Wharf Automation and Mechanisation

Coning & Deconing

Introduction

Manual Coning and Deconing

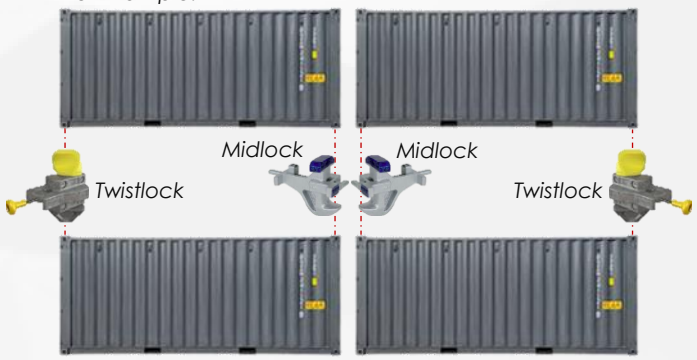
Coning & De-coning

Workers removes/fix the fittings near suspended loads and alongside heavy traffic

- **Coning/De-coning activity** - Typical operations require **2 Lashing Specialists (LS) deployed per crane**
- When containers from the vessel are discharged / loaded to or from the horizontal transport, each LS is required to **remove (decone) / fix (cone) the container fittings from/ onto the containers**
- The method to remove / fix the container fittings depends on:
  - **Type** : Twistlock, Midlock, Stacker Cone
  - **Make / Model**
  - At **which corner casting of the container**

Container fittings
(Twistlocks / Midlocks / Stacker Cones)
are used onboard vessels to secure top & bottom containers together

For Example:



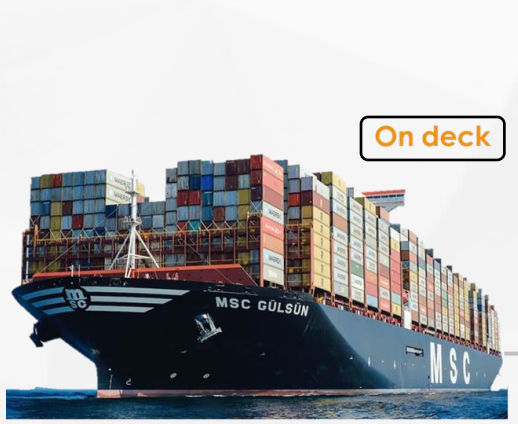
Vessel Operations	**Wharf Operations**	Horizontal Transport	Yard Operations
When the vessel berths alongside, the containers are loaded / discharged from the vessel	The containers are transported from the vessel onto the **Prime Movers (PM) / Automated Guided Vehicles (AGVs)** and vice versa via the QCs after the **de-coning/ coning activities**	The containers are transported to the yard for storage via the prime movers / AGVs	The yard cranes will carry the containers from the prime movers / AGVs and place them in the yard

Introduction

Manual Coning and Deconing

- **Wide variety of fittings exist (40+ make/models observed in PSA SG)**; with **different shapes and actuation methods** for coning/deconing, especially for varying fitting **types** (**SAT** vs **FAT** vs **Midlock** vs **Stacker Cone**)
- Certain fittings of the **same type may have similar shape and actuation** methods
- Comes from **different make and models with many versions** launched in the market over the years
- Fittings can weigh between **~2kg to 8kg**

• **Semi-Automatic Twistlock (SAT)**		✓ Manual unlocking but automatic locking	➢ Locking containers **on Deck** of vessel
• **Fully-Automatic Twistlock (FAT)**		✓ Automatic unlocking & locking	➢ Locking containers **on Deck** of vessel
• **Midlock**		✓ Automatic unlocking & locking	➢ Locking containers **on Deck** of vessel & between **2x20ft** containers
• **Stacker Cone**		✓ Automatic unlocking & locking	➢ Locking containers **Under Deck/Hatch** for **2x20ft** containers



