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ANALYSIS OF IMPLEMENTATION OF SAFETY MEASURES IN CONTAINER HANDLING TERMINAL IN PORTS AND CORRECTIVE MEASURES FOR IMPROVEMENT

Unnikrishnan.N[1], Saravanakumar.S[2], M. Sanjay[3], B. Surender[4]

[1]Student, ME Industrial Safety Engineering, Excel College of Engineering and Technology, Tamil Nadu, India

[2]Assistant Professor, Department o safety and fire Engineering f, Excel Engineering College, Tamilnadu, India.

[3]Assistant Professor, Department of Aeronautical Engineering, Excel Engineering College, Tamilnadu, India.

[4]Assistant Professor, Department of safety and fire Engineering, Excel Engineering College, Tamilnadu, India.

Abstract: Container terminals are lifeline of global trade. Operating a container terminal gives rise to a lot of hazards which are managed with a wide range of regional and international regulations. However, work at height for lashing operations is one of the riskiest operations in the whole array of operations. The most modern risk control for this is use of man cages for lashing operations. This thesis envisages the study of the hazards at container terminals and proposing a standard operating procedure for safe use of man cages for vessel operations.

Keywords: Container terminal, Work at height hazards, Lashing operations, Man cages

1.INTRODUCTION

Container terminals or container ports (used interchangeably) are the terms designated for the intermediate destination facilities that enable shipping containers container to switch methods of transport en route to their final destination.
Often times, cargo arrives to a container terminal in a single ship and is distributed over several modes of transportation for delivery to inland customers. The terminal is also an area which is designated for the maintenance and temporary stowage of shipping containers. Sometimes, the unloading, loading and storage of the cargo within these containers is also carried out here.

Container terminals are indicative of economic development of a country. India also has its own share of its global trade handled through its container terminals .Along the 7517 km of Indian shoreline there are 26 container terminals , 14 on the west coast and 12 on the East Coast. Out of this 17 are major ports and 9 are minor ports. Improving efficiency of container terminals are essential in maintaining competitiveness in global trade.
Various activities carried out in such container terminals include gate operations, yard operations and vessel operations. There are activities involving interfaces with equipments like cranes, internal transfer vehicles, external trailers, reach stackers etc. Typical vessel operations include unloading of containers from vessels using quay cranes and transferring them to yard using internal transfer vehicles and then unloading at yard using Rubber Tyred Gantry Cranes.
As it involves highly hazardous operations like work at height, interaction with equipments, pedestrian movement, Maintenance related hazards, Hazards while onboard ship berthed at the terminal for container handling, the severity of any such accidents can be very high, often leading to fatality.
The project aims at performing a hazard identification, risk assessment and then providing control measure for one high potential risk by recommending a Standard Operating Procedure

From the initial hazard identification and risk assessment, lashing activity performed for securing containers loaded on ships or the reverse operation is selected for detailed risk assessment and recommending control measures.

2. LITERATURE SURVEY

2.1 International Labour Organisation Code of Practice for Safety and Health in Ports

ILO code of practice outlines the general safety requirements in all port related activities and equipment. This document is not a law as such but gives detailed guidelines to be followed in case not outlined in the regulations of the

