Liquefaction of Solid Bulk Cargoes – Risks and Precautions

Webinar – 28 September 2022

Speakers:

- Dr Ken Grant, Director, Minton Treharne & Davies, Singapore
- Colin Chung, Fleet Manager, Britannia P&I
- Capt Slav Ostrowicki, Loss Prevention Manager, Britannia P&I

Liquefaction of Solid Bulk Cargoes – Risks & Precautions

Loss Prevention point of view

Captain Slav Ostrowicki
Loss Prevention Manager
Britannia P&I

Liquefaction of Solid Bulk Cargoes

Loss Prevention point of view

- Our focus today
- Overview of the problem
- Liquefaction and dynamic separation – what is it?
- Pattern of incidents and losses
- Typical cargoes affected
- Why does it remain a concern?
- Legal regime and its continual evolution

Liquefaction of Solid Bulk Cargoes

Loss Prevention point of view

- Knowledge and perception of the risk
- “Caution remains the watchword”
- P&I Clubs’ role in assisting Members
- Loss Prevention technical advice

Liquefaction of Solid Bulk Cargoes – Risks & Precautions

The IMSBC Code

Dr Ken Grant
Director
Minton Treharne & Davies, Singapore

MINTON,TREHARNE & DAVIES GROUP

2022

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28 September 2022

LIQUEFACTION OF SOLID BULK CARGOES – RISKS & PRECAUTIONS

Dr Ken Grant

Cargo Groups in IMSBC Code

2001: BC Code:

Appendix A: Materials which may liquefy

Appendix B: Materials possessing chemical hazards

Appendix C: Materials neither liable to liquefy nor possess chemical hazards

2004: BC Code:

Appendix A – Group A

Group A and B

Appendix B – Group B

Appendix C – Group C

IMO Circular Letter No. 4452 – 8 October 2021

IMSBC Code (2020):

"*cargoes which may liquefy if shipped at a moisture content in excess of the transportable moisture limit*" or TML

Group A consists of cargoes which possess a hazard due to moisture that may result in liquefaction or dynamic separation if shipped at a moisture content in excess of their transportable moisture limit.

PROPERTIES OF SOLID BULK CARGOES

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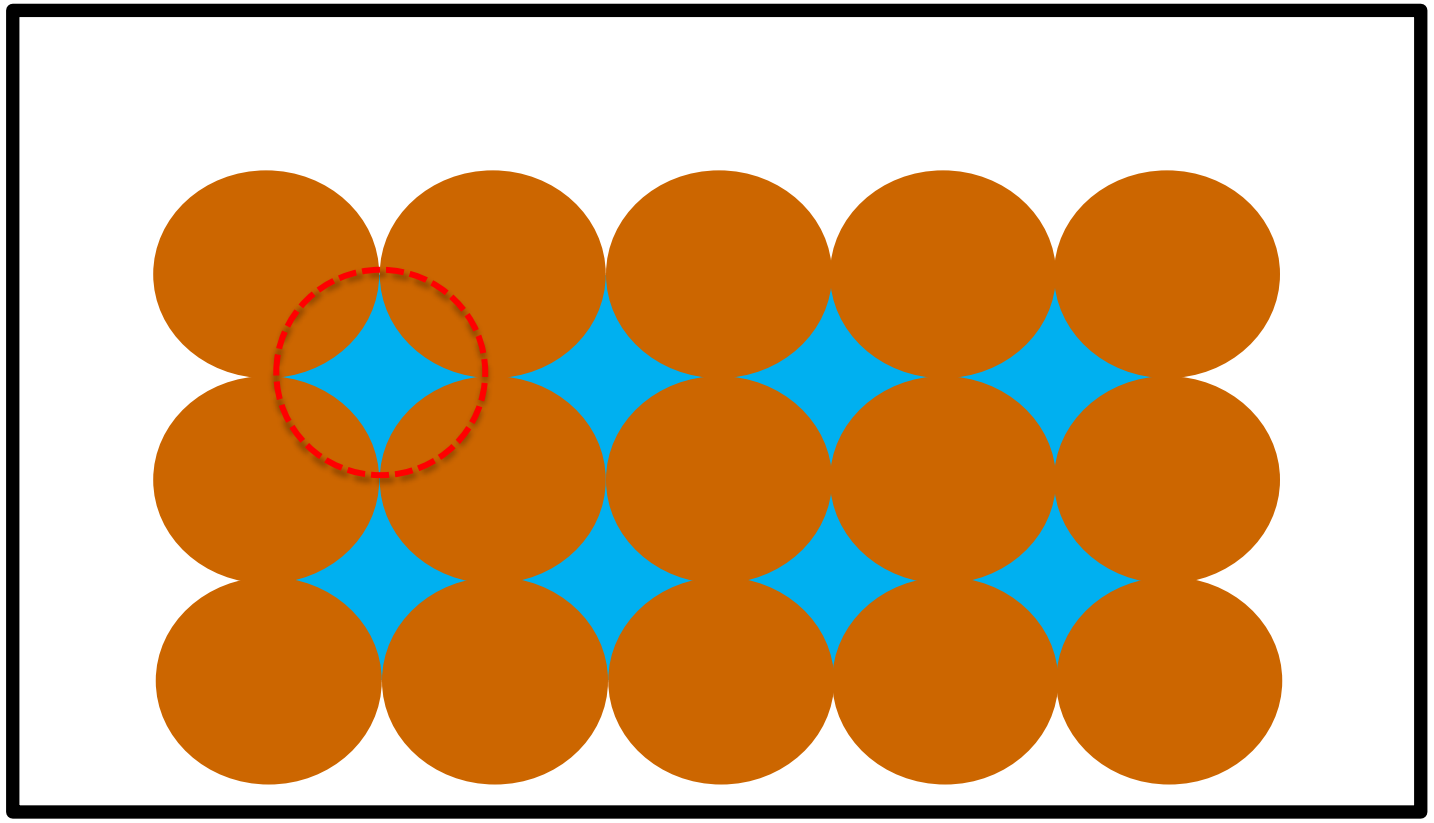