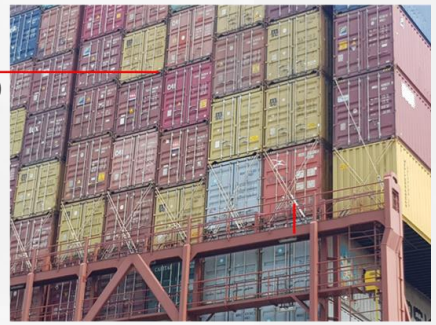
On deck

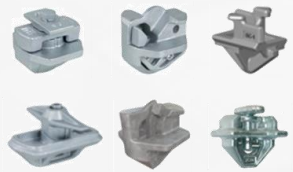
Under deck/ hatch

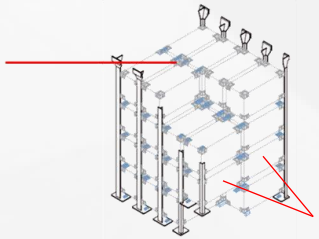

Semi-Auto Twistlock (SAT)


Fully-Auto Twistlock (FAT)


Midlock




Stacker Cones


20ft containers

Examples of coning/deconing:


Semi-Automatic Twistlock (SAT)


Fully-Automatic Twistlock (FAT)

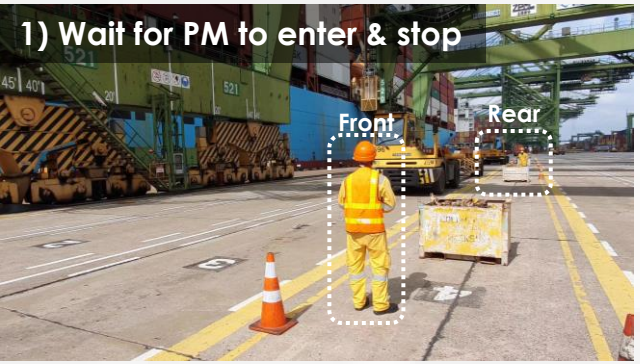

Midlock


Stacker Cone

List of container fittings OEM

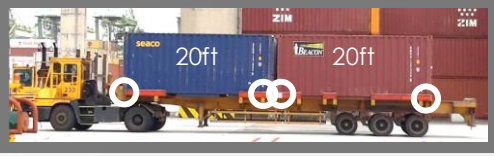
- Macgregor
- SEC Bremen
- German Lashing
- Taiyo
- Sclashing Shanghai
- MEC Pacific
- ISS Equipment
- Others
- Cargo Securing System Centre (CSSC)

Manual Deconing (after discharging container from vessel)



Legend:

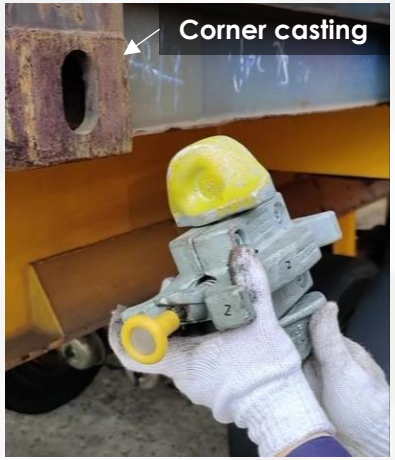
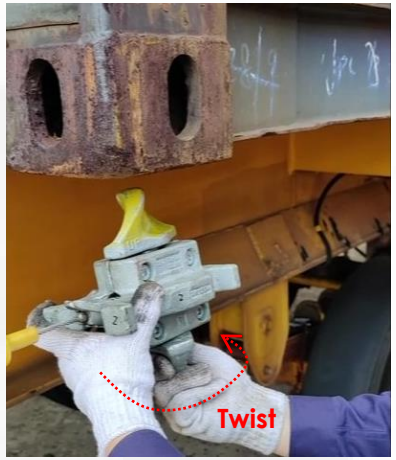
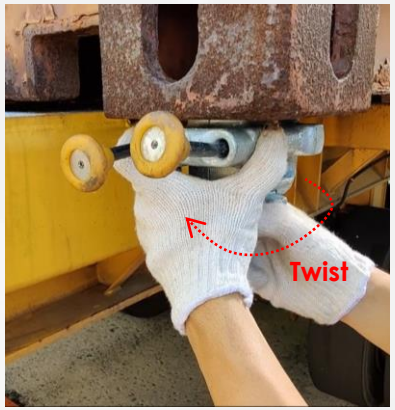
- PM: Prime Mover
- T20ft: Twinlift 20ft = 2 x 20ft on the trailer (Two workers decone 8 corner castings)