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country. Few of the pages related to lashing cages are taken for reference.
Page 83 of this COP gives guidance on the lashing cages
1. The framework of most access or lashing cages is similar to that of an ISO container. The location of corner fittings in the top framework should conform to ISO 668 Series 1 freight containers – Classification, dimensions and ratings to enable the cage to be lifted by a container spreader.
2. Most cages are 20 or 40 feet long
3. Access or lashing cages should have: — guard rails and toe boards . The top rail should be recessed or an additional handrail provided inside the guard rail, in order to prevent hands being trapped between the guard rail and a container or other object. The distance between a handrail and guard rail should not be less than 90 mm in order to allow for workers wearing glove
4. Robust doors or gates that open inwards and are self-closing. Chains should not be used instead of doors;
— mesh or other suitable protection on the sides and ends of the cage to prevent accidental trapping;
where practicable, protection from objects falling from above;
— suitable bins and hooks to stow equipment normally carried in the cage. Such equipment includes twistlocks and other inter-box connectors and twistlock poles. Covers for bins may form seats. The use of seats enables workers to be more stable during transfer to or from a quay;
— a secondary means of locking onto a spreader when the cage is in use The following possibilities may be considered:
• manual attachment of a chain at each corner;
• the use of hand-operated locking pins;
— provision of an additional automatically operated twist lock at both ends of the spreader;
— a notice giving instructions for safe use.
5. The bottom corners of the cage may be recessed and the end of the cage floor may be hinged to allow safe access to twist locks, etc., below the cage. Any area of floor where workers kneel should be suitable for the purpose and not of open-grid construction. A handrail should be provided in front of the kneeling position.
6. An emergency stop button should be provided, where possible.
7. Radio communication with the crane operator should be provided
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All lashing gear is provided by the ship and is ship's equipment. Fully manually operated twist locks are now tending to be replaced by semi-automatic twist locks (SATLs). On loading, SATLs may be placed in position on the underside of the container on the quay. When the crane lowers the container into position, the SATLs automatically lock into position. On discharge, the SATLs have to be unlocked with the aid of a long pole. Such poles can only be used from deck level to unlock up to four containers high because of their length and weight
Page 380
When a cage or platform is used for access:
— at least two persons should travel in the cage or platform, one of whom should have a radio in direct contact with the crane operator;
— the crane operator should only take directions from that person;
— the secondary means of attachment to the spreader should be connected; — all parts of the body, particularly the hands and head, should be kept inside the cage or platform at all times.

2.2 Dock Workers (Safety, Health and Welfare) regulations 1990
through its sections 85-11 (b)on safe working environment in container operations details: (b) suitable and safe means shall be provided to the workers for going on top of containers and attending to lashing and unlashing of containers

2.3 Safety risk assessment on container terminal using hazard identification and risk assessment and fault tree analysis method (Published in 10th international conference on Marine technology- Martec 2016 by Sunaryo, Mochammad Aditya Hamka
Cargo handling activities ranked as one of the highest potential accident risks in container port, as reported by some port safety authorities such as Hong Kong Marine Department [1], and Health and Safety Executive UK [2]. In case of Indonesia, in 2015 from 98 recorded accidents that occurred at TangjungPriok port, the largest and busiest container port of Indonesia, 75 of them were due to containers handling both at the quay as well as at the container yard [3]. In conjunction with the Indonesian government's commitment to reduce the container dwelling time at the port to less than three days [4] , the port safety might at risk due to attempt for reaching the target, therefore some efforts should be carried out to assess the safety risks of container handling in the port, particularly at the quay, because more factors have influence in the handling of containers at the quay, so that safety aspects could be included in considering the strategy for increasing the efficiency of container handling. The assessment was carried out based on the literature study and the data collected from various sources in Port of TanjungPriok Jakarta, which include flow and type of activities involved in container handling; type and number of accidents occurred in certain period of time related to the container

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handling, and their sources; standards, regulations, and policies related to port work safety. Risks analysis was conducted using risks matrix to identify the risks level of the activities involved in container handling, based on the findings risks assessments were carried out using Hazard Identification and Risks Analysis (HIRA) method to pinpoint the activities that have highest risks

2.4 Analysis of accidents at the quay side operations in the Turkish ports.E Gul AmechenGara, IJRET: International Journal of Research in Engineering and Technology)

	Incidents	%	Reason	%	Consequence	%
Berthing operation	Contact to Berth	60	Failure of Navigation	60	Commercial Losses	80
	Contact to Ship	20	Failure of Maneuvering	20	Losses of Life	20
	Work Accident (on deck)	20	Mooring Ropes Problems	20		
Loading /unloading	Work Accident(on berth)	50	Failure of Stevedore	50	Commercial Losses	100
	Listing	50	Failure of Unloading	50		

Table 1.1 Incidents at Container Terminals.

From this study it is evident that around 20 percent of all accidents have happened on deck (on ship) and 50% of reason of all accidents have been failure to stevedores (people who are handling lashing and cargo securing activities on board while ship is berthed on the port). Also 20% of incidents have resulted in losses of life. It is pertinent from this study that if operating procedures for Lashing are not followed strictly it can lead to serious injuries.