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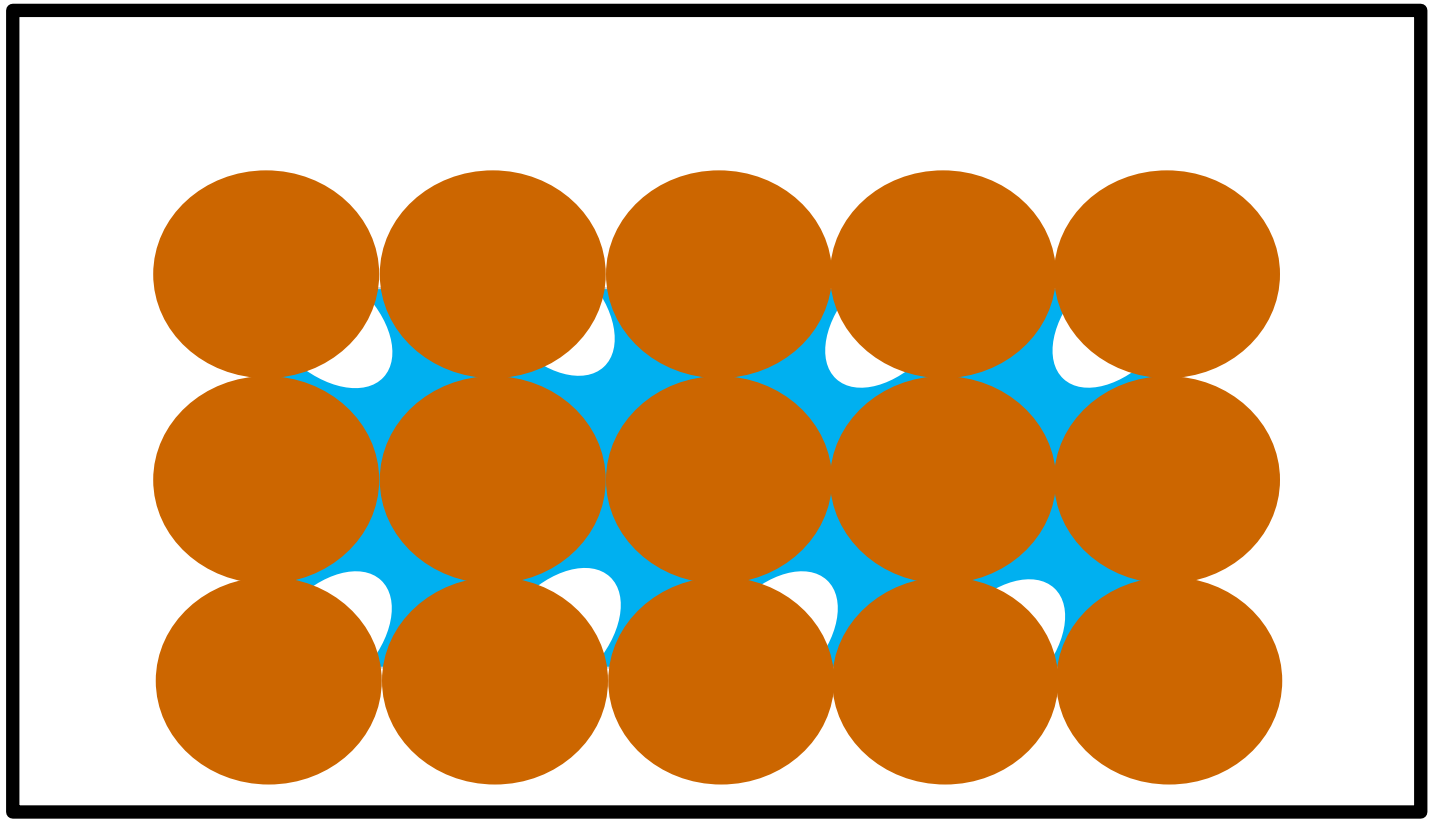
