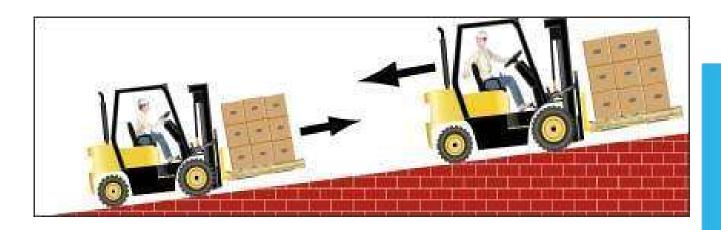




## Problem 11

### Safety first













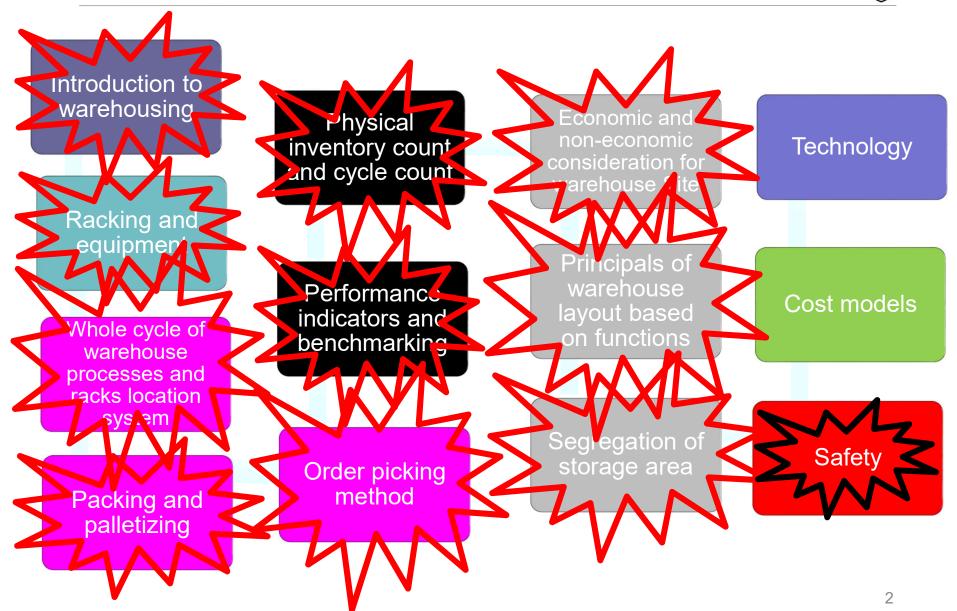






SCHOOL OF ENGINEERING E215 – Warehousing and Storage

### E215 Warehousing and Storage Topic Flow



#### **Learning Objectives**

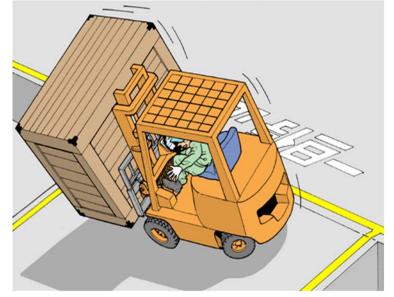


 Identify and explore the different areas and concerns of warehouse safety

Analyze each elements of warehouse safety

Elaborate some of the government regulations

required



### Importance of Warehouse Safety



#### **Employee Safety Awareness**

To provide a safe environment for employees by not just teaching warehouse safety rules, but by enforcing them.

#### **Benefits of Safety**

To prevent:

- 1) Injuries
- 2) Loss of life and properties
- 3) Interruption of business

#### Key Elements for a Safe Warehouse



- New Employee Orientation
- 2. Safe Materials Handling
- 3. Fire Safety
- 4. Safeguarding against Hazards
- 5. Sustainable Housekeeping
- Dock Safety
- 7. Materials Handling Equipment (MHE)
- 8. Warehouse Inspection Process
- 9. Chemical Exposures in the Work place
- 10. Personal Protective Equipment