2.5 Statistics on Occupational Health and Safety inMajor Ports in India for year 2018.

TYPE	Mumbai	JNPT	Kandla	Mormugao	Kolkata	Paradip	Visakha-patnam	Chennai	Kochi	New Mangalore	Tuticorin	Total
I. Fall of persons	--	--	01	01	--	--	--	--	--	01	01(01)	**04(01)**
II. Fall of objects	03(01)	01	--	--	--	--	--	--	01	--	--	**05(01)**
III. Stepping on, striking against or struck by objects excluding falling objects.	05	01	03(03)	--	05(03)	01(01)	03	03(01)	--	--	01	**22(08)**
IV. Caught in or between	02	01	--	--	01	--	--	--	01	02	--	**07**
V. Over exertion or wrong movement	--	--	--	--	--	--	--	--	--	--	--	--
VI. Exposure to or contact with extreme temperature	--	--	--	--	--	--	--	--	--	--	--	--
VII. Exposure to or contact with electric current	--	--	--	--	--	--	--	--	--	--	--	--
VIII. Exposure to or contact with dangerous goods	--	--	--	--	--	--	--	--	--	--	--	--
IX. Explosion	--	--	--	--	--	--	--	--	--	--	--	--
X. Others	--	01	--	--	--	--	01(01)	--	01	--	--	**03(01)**
TOTAL	**10(01)**	**04**	**04(03)**	**01**	**06(03)**	**01(01)**	**04(01)**	**03(01)**	**03**	**03**	**02(01)**	**41(11)**

Note: Figures in brackets represent Fatal Accidents.

Table 1.2 Classification of reportable accidents in Major ports in India in year 2018-based on Type

The statistics on the classification on reportable accidents (accidents which injured person being away from work for more than 48 hours) in Major ports in India shows that other than equipment related accident like fall of objects or struck by equipment, the third major cause of reportable accident is fall of persons from height out of which 25% has resulted in fatality (1 out of 4).

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3. EXISTING SYSTEM

Hazard identification of various tasks in existing operations
Activity: Diesel Storage and fueling (at fuel pump as well as at the yard)
Task: Storage
Description of hazard: Spill and leak
Effect of hazard: Spill of diesel on to hot engine/ exhaust parts leading to fire
Persons at risk: Refuellers
Possible Controls: Preset fuel dispensers, Heat shields on exhaust pipes, trained refuellers

Activity: Diesel Storage and fueling (at fuel pump as well as at the yard)
Task: Truck/Crane movement in the pump area and yard
Description of hazard: Contact with moving equipment
Effect of hazard: Equipment hitting/running over person leading to serious injury/fatality
Persons at risk: Refuellers
Possible Controls: Hard barriers to block during refuelling, communication to tower control and crane operator, high visibility clothing to refuellers

Activity: Battery Charging in work shop area
Task: Pouring acid for recharging
Description of hazard: Splash of acid while pouring into the battery
Effect of hazard: Injury, Acid burns Persons at risk: Technicians
Possible Controls: Standard operating procedures for battery charging, Scheduled change over to Sealed Maintenance Free batteries, Eye Protection, Aprons and Gloves

Activity: Battery Charging in work shop area
Task: Recharging batteries
Description of hazard: Evolution of hydrogen gas during recharging
Effect of hazard: Fire or internal battery explosion Persons at risk: Technicians
Possible Controls: Battery charging room with proper local and general ventilation intrinsically safe equipment at battery charging area

Activity: Container storage activity at the yard
Task: Failure to follow International Maritime Dangerous Goods Code (IMDG) on Stacking of incompatible chemicals in same area.
Description of hazard: Spillage ,Leaks, Fire
Effect of hazard: In case of an spill or a contact violent chemical reactions or an explosions could result.
Persons at risk: All Staff
Possible Controls: IMDG cargo stacking at the yard linked through software module. Physical verification of stacking by supervisors

Activity: Container storage activity at the yard
Task: Loading/ unloading from/to the truck
Description of hazard: Failure of gantry cranes due to overloading, poor maintenance, incompetent operator, not following procedure etc
Effect of hazard: Damage to equipment and cargo in container, Injury to operator
Persons at risk: Operator, yard staff
Possible Controls: Interlocks to prevent overloading, Periodic maintenance
Statutory checks for lifting equipments, Training for operator

Activity: Container delivery to external trucks
Task: unloading to the truck
Description of hazard: Contact with heavy equipment/trucks
Effect of hazard: Major Injury to truck driver
Persons at risk: Truck drivers
Possible Controls: No pedestrians allowed in yard, High visibility clothing for drivers, Communication with crane operator, Sufficient lighting during night.