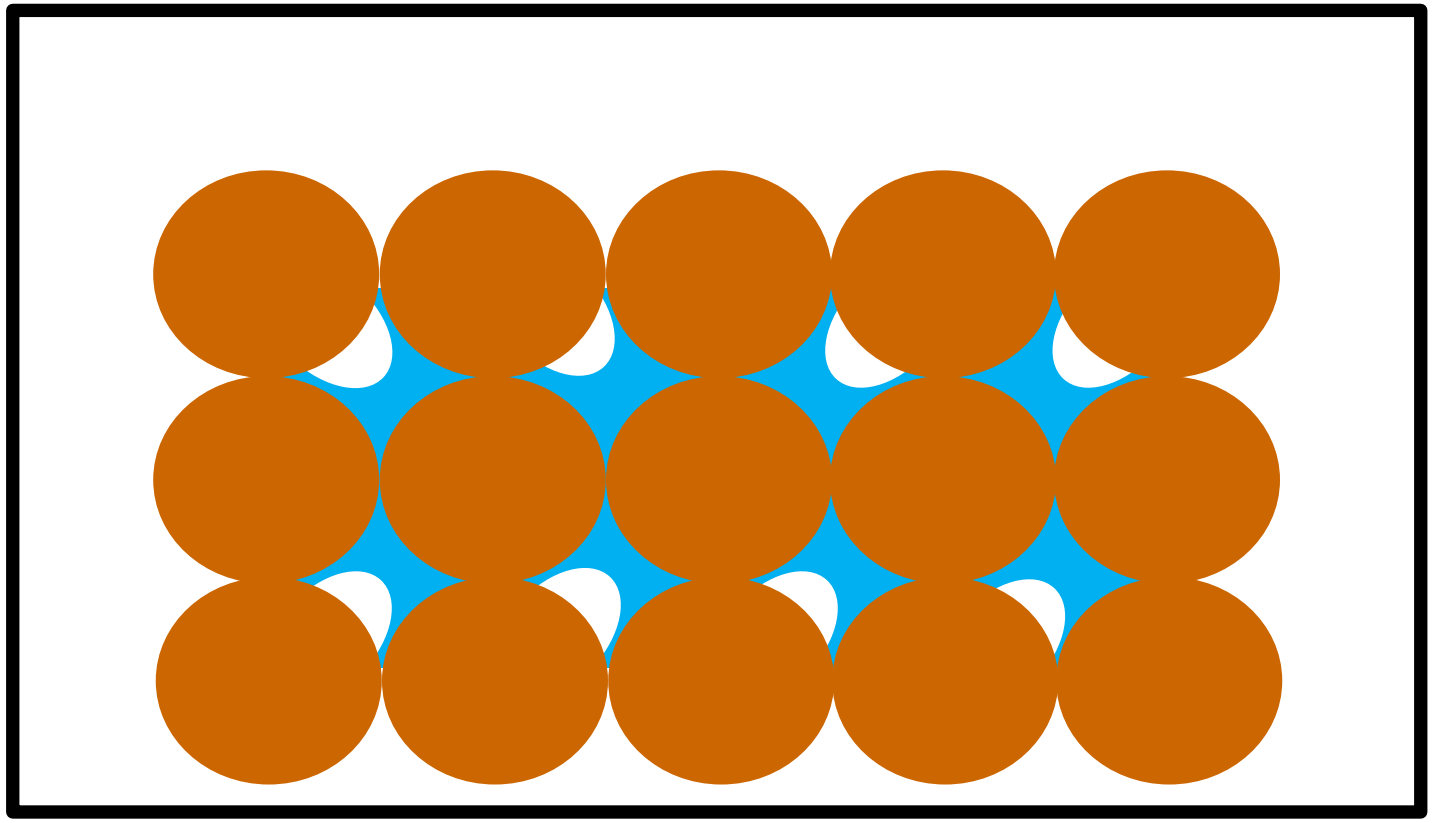
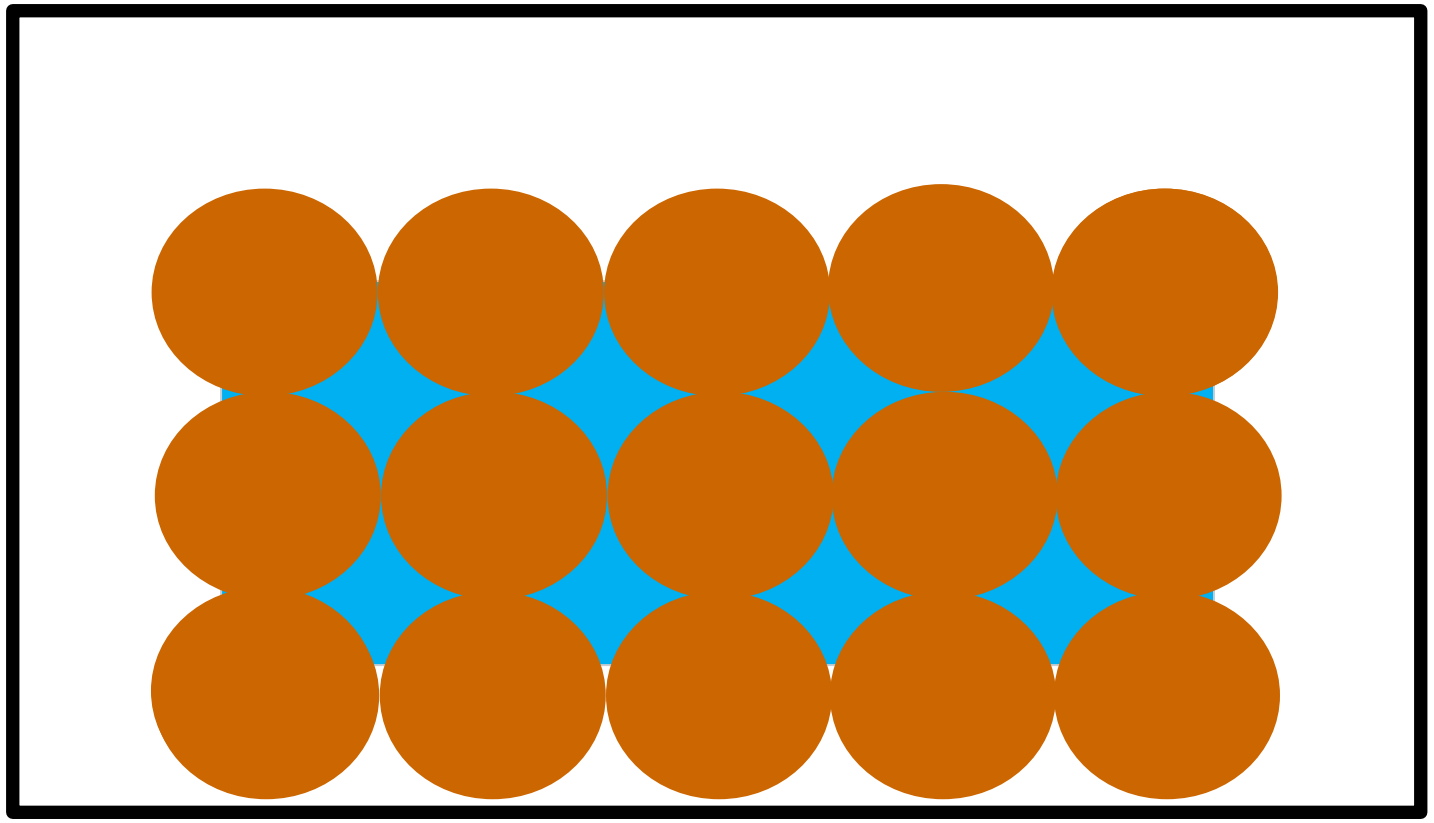