#### 1) New Employee Orientation



- a) Discussion of Warehouse Safety Rules
- b) Reporting of Injuries and Unsafe Conditions
- c) Proper use of tools
- d) Demonstration of Safe Way To Do Assigned Job
- e) Wearing of Personal Protective Equipment (PPE).
- f) House Keeping Practices
- g) Safe Method of Manual Lifting
- h) Proper use of Powered Equipment & Pressure Vessels
- i) Safe Handling of Flammable
- j) Safe Handling of Forklift Batteries and Charging
- k) Warehouse Emergencies

### 2) Safe Materials Handling



- a) Wooden Pallet Safety
- Separate Storage and Shipping pallet
- Sort out damaged pallets
- Dispose damaged and unsafe pallets
- b) Racking System
- Observe "safe working loads", widths, heights of pallet loads.
- Always consult the manufacturer before adjusting the height of beams
- Aisle should be of correct width
- Provide adequate back-to-back space for pallet overhangs and sprinkler pipes.



- Fire safety standards for buildings in Singapore were governed by the *Code of Practice for Fire Precautions in Building* ("Fire Code").
- Owners of public buildings are currently required to engage a Professional Engineer to conduct tests on fire safety systems annually to ensure that the systems are in good working condition.
- SCDF will issue a Fire Certificate after the Professional Engineer has certified that the systems function properly.







- a) Understanding Fire and Fire Extinguishers
- Fire needs 4 essential elements to start: Oxygen, Fuel, Spark/
   Ignition source and a Chemical chain reaction
- Portable fire extinguishers can be divided into five categories:
   Water, Foam, Powder, Halon, Carbon dioxide
- Most commonly used: Class ABC ("general purpose") Dry powder extinguisher has a based content of mono ammonium phosphate.
- b) Under the Singapore Standard, Code of Practice 55, Use and Maintenance of Portable Fire Extinguishers, the owner or occupant of a premise is responsible for the inspection and maintenance of the fire extinguishers installed in the premises.

**ABC Dry Powder** 









- Fire Reel Hose
- Manual Fire Alarm System

Electrical alarm initiated by the operation of a 'break glass' alarm call point.

Smoke Detectors



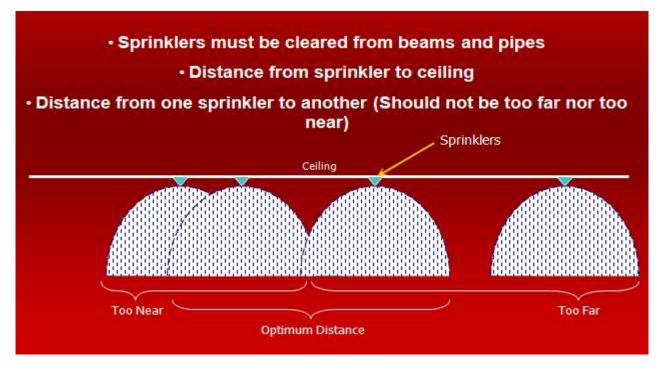






#### Automatic Fire Sprinkler System

Properly installed and maintained automatic fire sprinkler systems help save lives. Because fire sprinkler systems react so quickly, they can dramatically reduce the heat, flames, and smoke produced in a fire.





**Sprinkler Heads** 



- c) Fire Assess Road
- Allows Fire Engines to position nearer the fire site and assess to fire hydrants.
- d) Firemen Assess designated window panels (circle in "red") by SCDF, it must not be blocked or sealed.





### 4) Safeguarding against Hazards



- a) Safety Guards for Moving Parts
- Conveyor systems, Pulley belts and Elevator doors create exposures to pinching, shearing, cutting or grinding actions – these are hazards
- These can be controlled through proper placing of safety guards, through training and appropriate signage

#### b) Safety Barriers

- Safety Barriers (metal) are fixed to protect offices areas, walkways. Special racking post guards can protect the racking upright systems.
- Barriers are fixed along pedestrian walk-ways as protection and guide. Most walkways must have yellow line markings.