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Activity: Reefer container handling
Task: Connection of reefer containers to power supply on the reefer towers
Description of hazard: Contact with Electricity due to not following procedure on connecting power plugs, leakages
Effect of hazard: Electrocution
Persons at risk: Technician
Possible Controls: Double insulated electrical connections, ELCBs on all circuits
Periodic checking of ELCB by competent person. Repair and maintenance of faulty equipments. Insulating gloves for technicians.

Activity: Forklift operation in the workshop for assisting in maintenance
Task: Driving forklift in workshop area
Description of hazard: Collision with other equipment/pedestrian
Effect of hazard: Injury to operator
Persons at risk: Operator
Possible Controls: Travelling alarms to the forklift, Demarcated forklift passages. Convex mirrors on blind corners. High visibility clothing for all workshop personnel.

Activity: Reach Stacker/ECH operation
Task: Handling load with reach stacker/Empty container handler
Description of hazard: Overloading the equipment/Operating beyond the safe limits of angle and extension/overspeeding
Effect of hazard: Overturning of the equipment/Injury to operator/damage to container
Persons at risk: Operator
Possible Controls: Interlocks to prevent overloading, unsafe extension angle etc.
Speedlimits for operation, Training to operators.

Activity: Lashing and unlashing containers on board vessels berthed at the terminal
Task: Working on top of containers
Description of hazard: Working at height without proper precautions
Effect of hazard: Fall from height, fatal injuries Persons at risk: Lashing personnel
Possible Controls: Safety harness to all lashers working at height, Work cages for access.

Activity: Lashing and unlashing containers on board vessels berthed at the terminal
Task: Handling of lashing bars
Hazard: Manual handling
Description of hazard: Improper handling of lashing rods
Effect of hazard: Injuries
Persons at risk: Lashing personnel
Possible Controls: Manual handling training

Activity: Lashing and unlashing containers on board vessels berthed at the terminal
Task: Walking on ships aisles/access
Hazard: Slip/trip/Fall
Description of hazard: Presence of oil and grease on gangways/aisles/walkways
Effect of hazard: Injuries
Persons at risk: Operations staff/lashing personnel
Possible Controls: Pre operations checklist for inspection of ships access prior to working and intimation to ships crew to ensure safe work environment

Activity: Container handling operations at quay
Task: Loading and unloading of containers from/to trucks/ships
Hazard: Load handling
Description of hazard: Container hitting against person/equipment
Effect of hazard: Injuries
Persons at risk: Operations staff
Possible Controls: Signal man to guide operator on movement, Safe zones demarcated under crane gantry beams for signalers, Gantry travelling and container descending speed limiters provided as interlocks, Travelling alarms on cranes, Hooters controlled from operator cabin, Cameras for all round visibility.

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Activity: Container handling operations at quay
Task: Loading and unloading of containers from/to trucks/ships
Hazard: Load handling
Description of hazard: Failure of lifting equipment
Effect of hazard: Injury, damage to container, damage to equipment
Persons at risk: Operations staff, Operator
Possible Controls: Automatic truck positioning system for proper alignment.
Periodic maintenance. Statutory checks like annual load test on lifting equipments, quarterly visual checks on lifting gears etc.
Activity: Machinery maintenance
Task: Use of handtools for maintenance
Hazard Contact with tools
Description of hazard: Pinch or nip points while using the handtools
Effect of hazard: Injuries
Persons at risk: Technicians
Possible Controls: On the Job training for technicians, Gloves during maintenance
Proper illumination of work location/equipment.