Semi-Automatic Twistlock (SAT)

Note: Below examples are common types of manipulation, and details may vary amongst different make/model

Coning:

	1) Locate the corner casting, and Hold on to the collar of the twistlock	2) Twist the bottom cone anti-clockwise or clockwise (depending on the make/model)	3) Fit into the corner casting	4) Release or twist the SAT for it to lock in place
SEC TL-GA				
Macgregor CV20 				

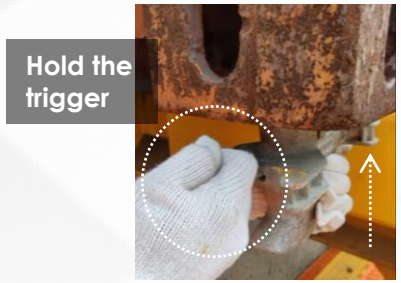
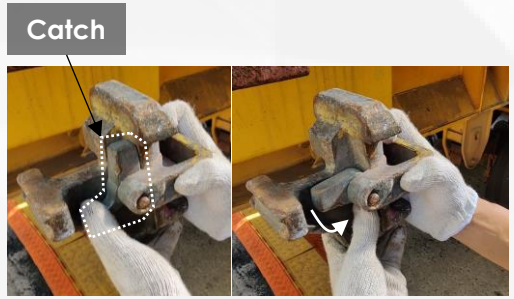
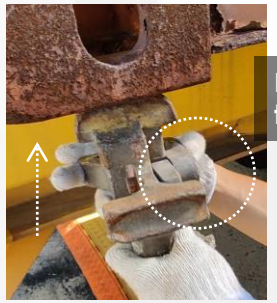
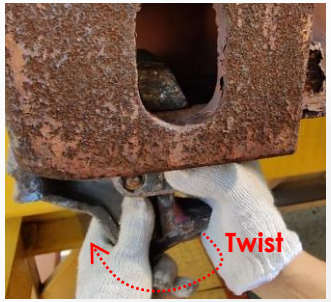
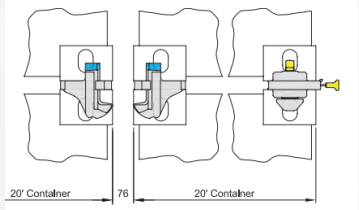
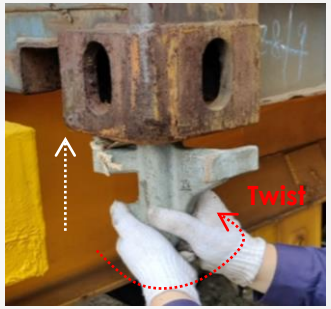
Deconing:

reverses the steps

Midlock

Note: Below examples are common types of manipulation, and details may vary amongst different make/model

Coning:

	1) Pull / Trigger the spring-loaded mechanism to release the catch	2) Fit the midlock into the corner casting	3) Rotate 90° anti-clockwise / clockwise and release catch for it to lock in place	4) Release finger trigger for it to lock in place
German Lashing ML-2 				
Macgregor AFC-1L 				
SEC TL-ML 				

Deconing:

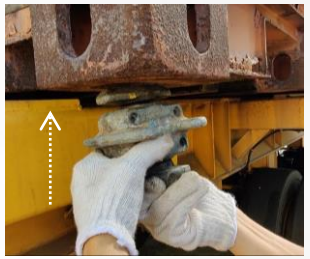
reverses the steps

Stacker Cone (slide 1/2)

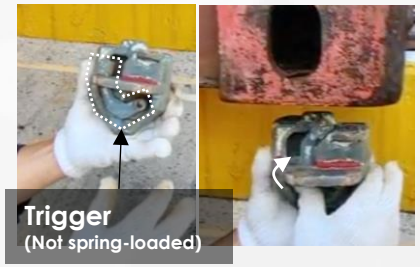
Note: Below examples are common types of manipulation, and details may vary amongst different make/model