#### 4) Safeguarding of Hazards (Safety Signs)





**CAUTION** 

**AUTHORIZED** 

PERSONNEL

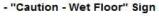
ONLY













#### 5) Housekeeping



- A safe, orderly, efficient warehouse is the key to a successful operation.
- Good housekeeping is one of the surest ways to identify a safe workplace. Good housekeeping is not the result of cleaning up once a week or even once a day. It is the result of keeping cleaned-up all the time. It is an essential factor in a good safety program, promoting safety, health, operations, and morale.

#### **Safety Committee Meeting**

 The purpose of this safety meeting is to CRITICALLY look at the warehouse with safety in mind—so that ALL EMPLOYEES are alert to the hazards and always do what's necessary to prevent accidents.

#### 5) Housekeeping



#### Warehouse housekeeping hazards

- Objects or materials in aisles or on the floor, which become tripping hazards
- Materials stacked or stored loosely or insecurely that might fall on someone
- Protruding nails, fasteners, and other sharp objects that can puncture or cut
- Large items left where people can bump against them
- Trash strewn about that can cause someone to trip or slip. Flammable trash can, of course, be a fire hazard
- Water, oil, or other liquid spills on the floor that can cause slips and falls.

#### 5) Housekeeping



## THE 5S PRINCIPLES (Adopted from the original Japanese good Housekeeping Practices)

**SEIRI - Sort out** 

**SEITON** – Systemize (Orderliness)

**SEISO** – Shining (the cleaning)

**SEIKETSU – Standardize** 

**SHITSUKE - Sustain (Discipline)** 

#### **Benefits:**

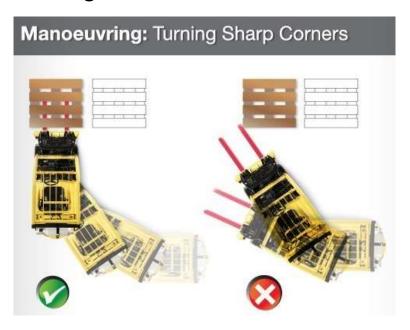
TIME SAVING
QUICK RETRIEVAL
ACCIDENTS & MISTAKES MINIMIZED
INCREASES SPACE
CREATES WORKPLACE OWNERSHIP

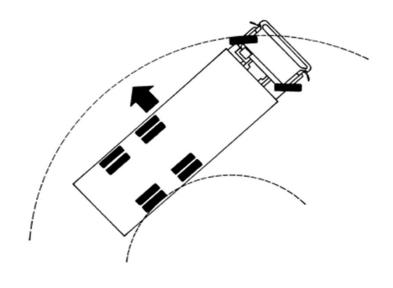
### 6) Dock Safety



#### a) Safe Dock Design (a.k.a Loading/Unloading Bays)

- ➤ Design must be undertaken by Civil Engineers and Planner.
- ➤ Designed to accommodate various docking heights and widths of trailers and loaded containers (TEU)
- ➤ Driveway, positioning of "entrance" and "exit", traffic flow and proper "L" and "U" turning areas must be designed for extended/long chassis.



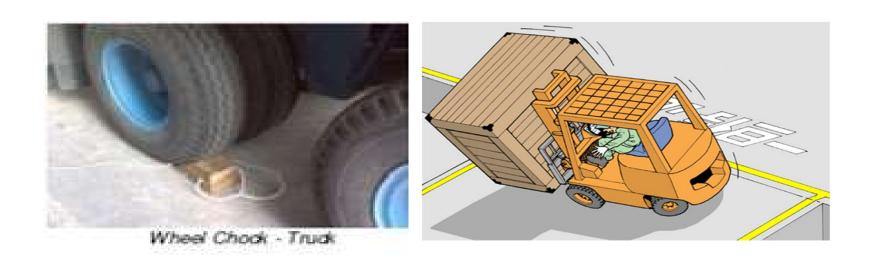


#### 6) Dock Safety



#### b) Safeguarding a stationery Vehicles:

- Use of Wheel Chocks (a.k.a. Wedge) to prevent trailer movement and "shifting"
- Trailers must always have "hand brakes" on.





