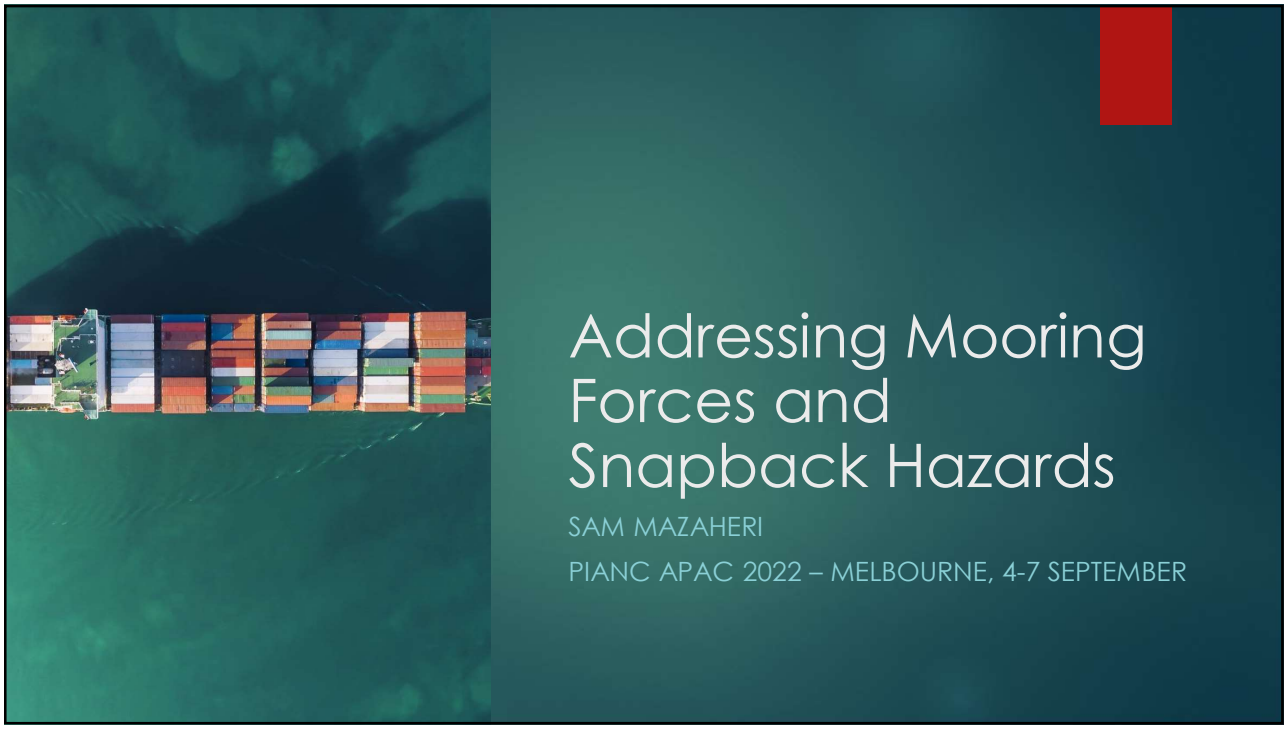


Addressing Mooring Forces and Snapback Hazards

SAM MAZAHERI

PIANC APAC 2022 – MELBOURNE, 4-7 SEPTEMBER

1

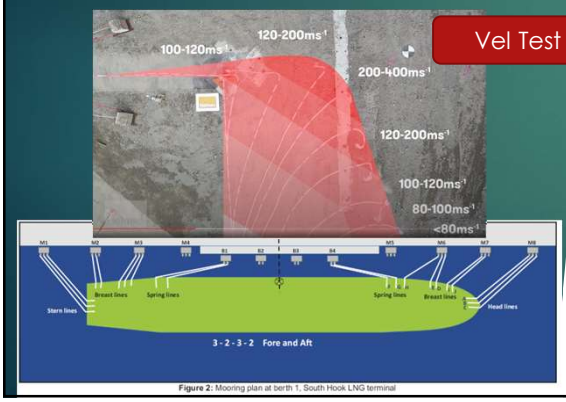
Overview

- Definition / Issue
- History of Incidents
- Standards and Guidelines
- Awareness / Approach
- Concluding Remarks

2

Snap-back

- Rupture in a mooring line
- Parted line snap-back like a rubber
- Significant Safety Risk to personnel on wharf and ship decks