Activity: Equipment operation
Task: Sitting for long hours for equipment operation
Hazard: Health/Ergonomic hazards
Description of hazard: Poor posture while operating equipment due to improper seats, lack of training, locations of controls, infrequent breaks.
Effect of hazard: Back pain, Fatigue, Stress
Persons at risk: Operators
Possible Controls: Regular maintenance of seats, training to operators on ergonomic stretches and exercises.
Activity: Survey activities at the gate and at the berth
Task: Presence at the gate where trucks are moving
Hazard: Health
Description of hazard: Suspended Particulate Matter from trucks, dust
Effect of hazard: Respiratory problems
Persons at risk: Surveyors
Regular cleaning of area.
Activity: Survey activities at the gate and at the berth
Task: Presence at the gate where trucks are moving
Hazard: Health
Description of hazard: Noise from trucks operating in a close proximity in partially closed environment
Effect of hazard: Hearing loss
Persons at risk: Surveyors
Possible Controls: Provision of ear muffs and plugs to surveyors
Activity: First Aid station activities
Task: Dressing up wounds from first aid cases
Hazard: Health
Description of hazard: Contact with blood borne pathogens.
Effect of hazard: Cross contamination, infections
Persons at risk: Paramedics
Possible Controls: Disposable latex gloves for paramedics, Standard operating procedures on dressing up open wounds, Sharps handling and disposal procedure

Health and Welfare Hazards
Activity: Maintenance activities
Task: Greasing, Use of chemicals like Rust Off/WD-40/Electrical contact cleaning etc
Hazard: Health
Description of hazard: Contact with paint and thinner and chemicals.
Effect of hazard: Contact and allergic dermatitis
Persons at risk: Technicians
Possible Controls: Training on handling hazardous substances, medical screening, barrier creams, Gloves and protective clothing

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Activity: Operators and technicians working in shifts
Task: Rostering and duty offs for staff on shift duty
Hazard: Health
Description of hazard: Changing sleep cycles due to work in shifts.
Effect of hazard: Physiological stress on body due to varying sleep cycles.
Persons at risk: Technicians and operators
Possible Controls: Health screening, Staggered shift rosters, Job rotation

Activity: Working onboard ships berthed for cargo discharge loading
Task: Work near noise making machinery onboard
Hazard: Health
Description of hazard: Working without ear protection near ships machinery areas.
Effect of hazard: Poor communication, Hearing loss
Persons at risk: Lashing personnel

4. PROPOSED WORK

Conducting a risk assessment for all the hazards listed above and then conduct detailed risk assessment of one high safety risk activity lashing activity onboard. Find out whether the controls measures like man cages can have any operational shortfalls and recommend standard operating procedure to overcome the same.
Risk assessment:
Risk assessment considers those hazards which are found to have a significant risk rating even after the current level of control measures.

Risk Ranking method

Level	Descriptor	Example detailed Description
1	Rare	May occur only in exceptional circumstances(e.g once in 100 years)
2	Unlikely	Could occur some time(e.g once in 10 years)
3	Possible	Might occur some time(e.g Once in 5 years
4	Likely	Will probably occur some time (e.g .Every year)
5	Almost Certain	Is expected to occur in many circumstances(e.g many times a year)

Table 4.1 Likelihood ranking method

Severity level	Safety
1 Insignificant	Hazard identified with no injury
2 Minor	First aid treatment, 1-2 days workdays lost
3 Moderate	Medical treatment injury ,> 3 days lost time
4 Major	Single fatality, Extensive injuries such as permanent disability/amputation
5 Catastrophic	Multiple fatalities

Table 4.2 Consequence /Severity RankingTable

	Severity					
Likelihood	Almost Certain	M (5)	H(10)	H(15)	E(20)	E(25)
	Likely	M (4)	M (8)	H(12)	H(16)	E(20)
	Possible	L (3)	M (6)	M (9)	H(12)	H(15)

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	Unlikely	L (2)	M (4)	M (6)	M (8)	H(10)
	Rare	L (1)	L (2)	L (3)	M (4)	M (5)

Table 4.3Risk Assessment Rating Matrix

Risk assessment for Physical hazard
Activity : Container Lashing and Unlashing activity on board vessels berthed at the terminal