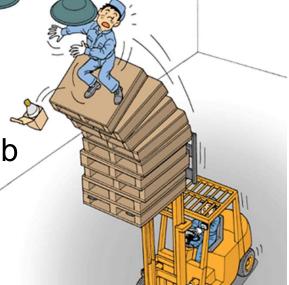
#### a) Basic Requirements:

- Only designated and qualified operator should ride on a forklift.
- Loaded forklift must be stable to prevent tipping over.
- Drive forklift slowly, with hazard light "on".
- Horn when turning and driving into aisle.
- Keep forks—and loads—low and tilted back while moving.
- Park a forklift with forks lowered and tilted flat, brake set, and key removed.



#### b) A number of factors contribute to forklift safety:

- Only trained and qualified personnel permitted to operate the MHE.
- Safety induction before the permit is issued.
- Refresher course conducted yearly.
- Comply to the Workplace Safety and Health Act
- Preventive maintenance
- Use correct equipment type for every job
- No shortcuts





#### **Charging or changing batteries:**

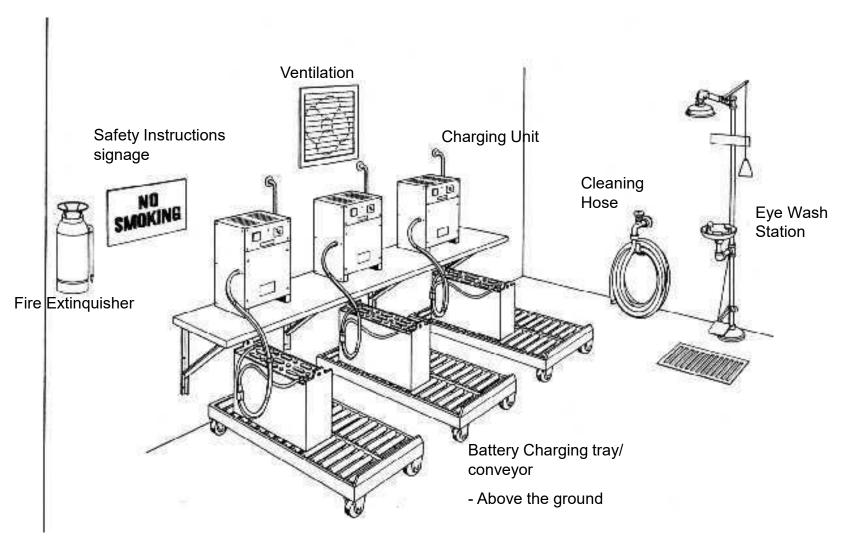
## The battery changing/charging area should have the following:

- No Smoking signs.
- adequate fire protection (fire extinguishers).
- plenty of water for flushing and neutralizing spilled battery acid.
- an eyewash, and shower facility
- enough ventilation to remove hydrogen gas during battery charging.

If you have to add water, to batteries or handle battery acid, be sure to wear personal protective equipment







#### 8) Warehouse Inspection Process



#### a) Materials Handling Equipment (MHE)

- The equipment being used in the workplace must be in proper working condition (including horn, hazard light)
- Check for oil leakage, tire pressure, braking system.

#### b) Facility Inspections

- a) Fire detection and reporting systems.
- b) Security systems.
- c) Observe structural defects, and electrical systems.
- d) Storage methods (racking) and practices (handling).
- e) Pest Control
- f) Removal of rubbish
- g) Washroom hygiene