Vel Test

Figure 2: Mooring plan at berth 1, South Hook LNG terminal

3

Two seafarers killed when struck by a parting mooring line

Crewmember in coma – struck on the head by a parting mooring line

3/O sustained 90% partial amputation of leg and fractured elbow

A/B suffered a fractured hip when struck by a parting mooring line

Both legs broken when struck by a parting mooring line

Mooring line slipped from windlass drum and struck crewmember's head

C/O killed when tow-line to barge parted and snapped back

Deck cadet suffered serious arm injuries during mooring operations

4

Incident recorded on 12 June 2022

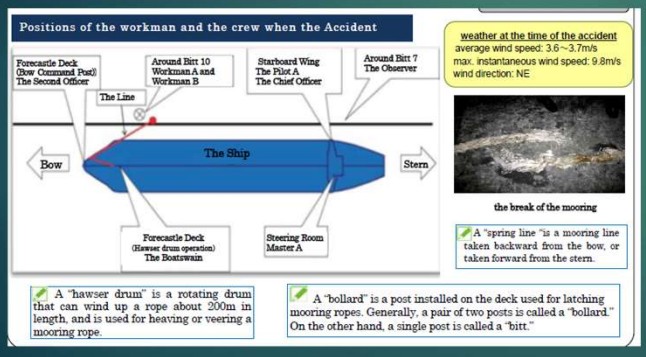
- VLC Bulk Carrier (292m LOA)
- Mooring configuration 4+2+2
- Breast line was parted shortly after the high water
- A slight spike on the Berth Alert System was recorded although the system remained in the Green status

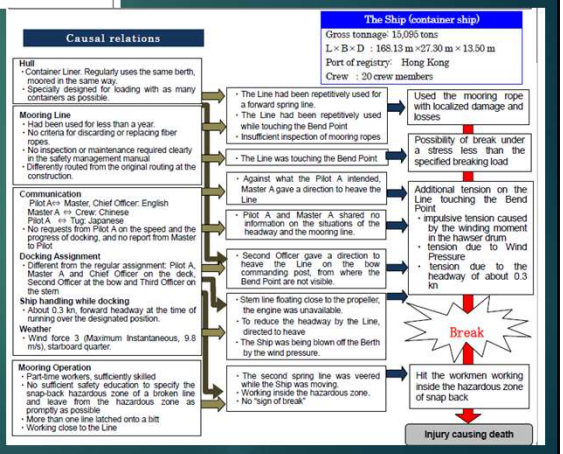
5

Serious Accident

While in docking operation for a container ship, a mooring rope attached onto a bitt on the berth broke, and snapped back, hitting mooring workers, and took their lives

Outline: the container ship (the Ship) was docking at Port Island Container-Berth 18 at about 0736 hrs, May 20, 2009, when a mooring rope attached onto a bitt on the berth broke, snapped back and hit two workmen engaged in mooring work. Both of them died.





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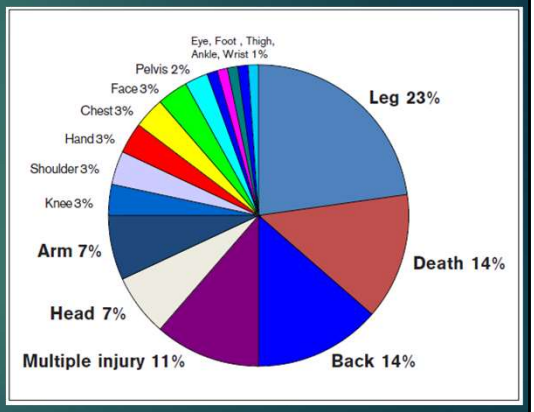
UK P&I Club

- Mooring equipment related incidents have injured many personnel
- 14% of the incidents have led to fatalities
- Still incidents with serious injuries are being reported