Reason for the activity: Container stowage on board ships is essential for keeping the cargo secure during the voyage. If this is not properly secured the stack of containers could topple due to the ship's movement or due to weather conditions like strong winds, leading to damage to cargo in turn causing property loss. Securing of containers to each other and with the ship is done by using twist locks, which is a heavy iron casting with two male parts fitting into the corner castings of two containers. One of the parts is rotated 90 degrees by means of manual lever or a spring-loaded release mechanism.
Whenever one row of containers is loaded over the ship's holds twist locks are placed on top of the corner casting so that another stack of containers could be placed over the first row. Twist locks to be placed on the vessel are property of the ship.
In case of manual twist locks the locks have to be disengaged by turning of a lever to the left- or right-hand side based on the type of the lock. For manual twist locks there is a remote possibility of inadvertent unlocking of the twist lock in movement. That chance is eliminated by using spring loaded semi-automatic or automatic twist locks. For Semi-Automatic twist locks, the locking mechanism is disengaged by pulling a wire handle using a lashing hook. Engaging of locking mechanism is done automatically while the container is pressed on top of the other.
For removal of locks for manual and for pulling the wirelock of semi-automatic twistlocks, stevedores or lashers need to access the container corners.
The skill levels of lashing personnel engaged in the job are quite low. This can lead to taking shortcuts and at-risk behaviour. The activity involves physical labour and fitness is of prime importance.
Communication errors with the operator or signal man could lead to fatal injuries. Also, while working on top of containers on board any ship, undulation due to tide or loading activities can cause person to lost balance and lead to fall.
The activity is essential in the operation of any container terminal. Exposure to the risk, the probability of occurrence of incident and severity of outcomes all remain high.
The outcome of the realization of the physical hazard i.e. fall from height can result in serious injury or fatality inturn leading to loss of production, employee morale, reputation and legal implications.
Current control measures: Man cages
Steps Involved:Access to the container top in man cagesPersons at risk: Lashing personnel Effect: Fall from heightLikelihood: Possible (3) Severity: Major (4) Risk Rating (H12)
Current Control measures: Man cages
Additional Control measures: Communicating to lines to eliminate manual twist locks and convert them to semi-automatictwist locks (SATL) or automatic twist locks
Steps Involved:Getting out from the man cage and working on top of containers
Persons at risk: Lashing personnel Effect: Fall from height
Likelihood: Possible (3) Severity: Major (4) Risk Rating (H12) Current Control measures: Man cages
Additional Control measures: Communicate with lines to bring vessels with lashing platform to eliminate climbing the mancage.
Fabricate 40' mancages on all cranes to avoid lashers getting out of the mancage to remove twistlocks on a 40' container.

Steps Involved:Moving horizontally from anchoring point
Persons at risk: Lashing personnel Effect: Pendulum effect on fall, strainLikelihood: Possible (3) Severity: Major (4) Risk Rating (H12) Current Control measures :Full body harness and Self Retracting lanyards(Vertical lifelines) 15 m long to avoid frequent shifting of man cages

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Steps Involved: Non or improper use of fall protection equipment and PPE
Persons at risk: Lashing personnel Effect: Fall from heightLikelihood: Possible (3) Severity: Major (4) Risk Rating (H12)
Current Control measures:Work at height training for new joiners, Supervision
Additional Control measures: Regular training and competency assessment to ensure those working at height are competent in their activity.
Disciplinary action against wilful violators
Control measures identified:

8. RESULT

Standard operating procedure for working from Man cages. This procedure provides a safe system of work in relation to container top work.
General
Whenever possible all works on container top shall be carried out from the work cage itself. If a need arises for personnel to work outside the cage, the personnel should be trained and assessed competent in working at height and should be provided with appropriate personal protective equipment (PPE).
The work cage shall be used for the following container top work
a) unlocking of manual or auto twist locks which cannot be done from the vessel deck or the lashing platform
b) Placement and removal of twistlocks, cones and other securing devices
c) Before the decision of using the man cage is made, the vessel operations supervisor should consider weather including windspeed, adjacent operations etc
d) All personnel working in or from the man cage shall wear PPEs like Hard hat, gloves, slip resistant footwear and a personal safety harness.
e) All personnel entering the workcage shall attach the safety harness to the lanyard. Lanyard should be anchored to either a lifeline on the top of the man cage or any suitable anchor point on the man cage adjacent to the area of work when person is working out from the man cage.
f) If need to go out of the cage then the person need to attach himself to a lanyard closest to the exit point or attach the lanyard of his safety harness to an anchorage point closest to the point of exit.
g) No more than one person shall be attached to the same anchoring point unless the same has been tested for 2 man use or withstand 22kN force which can be exerted during a fall from height.
h) In case the person is suspended in a safety harness, it can result in suspension trauma. Rescue of suspended person in such a scenario must be considered.
Preparation on the wharf apron
Inspection
a) Man cage condition need to be inspected before each use
b) Floor conditions, condition of anchorages and lifelines, gates of the cage shall all be included in the inspection
c) There shall not be any oil or grease traces on the floor to prevent slip and fall hazard
d) The recommended maximum number of personnel permitted to work in the cage is three (3) and shall not exceed the rated load for the cage or other statutory requirements regarding manning levels.
e) If the cage is being used for carrying the removed twistlocks from the vessel to shore during discharge operations, these shall be stowed safely in the bins provided in the cage with covers and should not be placed scattered on the floor of the cage. Such twistlocks shall be removed from the cage while it is brought back to the shore and before lifting back to lashing activities on board.
f) Harnesses used on board shall be inspected before each use for any signs of damage on the webbing, stitching or D rings and by a competent person once in every six months. If the user or Person In Charge is doubtful of the condition of the harness, it should be taken away from use and tagged “out of service”
Securing of personnel during service
a) All personnel working in the work cage shall properly wear a fall-arrest harness and lanyard before the cage is lifted or moved.
b) Each person should have alteast one lanyard attached to the safety harness which should be secured to the anchorage point on the cage depending on the location of the work. They should remain attached to anchoring point till they safely land on shore.
c)Personnel shall ensure that all access gates and closed and locked before the cage is lifted
d)The hinged flaps at the corners shall be closed before lifting
e) Work cage is to be lifted only be Quay side equipment with the container spreader and not with any other equipment.
f) Communication with the crew in the man cage and the crane operator using radio sets shall be tested and confirmed before the lifting.