#### 8) Warehouse Inspection Process



#### **Singapore Legal Requirements Assessment Checklist**

Determination of inspection.				
Date and time of inspection:				
Name of inspection team members:				
Name of inspection team leader:		_		
Signed by (leader of inspection team):				
Factory Act	Yes	No	NA	Specific Information for Non-conformances
Is the premise considered a Factory? Under Factory Act?				
2.Is the Factory registered under the law? Fees paid? 2.1 More than 10 people working in the factory?				
3. Health Requirements				
3.1 Cleanliness				
3.1.1 Premises kept clean? Free from effluents? 3.1.2 Refuse removed daily from floors, benches and	_			1
passages?				
3.1.3 Floors cleaned weekly by sweeping, washing or other				1
methods?				1
3.1.4 Walls, ceilings and partitions washed or whitewashed vearly?			1	
3.1.5 Work benches and other surfaces disinfected if they are				
likely to be contaminated with disease causing organisms?	~ \			
3.2 Overcrowding			-	
3.2.1 Is the space per worker more than 11.5 cub.c. Letters? 3.2.2 Is the height of ceiling more than 3 math s?			-	
5.2.2 is the fielding flore that 6 in the			-	
3.3 Ventilation				
3.3.1 For natural ventilation, the total area of doors, windows				
and other openings is more than 10% of floor area? 3.3.2 For mechanical ventilation, is the fresh air supply more	-			
than 0.5 cubic metre per minute per square meters of the				
floor area?				
3.3.3 For mechanical ventilation, is the fresh air supply more				
than 0.3 cubic metres per minute per person? 3.3.4 For harmful gases, vapours or other impurities, effective				
ventilation provided to render them harmless?				
3.4 Adequate lighting provided; artificial or natural?			-	
3.5 Noise and vibration				
3.5.1 No one is exposed to over 8 hrs workday of above				
85dB?			-	
3.5.2 Less than 50pple exposed to excessive noise? Noise control officer appointed?				
3.5.3 Any new noisy machinery? Any noise control features?				
3.5.4 Any noise control measures put up eg sound barriers,				
silencers etc?				
3.5.5 Warning signs put up in areas of excessive noise? 3.5.6 Training program on noise hazard and its				
control/prevention for all pple exposed to excessive noise implemented? Conducted once every 3 yrs?				
implemented: Conducted once every 5 yrs:				



Any person who wishes to purchase, store and/or use any hazardous substance controlled under The Environmental Protection and Management (Hazardous Substances) Regulations must obtain a Hazardous Substances Permit.



The National Environment Agency (NEA)



- a) Safety Data Sheet (SDS) and Certificate of Analysis (COA)
- •All Manufacturer and importers must develop an SDS for EACH hazardous chemical. SDS must provide information on the physical and chemical characteristics of EACH hazardous chemical. It must contain precautionary measures, emergency and first aid procedures, and the organisation responsible for preparing the SDS
- •COA: A document usually issued by an inspection firm attesting to the quality or purity of exported commodities. The document is often required either by the importer or by government regulation in the importing country.





#### PHYSICAL PROPERTIES

- Lipid solubility
- Water solubility
- Vapor pressure
- Odour threshold



#### ACUTE TOXICITY DATA

- Oral toxicity, LD50
- Dermal toxicity, LD50
- Dermal and eye irritation
- Inhalation toxicity, LC50



#### SUBACUTE AND SUBCHRONIC DATA (ORAL, DERMAL OR INHALATION)

- 14 day, NOEL
- 90 day, NOEL
- · 6 month, NOEL



#### OTHER DATA

- Developmental (teratology and embryotoxicity)
- Mutagenicity (Ames test, Drosophila, etc.)
- Fertility
- Reproductive (3 generation)
- Reversability study
- Dermal absorption test
- Pharmacokinetics
- Cancer bioassay (2 year)



#### EPIDEMIOLOGICAL DATA

- Morbidity
- Mortality
- Base reports



#### INDUSTRIAL HYGIENE EXPOSURE DATA

- Area samples
- Personal samples

Pollution Control
Department (PCD) of the
National Environment
Agency



#### b) Employee Training

- •Establish a training program for employees exposed to hazardous material
- •Training program must consist of:
  - ✓ Reading and interpreting information labels
  - ✓ The hazards of the chemicals in the work place
  - ✓ Measures employees can take for protection
  - ✓ Detection methods and observation of presence of hazardous chemicals

#### 10) Personal Protective Equipment (PPE)



- a) Types of Equipment
  - Hard hats
  - Steel toe shoes or boots
  - Gloves
  - Safety Goggles
  - Back belts



- b) Written Regulation and Mandate Requirements
  - Work site procedures must be specific to that operation
  - Employees must be trained to recognize and protect themselves

#### First Aid Kit





## It is mandatory that First Aid Kit is available in the warehouse. The requirement for

first-aid treatment in the workplace is not new and was defined in Section 58 of the Factories Act as well as the Factories (First-Aid) Regulations 1995.