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Standards and Guidelines

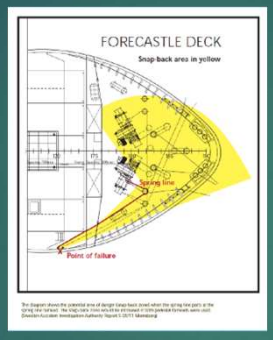
9

Maritime Coastguard Agency


Maritime & Coastguard Agency

Code of Safe Working Practices for Merchant Seafarers

2015 edition – Incorporating Amendment 1, October 2016



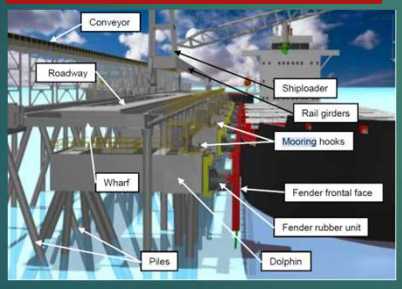
- Highlights
  - Conduct risk assessment for each new mooring operation and implement control measures
  - 26.3.2 the entire deck area should be considered a potential snap-back zone
  - 26.3.3 no painting for identifying snap-back zones should be done as this may give a false sense of security

10

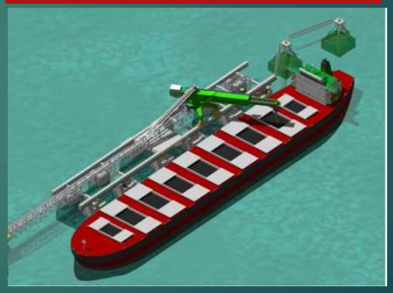
Mooring Infrastructure and Mooring Line Issues

- Design Principles for Dry Bulk Marine Terminals PIANC MarCom WG 184

Linear Wharf Structure supported by piles



Linear Wharf Structure supported by caissons



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Mooring Bulk Vessels

- OCIMF Mooring Equipment Guidelines (MEG04-2018)
- BS 6349 Maritime works
  - Part 4: Code of practice for design of fendering and mooring systems
- PIANC 153 (2016) - Recommendations for the Design and Assessment of Marine Oil and Petrochemical Terminals
- PIANC 186 Safe Mooring of Large Ships at Quay Walls

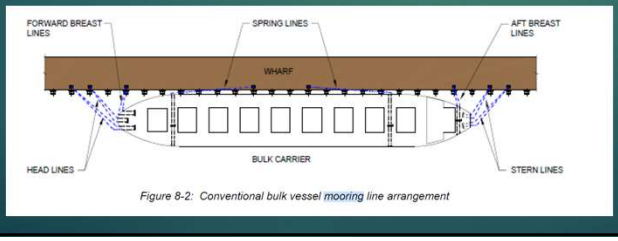

Figure 8-2: Conventional bulk vessel mooring line arrangement

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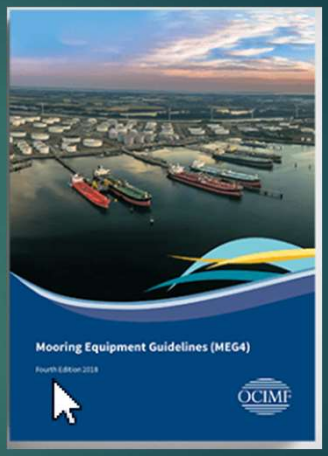
Snap Back – Standards Point of View

- **MarCom WG 184**
  - Limited to snapback awareness
  - Refer to OCIMF (Mooring equipment guidelines, 2018) guideline for further details such as identifying the danger area which can be used to plan suitable barriers
  - No guideline to how implement a physical protection



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MEG4-2018 TOC

Sec 1 Introduction to Mooring
- Ship mooring management
- Mooring system management plan

Sec 2 Human Factors
- Safety critical task analysis
- Human-centred design

Sec3 Mooring forces and environmental criteria
- Calculation of forces
- Site-specific environmental data and mooring line loads

Sec 4 Mooring arrangement and layout
- Piers and sea islands

Sec 5 Mooring lines
- Introduction
- Mooring system design and line selection
- **The hazard of snap-back**
- Factors influencing mooring line performance
- Maintenance, inspection and retirement
- Steel wire ropes
- High Modulus Synthetic Fibre line
- Conventional fibre lines
- Synthetic mooring tails

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GEM4-2018 TOC – cont'd

Sec 6	Mooring winches
Sec 7	Mooring and towing fittings
Sec 8	Structural reinforcements
Sec 9	Berth Design and fittings
Sec 10	Ship/shore interface
Sec 11	Alternative mooring technology
Appendix A	Wind and current drag coefficients
Appendix B	Guideline for the purchasing and testing of mooring lines and tails