EFFECT OF SHIPS MOTION

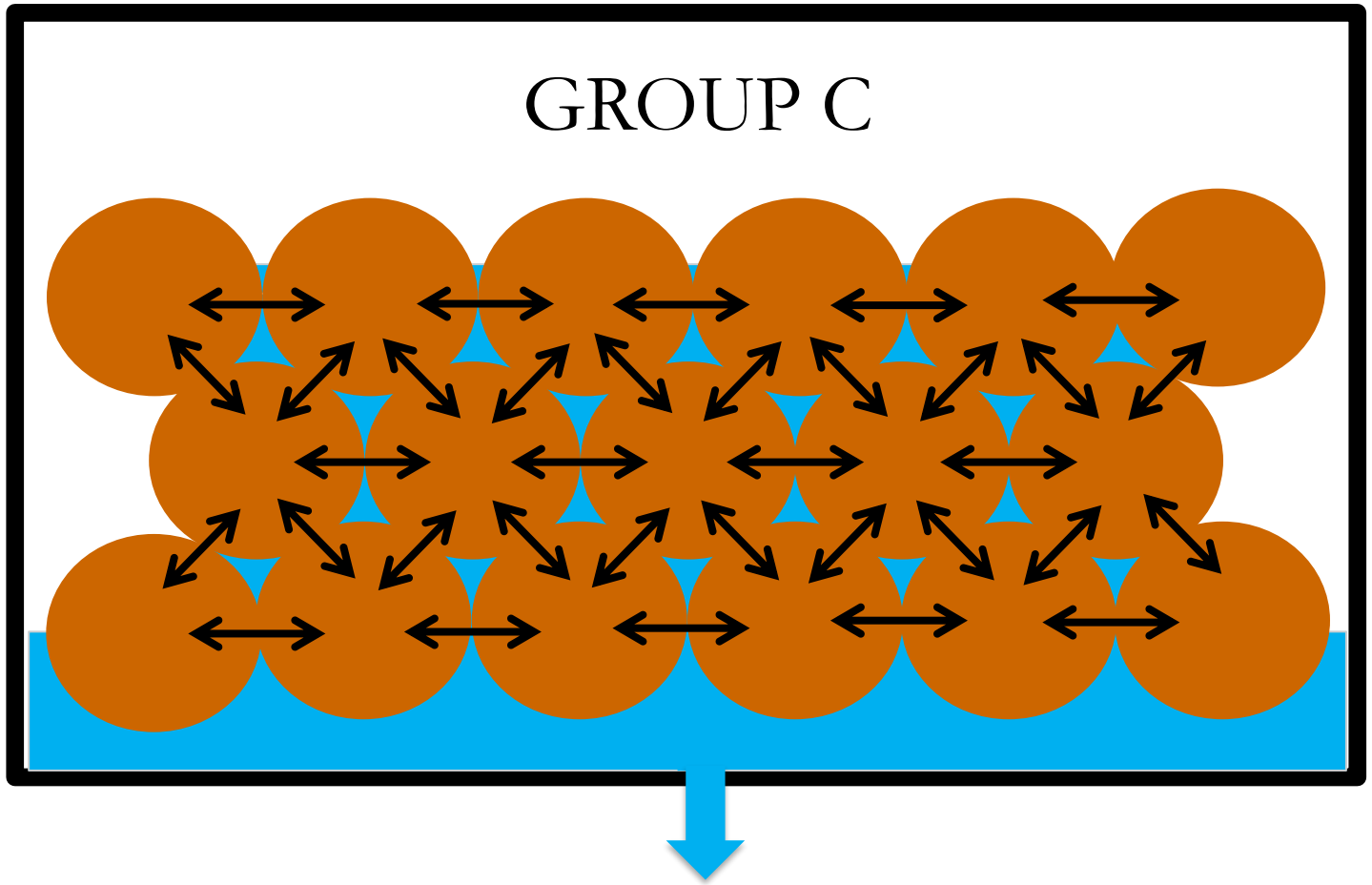


COMPACTION & CONSOLIDATION

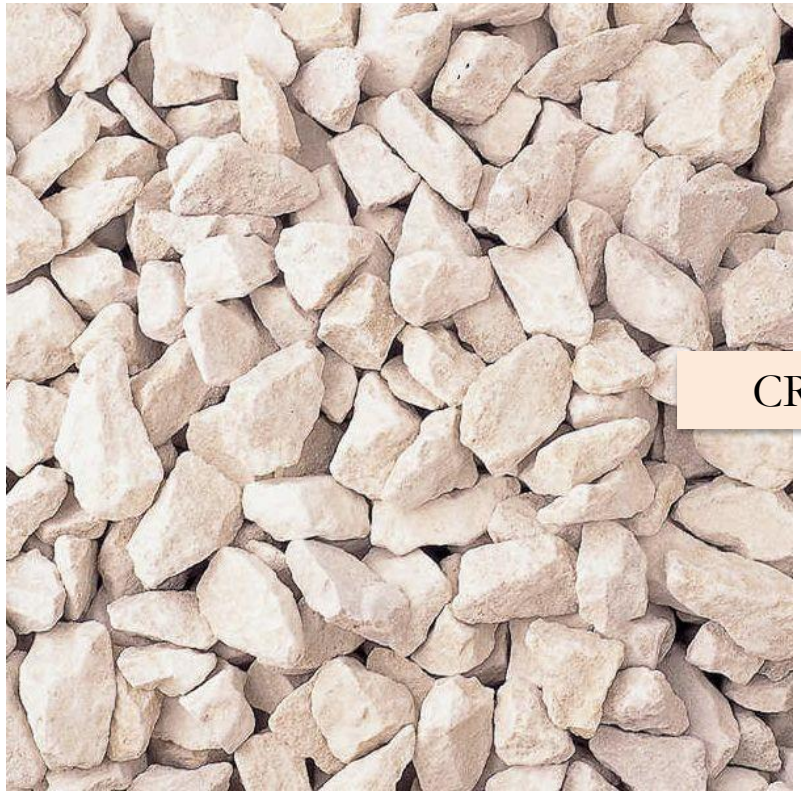


Cargoes Comprising Lumps

WATER DRAINAGE



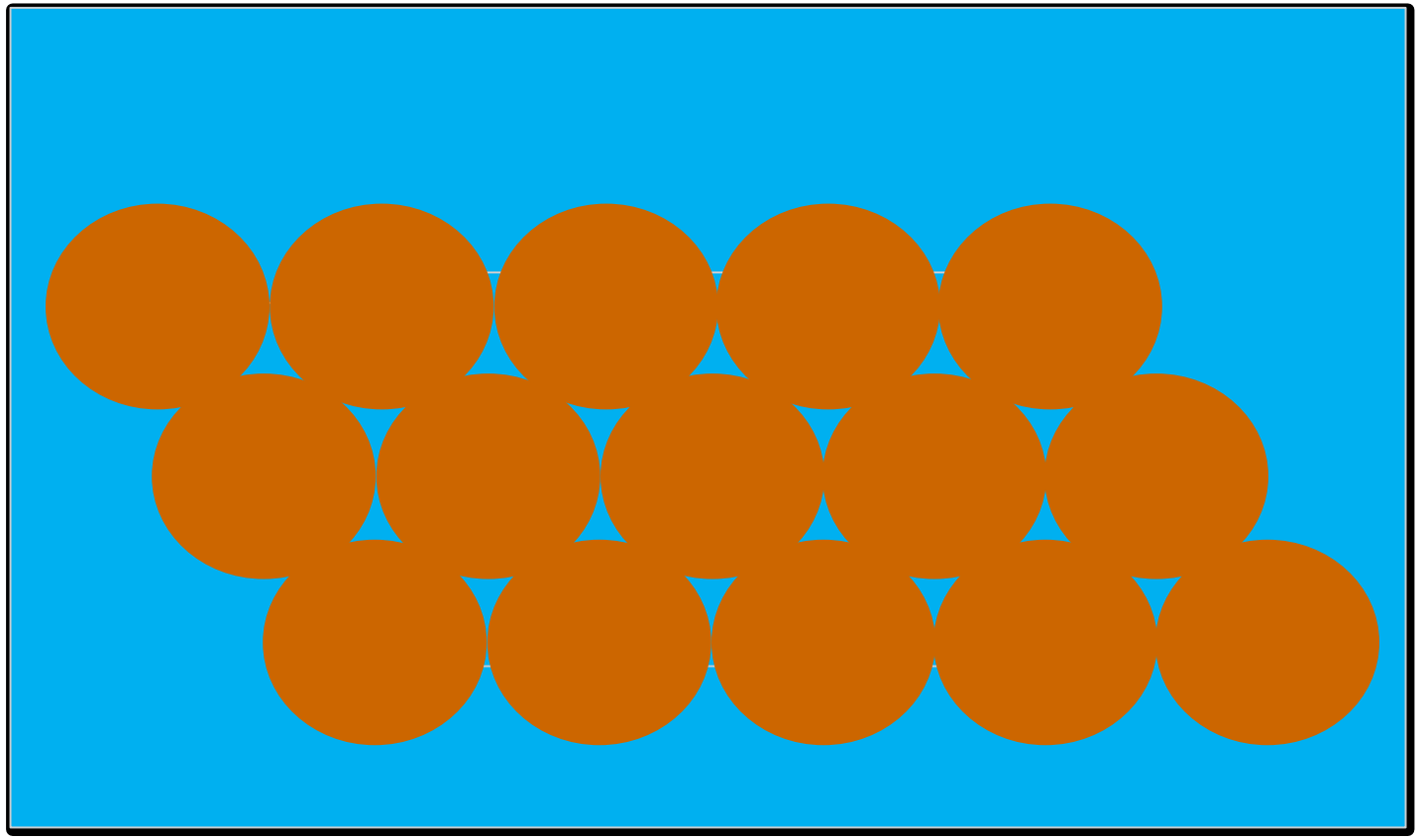
Cargoes Comprising Fines



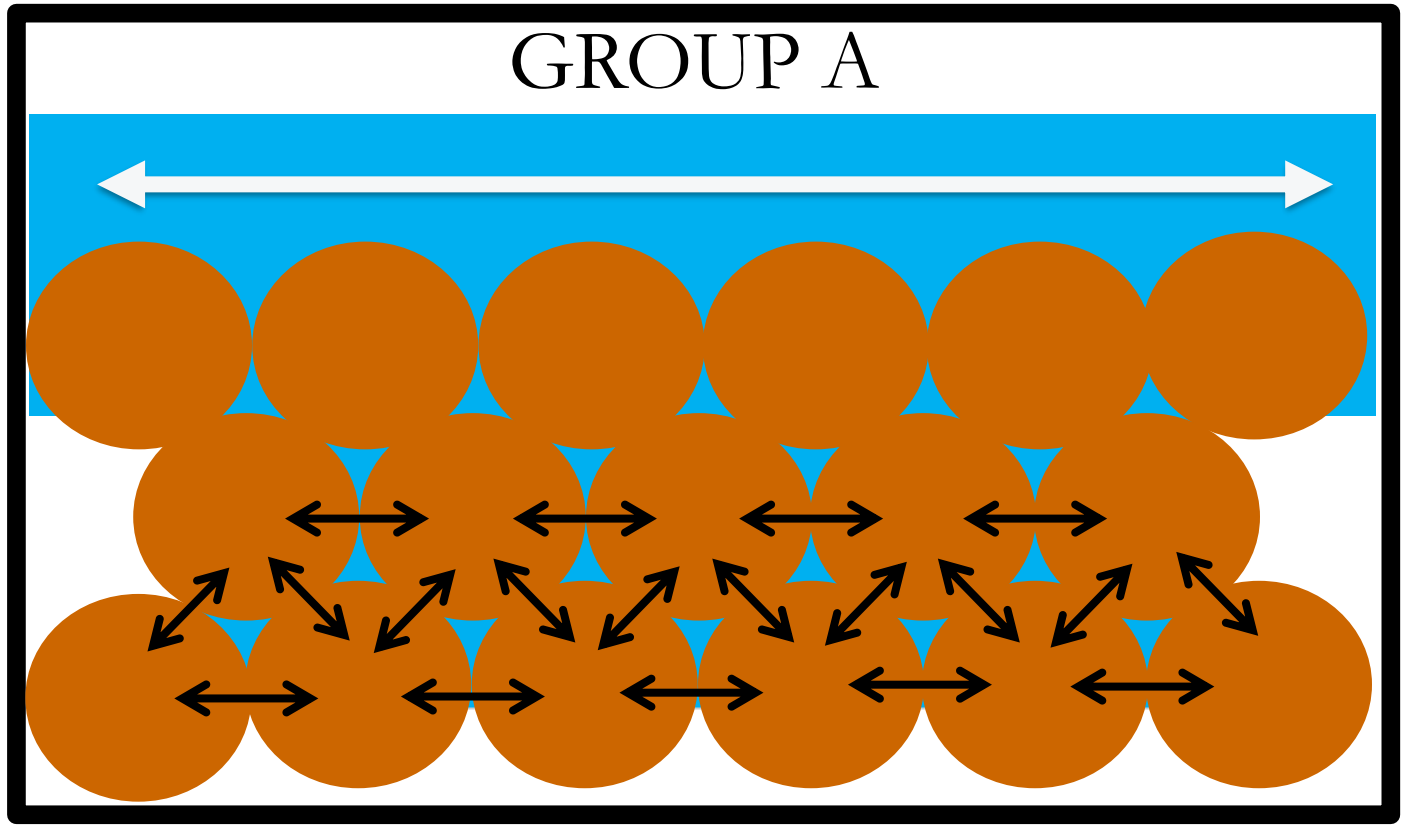
CRUSH

LIQUEFACTION

GROUP A



DYNAMIC SEPARATION



Group A and C Cargoes

CRUSH

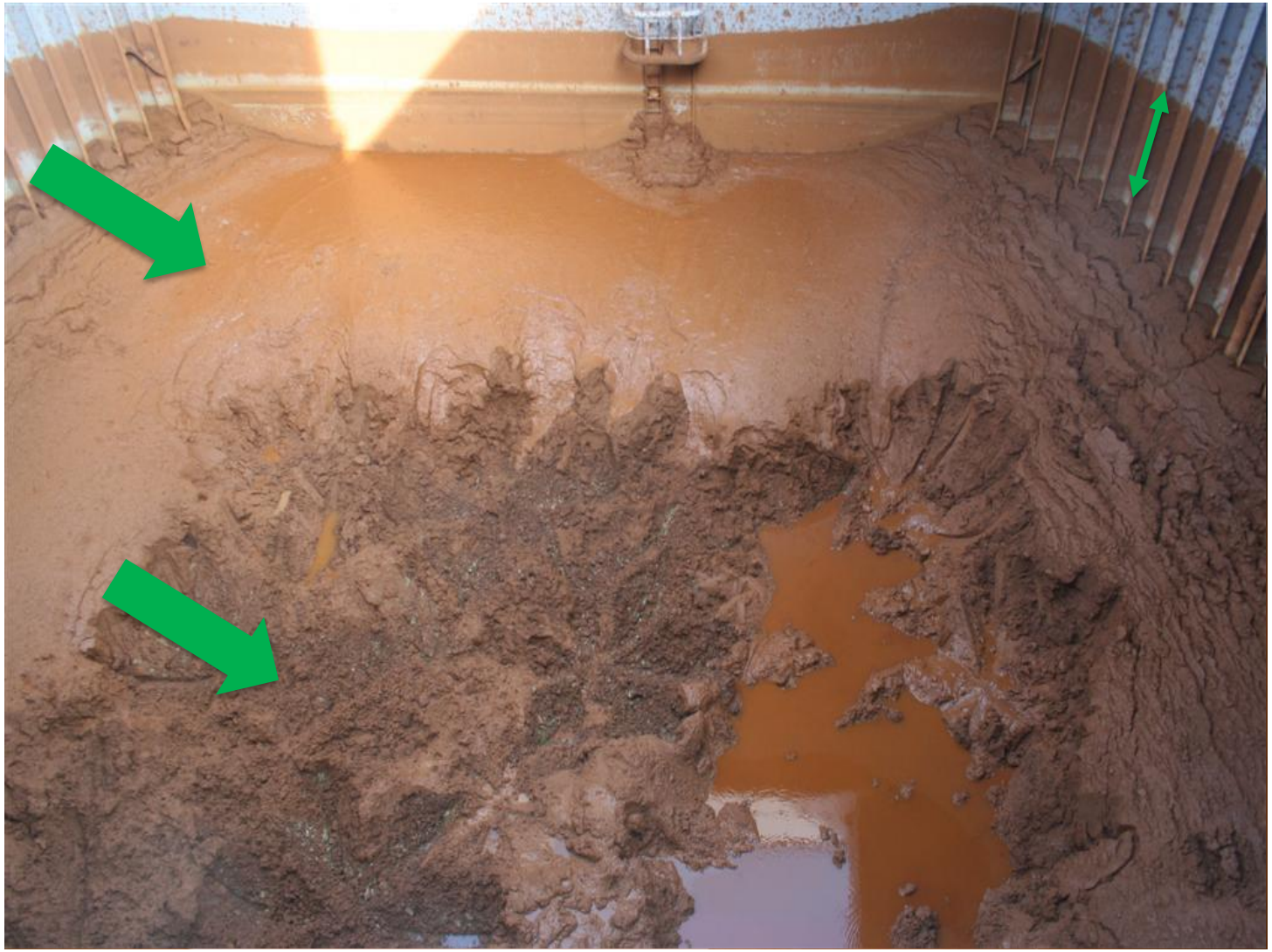
GROUP C

GROUP A