Ensure that the list of items matches the items in the first aid kit

Check expiry dates on all items!







#### Workplace Safety & Health (WSH) Act



#### The three guiding principles of the WSH Act are to:

- A. Reduce risk at the source by requiring all stakeholders to remove or minimise the risk they create.
- B. Encourage industries to adopt greater ownership of safety and health outcomes.
- C. Impose higher penalties for poor safety management and outcomes.

#### The WSH Act has four key features:

- 1. It places responsibilities on stakeholders who have it within their control to ensure safety at the workplace.
- 2. It focuses on workplace safety and health systems and outcomes, rather than merely on compliance.
- 3. It facilitates effective enforcement through the issuance of remedial orders.
- 4. It imposes higher penalties for non-compliance and risky behaviour.

#### What the Act covers:

- ✓ All workplaces, unless exempted
- Responsibilities of stakeholders
- ✓ Hazardous substances
- ✓ Machinery & equipment



#### Roles and Responsibilities under the Act



Under the Act, all employees have a duty to keep their workplace and colleagues safe. As an employee, you should:

- follow safety and health procedures at your workplace;
- not endanger yourself and your colleagues;
- not tamper with safety devices, or perform wilful or reckless acts;
- report unsafe work conditions, behaviours and workplace incidents (regardless of whether an injury has taken place); and
- provide suggestions to improve safety and health at work.

Under the Act, employers are required to ensure the safety and health of every one of their employees. Employers should:

- remove or control risks at their workplace;
- maintain a safe work environment;
- make sure that safety is maintained in the handling of all equipment used at the workplace;
- develop plans for dealing with emergencies; and
- provide employees with clear plans and resources to keep their workplace safe.

Source



### Risk Assessment and Incident Reporting



Under the Workplace Safety and Health (WSH) Act, workplaces are required to have risk management policies in place. This involves risk assessment, as well as clearly communicating the risks and control measures to all employees

RISK ASSESSMENT FORM

ACTIVITY-BASED RISK ASSESSMENT FORM									
Company: Conducted by:									
Process/Location:	ocess/Location: (Names, designations)								
Approved by:		(Date)							
(Name, designation) (Date)		Last Review Date:		Next Review Date:					

	1. Ha	2. Risi	Evalua	3. Risk Control						
1a.	1b.	1c. 1d.		. 1d. 2a. 2b. 2c.				3a.	3b.	
No.	Work Activity	Hazard	Possible Accident / III Health & Persons-at-Risk	Control Sev- Likeli		Likeli- hood	Risk Level	Additional Risk Control	Action Officer, Designation (Follow-up date)	
		1								
									34	

#### Report workplace injuries and illnesses



Under the WSH Act, employers are required to report workplace accidents, dangerous occurrences and occupational diseases to MOM. This will help MOM identify and monitor trends in WSH issues faced by employers.

Accidents that need to be reported include:

- A workplace accident that results in the death of an employee, self-employed person or non-employee;
- ✓ A workplace accident that results in the injury of an employee who is given more than 3 consecutive days of medical leave or hospitalised for at least 24 hours; and
- ✓ A workplace accident that results in the injury of a self-employed person or non-employee who receives treatment in hospital.



- ✓ Apply the international occupational health and safety management system in the warehouse
- ✓ Apply the Singapore Workplace Safety & Health Act in the warehouse
- ✓ Develop the accident investigation process
- ✓ Develop the incident reporting process