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Design / Operation

- Addressing mooring forces
- Addressing mooring arrangement
- Addressing mooring line materials
- Snapback protection barrier
  - No standards addressing this issue
  - No consistence practice
  - Relies on site risk assessment and experiences
  - It is based on trial and error

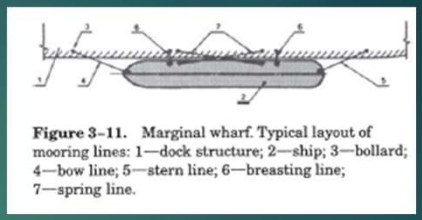

Figure 3–11. Marginal wharf. Typical layout of mooring lines: 1—dock structure; 2—ship; 3—bollard; 4—bow line; 5—stern line; 6—breasting line; 7—spring line.

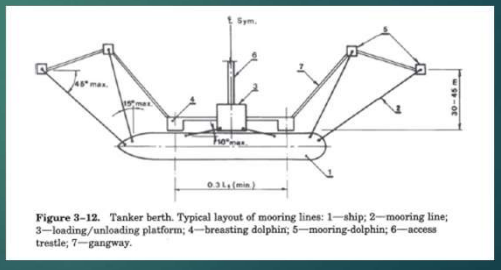

Figure 3–12. Tanker berth. Typical layout of mooring lines: 1—ship; 2—mooring line; 3—loading/unloading platform; 4—breasting dolphin; 5—mooring-dolphin; 6—access trestle; 7—gangway.

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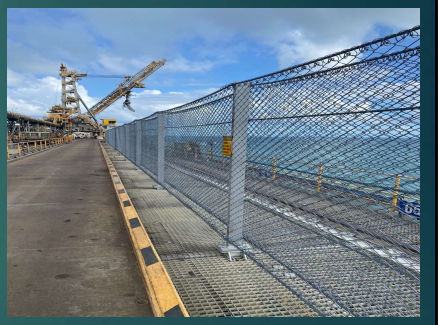
Some Industrial Practices (Physical Barriers)

- Basis for Design
  - Rope tip impact velocity
  - Impact energy imparted on barrier

Cage

Concrete

Fencing Sys



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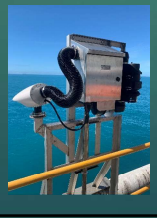
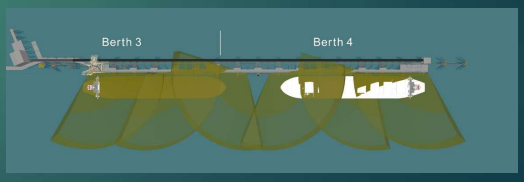
Other Control Measures

- Classifying as material risk
- Frequent Incident Audit / Review
- Line vetting prior to mooring
- Utilising quick release hook with line management plan
- Cell load monitoring with warning signals
- Utilising vessel drift detection system
- Fender loads monitoring – no record has been seen





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Awareness / Approach

- More collaborative works between various stakeholders need to be done in this space
- A new TOR needs to be defined for the committee
- Forming a working group containing representatives of key stake holders seems inevitable

Scope of WG

- Address the issue thoroughly
- Collate and analysis the incidents and lessons learnt
- Identify the gap and current risk
- Enhance guidelines
  - Design (infrastructure, mooring equipment)
  - Physical protection
  - Operational/ Risk Management
  - Key control measures

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Concluding Remarks

- Snap-back is hazardous
- There are still gap and uncertainties in the guidelines and industrial practices
- The usage of physical barriers and control measures is not regulated and consistent across the port industry
- More works need to be done in this space to ensure the safety of every personnel working around mooring equipment is maintained properly
- Extensive incident reports along with industrial practice can be utilised to enhance the current guidelines or develop a new one if needed

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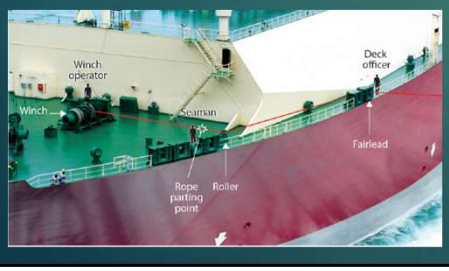
Reviewers Comments

- Excellent subject and opinions, requires tighter sentence structure and more industry facing recommendations.
- See comments in returned file - grammar through-out can be improved - try to keep sentences shorter - emphasize call for an international working group report in abstract and especially in the presentation



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