IMSBC Code, Appendix 3

Section 2.1 *"Many fine-particled cargoes, if possessing a sufficiently high moisture content, are liable to flow. Thus any damp or wet cargo containing a proportion of fine particles should be tested for flow characteristics prior to loading."*

HAZARDS DUE TO MOISTURE IN CARGO



IMSBC Code

IMSBC Code, Section 4:

1. The Shipper must provide the Master with the necessary information prior to loading to allow him to carry the cargo safely (Section 4.2.1)

2. Information must be accurate (Section 4.2.3)

Group A consists of cargoes which possess a hazard due to moisture that may result in liquefaction or dynamic separation if shipped at a moisture content in excess of their transportable moisture limit

<

SAMPLING

IMSBC Cod

4.4.1 *"Physica* *orior to loading on truly*

INTERNATIONAL STANDARD

ISO 8685

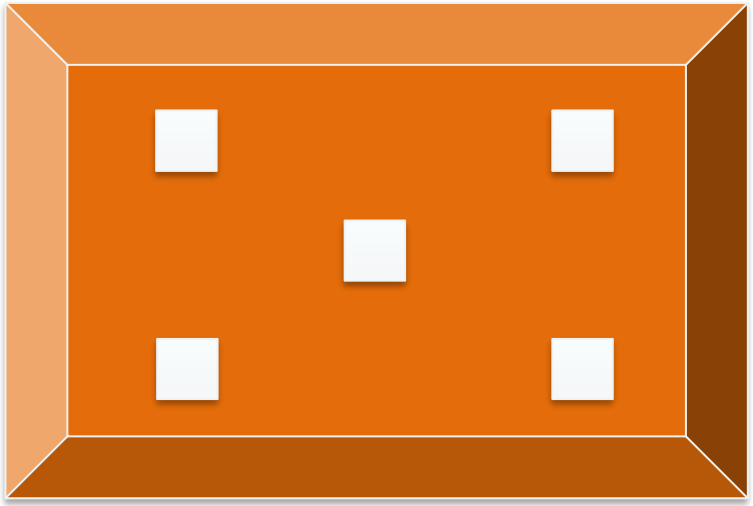
First edition
1992-06-01

4.1 General

The basic requirement of a correct sampling scheme is that all particles in the stream have an equal opportunity of being selected and appearing in the final gross sample for analysis. Any deviation from this basic requirement can result in an unacceptable loss of accuracy and precision. No incorrect sampling scheme can be relied upon to provide representative samples.