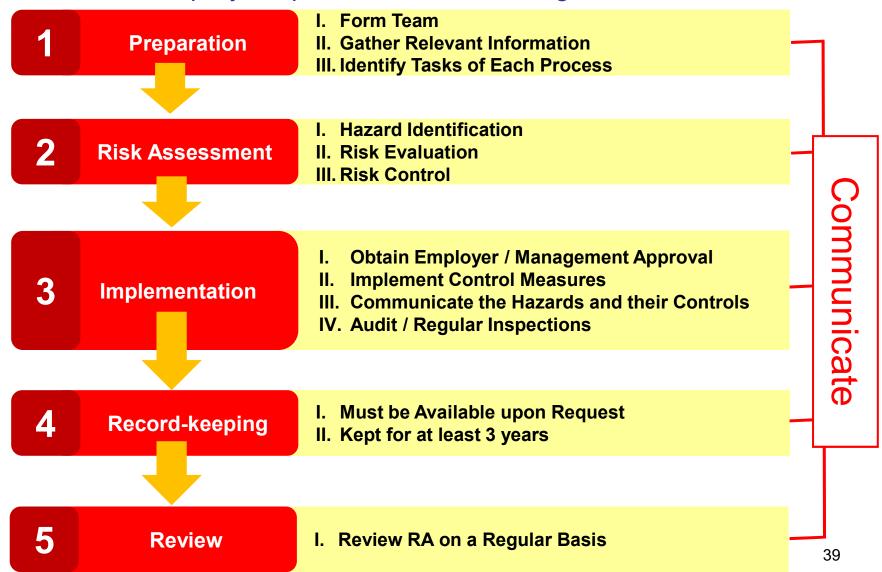


#### Establish all the key elements for a safe warehouse:

- 1. New Employee Orientation
- 2. Safe Materials Handling
- 3. Fire Safety
- 4. Safeguarding against Hazards
- 5. Sustainable Housekeeping
- 6.Dock Safety
- 7. Materials Handling Equipment (MHE)
- 8. Warehouse Inspection Process
- 9. Chemical Exposures in the Work place
- 10.Personal Protective Equipment



#### Follow the Step-by-Step Guide on Risk Management





- ✓ Prepare a Risk Assessment Form
- ✓ Prepare Safety checklists
- ✓ Ensure employer and employees comply with the WSH Act

#### Risk Assessment Form

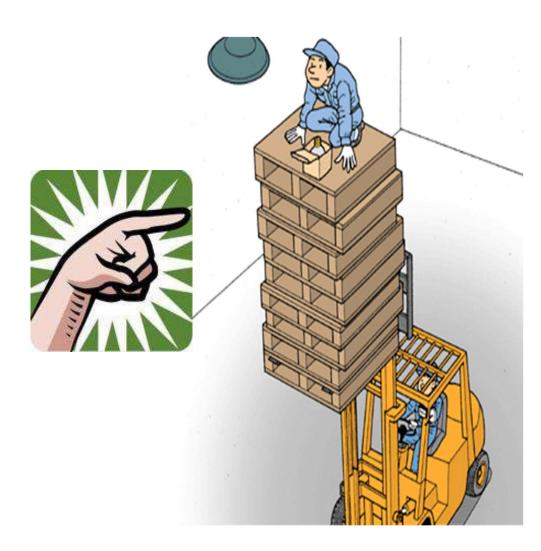
Department:	Warehouse	RA Leader: Justin Lee	Approved by:		Reference Number:		
Process:	Receiving of Raw Materials	RA Member 1: Tan Chin Meng		701	Warehouse 001		
Activity/Location:	Entrance Gate 1	RA Member 2: Alice Li	Signature:	Chan			
Assessment Date:	31 March 2015	RA Member 3: Abdul Rahman	Name:	James Chan			
Last Review Date:	31 March 2014	RA Member 4: Veerasamy	Designation:	HSE Manager			
Next Review Date:	30 April 2018	RA Member 5: Sazali Mohd	Date:	30 April 2015			

	Hazard Identi	fication		Risk Evaluation				Risk Control						
Ref	Sub-Activity	Hazard	Possible Injury/ III- health	Existing Risk Controls	S	L	RPN	Additional Controls	s	L	RPN	Implementation Person	Due Date	Remarks
1.	Forklift Operation	Moving forklift collide with other vehicles, pedestrians, parts or equipment due to speeding	Injury to forklift operator or co-workers	Display speed limit sign	4	2	8							

### Finally...



# Safety Begins With YOU



#### Learning Objectives



 Identify and explore the different areas and concerns of warehouse safety

Analyze each elements of warehouse safety

Elaborate some of the government regulations

required