Coning:

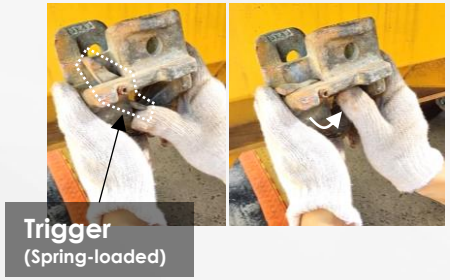
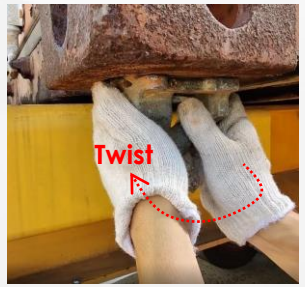
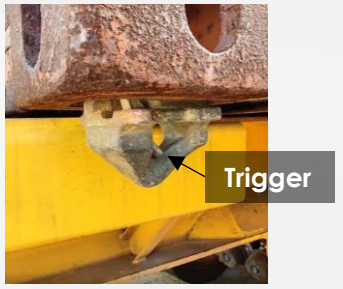
Macgregor C16A

1) Locate the corner casting, and Hold on to the collar of the twistlock	2) Twist the bottom cone anti-clockwise or clockwise (depending on the make/model)	3) Fit into the corner casting	4) Release or twist cone for it to lock in place
			

Macgregor SDL-4

1) Finger trigger to press the (spring-loaded) mechanism to release catch	2) Fit into the corner casting at an angle	2) Twist the Stacker Cone	3) Release the trigger for it to lock in place
			

German Lashing S1.43

Deconing:

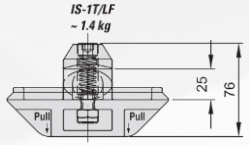
reverses the steps

Stacker Cone (slide 2/2)

Note: Below examples are common types of manipulation, and details may vary amongst different make/model

Deconing:

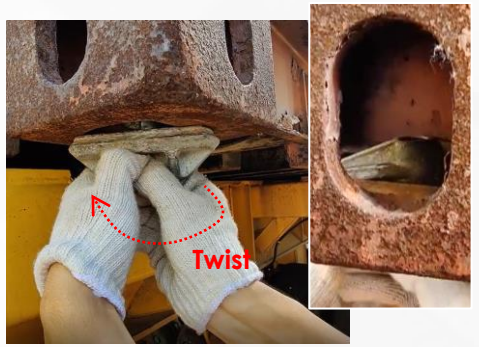
SEC IS-1T



1) Hold onto the bottom of the cone (spring-loaded)

2) Pull downwards

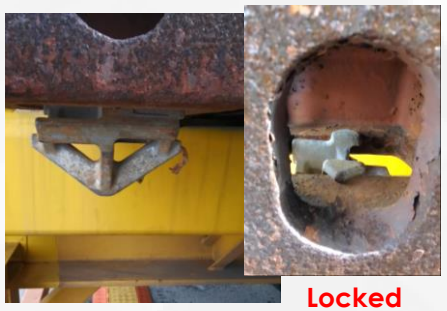
3) Twist the Stacker Cone



4) Pull downwards further until it is removed

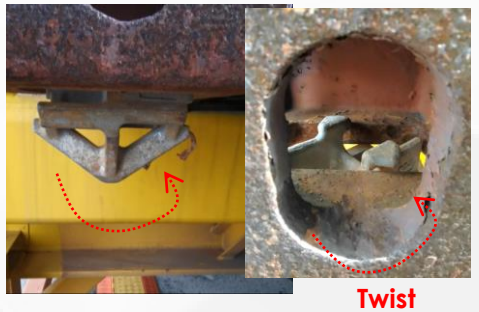
German Lashing Smartcone SC-1

1.3kg



Locked

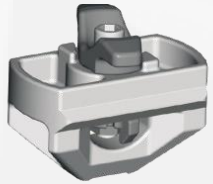
No need to pull downwards



Twist

Macgregor SDL-1

2.1kg



1) Hold onto the cone

2) Twist the trigger using thumb and finger (spring-loaded)

Front View

Left Hand — Right Hand

Rear View

Right Hand — Left Hand

Top View

Left Hand — Right Hand

3) Pull downwards until it is removed and release trigger

Hold and Pull

Then Release

Coning:

reverses the steps

Space Considerations for Coning and Deconing

Prime Mover & Trailer
There are different batches and models of trailers in PSA. 2 common types shown below.

