security report form, write a report detailing this finding.
Assessment

1. Define the three (3) maritime security levels.
2. Explain the necessity to keep sensitive security information confidential.
3. Explain six (6) procedural practices in reporting security breeches that are likely to be observed at the ship/port interface.
4. Describe six (6) weapons likely to be transported via ships, for use by terrorists.
5. Describe five (5) typical behavioural patterns of a person who is likely to threaten security at a port facility or onboard a ship.
6. Explain five (5) techniques that is likely to be used to circumvent (avoid) security measures.
7. State five (5) places on board a ship that would normally be deemed a “Restricted Area”.
8. State five (5) places at the port facility that would normally be deemed a ‘Restricted Area’.
9. Describe the importance of maintaining records of cargo movement at the port facility.
10. List possible security breeches when handling the following cargo types: General Cargo, Ro-Ro Cargo and Containerized Cargo.