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g) The man cage shall be attached to the spreader by means of the secondary chains provided before each lifting. The operator shall clearly confirm this on radio prior to each lifting of the man cage.
h) While moving all persons should secure the handrails provided in the cage if they are standing. Make sure that the body parts are not projected beyond the cage during movement from wharf to ship or vice versa to prevent pinch point hazards.
i)All gears inside the man cagee.g lashing rods or hooks shall be safely secured before movement.
j)Maximum number of persons carried inside the cage shall not exceed three.
k)Total weight carried by the man cage shall not exceed the safe working load
Landing of work cage on top of the containers
a)On receiving the communication from the person in charge, the crane operator shall lift the man cage from the wharf and land it on top of the container stow on the ship or hover it immediately above the container if it cannot be safely landed.
b)All movement should be in slow speed.
c)Spreader should not be removed even when the man cage is landed on the top of the container. Crane hoist wires shall be slackened off.
d)Personnel should step out of the man cage only if it is safe to do so.
Working inside the work cage
a) The mancage shall be in final landed position before work commences from inside the cage.
b) The lashing poles could be used from the corner cuttings to lock/unlock the twist locks. Personnel should be careful while using the lashing pole so that it does not strike other persons in the cage.
c)After finishing work on top of one container communication shall be provided to the operator to move to the next position. This movement shall be done slowly.
d)All fittings removed during the operation shall be safely stored in the bins provided in the mancage.
e)While removing the twistlocks or other fittings ensure that no person is standing below the area of operation.
f) While the cage is in motion, the floor openings shall not be used to remove twist locks. The covers should be placed on the floor openings till the cage is safely located over the next working position.
g) Movement of cage shall be done after clear communication between the person in charge and the crane operator.
Working outside the man cage
a) If it is required to move out of the mancage during operations, it should be done with utmost care.
b) The person moving out of the cage shall ensure to attach his lanyard to the anchorage points nearest to the point of operation at all times.
c) The man cage shall be landed before any person steps out of the cage.
d) Radio communication between the person in charge and the crane operator shall be maintained at all times when any person is moving out of the work cage.
e) In case of failure of radio communication internationally recognized hand signals shall be the mode of communication for which the person giving the signal shall have visual contact with the crane operator.
f) While moving out of the mancage, the work shall be confined to the length permitted by the lanyard attached to the anchorage point.
g) It is not recommended to use the Self retractable life lines to extend the lanyard length as it may cause pendulum effect in case of any fall of the person.
h) While moving to the next point, the person shall come back inside the mancage, to be moved by the crane.

9. FUTURE WORK

The frame work for a proper usage of mancages which can prevent the work at height risk to a great extent is prepared. This need to be included as part of regulations so that this can be enforced by law and any future chances of accidents related to such high-risk activity like lashing is eliminated.

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