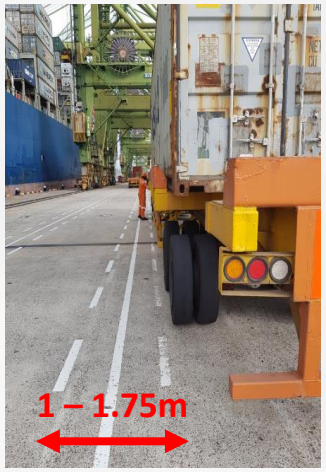
Available horizontal space (**side protection guards of trailers**) and vertical space (**structural beams to support the container**) to handle the container fittings for the different container configurations.

Trailer wheel below container corner casting

Trailer structural beams beside container corner casting

Trailer side protection guards below container corner castings

Space between adjacent lanes



Trailer structural beams beside container corner casting

Prime Mover wheel below container corner casting

Gearbins

Possible Challenges:

1. Most challenging portion would be the **Vision recognition of the right container fitting** from the gearbin and to devise a way to efficiently pick up the container fitting, orientate it to prepare for coning/ de-coning action

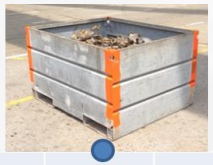
2. Container fitting, especially for semi-automatic twistlock can weigh up to 8 kg, **May require additional force to extract TL from the gearbin** as the knob at the end of the wire rope may at time be entangled or weighed down by other container fitting

3. **Orientation of container fitting is very un-orderly in the gearbin**. May not have the space required for the end gripper to pick up the container fitting at the right position for subsequent orientation to prepare for coning and de-coning work

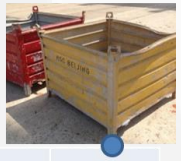
4. For semi-automatic twistlock, most of them have **Orientation requirements** whereby the yellow coloured portion is to be fitted upwards into the corner casting of the container. Vision recognition needs to be robust enough to differentiate, especially for various shades of yellow due to wear and tear and exposure to harsh environmental condition. This increases difficulty to pick up the twistlock in the right orientation.

5. Sufficient reach to pick up the container fitting from **Various dimensions of gear bins**.

Rusty





Length (cm)	132	132	132	132	132	131	130	127	126	110	109	108	108
Width (cm)	109	109	109	87	87	107	105	105	106	109	107	108	108
Height (cm)	74	86	74	79	79	85	84	86	86	87	86	88	86



Mixture of fitting in a gearbin

Twistlock at the base of the gearbin

Video References

Semi-Automatic Twistlock

(ILS IF-56) https://www.youtube.com/watch?v=TNhq-mduQA0

(GLS BD-V2) https://www.youtube.com/watch?v=valgGqwns-k

Fully-Automatic Twistlock

(SEC TL-FA/GL) https://www.youtube.com/watch?v=6SZztIbVCbU

(SEC TL-FA/SL) https://www.youtube.com/watch?v=9V_85W6uPOE

(TAIYO FA-8) https://www.youtube.com/watch?v=V3iRsSTulX4&t=6s

(Macgregor ACV 1 Hippo) https://www.youtube.com/watch?v=LLdxlVVb6ug

Midlock

(GLS BD-K2) https://www.youtube.com/watch?v=wqo3S8nDIUI

Stacker Cone

(GLS) https://www.youtube.com/watch?v=pLKCHEfLdrA

(GLS BC-G2/C) https://www.youtube.com/watch?v=5nquMbMvyOU

Thank You