Aluminium ores — Sampling procedures

SAMPLING



UNDERSTANDING THE IMSBC CODE

2 January 2015: Bulk Jupiter sank while carrying bauxite from Malaysia to China. Only 1 crewmember survived.

BAUXITE

DESCRIPTION
A brownish, yellow claylike and earthy mineral. Moisture content: 0% to 10%. Insoluble in water.

CHARACTERISTICS

ANGLE OF REPOSE	BULK DENSITY (kg/m^3)	STOWAGE FACTOR (m^3/t)
Not applicable	1190 to 1389	0.72 to 0.84
SIZE	**CLASS**	**GROUP**
70% to 90% lumps: 2.5 mm to 500 mm 10% to 30% powder	Not applicable	C

Group A * Group B Group C * For cargoes which may liquefy (Group A and Group A and Group B cargoes)	NOT APPLICABLE Moisture content at shipment 10%
	Additional certificate(s)*

APPENDIX 1 SCHEDULES

IMSBC Code, Section 1.2.1:

"Typical cargoes currently shipped in bulk, together with advice on their properties and methods of handing, are given in the schedules for individual cargoes. However, these schedules are not exhaustive and the properties attributed to the cargoes are given only for guidance. Consequently, before loading, it is essential to obtain current valid information from the shipper on the physical and chemical properties of the cargoes presented for shipment"

UNDERSTANDING THE IMSBC CODE

Bauxite:

- Loss of Bulk Jupiter – 2015
- Bauxite Fines Schedule – 2020

Nickel Ore:

- 7 vessels lost 1988 – 2012
- Nickel Ore Schedule – 2012

Iron Ore Fines:

- 5 vessels lost 2007 – 2009
- Iron Ore Fines Schedule 2016

UNDERSTANDING THE IMSBC CODE

Vessel loaded cargo of clay in Taiwan

- Sailed 02:18 hours on 19 March 2012
- Listed at 04:00 hours
- Sank at 04:50 hours

CLAY CARGOES

CLAY

DESCRIPTION

Clay is usually light to dark grey and comprises 10% soft lumps and 90% soft grains. The material is usually moist but not wet to the touch. Moisture is up to 25%.

CHARACTERISTICS

ANGLE OF REPOSE	BULK DENSITY (kg/m^3)	STOWAGE FACTOR (m^3/t)
Not applicable	746 to 1515	0.66 to 1.34
SIZE	**CLASS**	**GROUP**
Up to 150 mm	Not applicable	C

HAZARD

No special hazards.
This cargo is non-combustible or has a low fire-risk.

CLAY CARGOES

Cargo remaining at Loadport was sampled:

- FMP = 27.9%
- TML = 25.1%
- Moisture = 29.7%

GROUP A

BALL CLAY MALAYSIA - 2017

BALL CLAY MALAYSIA - 2017

Cargo Declared Group C
Cargo Sampled:

- FMP = 32.1%
- TML = 28.9%
- Moisture = 36.4%

GROUP A

BALL CLAY MALAYSIA - 2020

M/V Xin Hong

- Vessel sank 18 December 2020
- Loss of crew

BALL CLAY MALAYSIA - 2021

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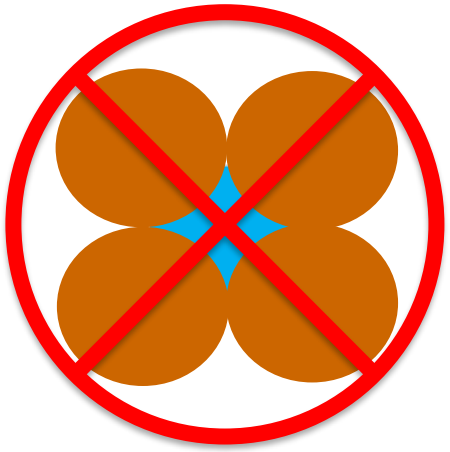
FORM FOR CARGO INFORMATION
for Solid Bulk Cargoes

BCSN		
Shipper		Transport document number
Consignee	TBA	Carrier :
Name / means of transport	BY SEA	Instructions or other matters
Port/Place of departure	LUMUT	
Port/Place of destination	TAIWAN	
General description of the cargo (Type of material/Particle size)	BALL CLAY	Gross mass (kg/tonnes) : 9,5.00 MT +/-
Specifications of bulk Cargo, if applicable **Stowage factor** 1 -1:3 CBIM PMT Angle of repose , if applicable NA Trimming procedures NA Chemical properties if potential hazard NA * e.g.,Class & UN No. Or "MHB"		
Group of the Cargo ☐ Group A and B* ☐ Group A* ☐ Group B ☒ **Group C** * For cargoes which may liquefy (Group A and Group A and B cargoes)		Transportable moisture limit Moisture content at shipment
Relevant special properties of the cargo (e.g.,highly soluble in water) **IN SOLUBLE IN WATER , USED IN THE MANUFACTURE OF CERAMICS . CARGO LOADED ON BOARD ARE NOT HARMFUL TO MARINE ENVIRONMENT.**		Additional certificate(s)* ☐ Certificate of moisture content and transportable moisture limit ☐ Weathering certificate ☐ Exemption certificate ☒ **Other (Specify): SPECIFICATION AND MSDS** * if required
DECLARATION I hereby declare that the consignment is fully and accurately described and that the given test results and other specifications are correct to the best of my knowledge and belief and can be considered as representative for the cargo to be loaded.		Name / Status ,Company / Organization of Signatory : Place and date : 18.11.2021 Signature on behalf of Shipper

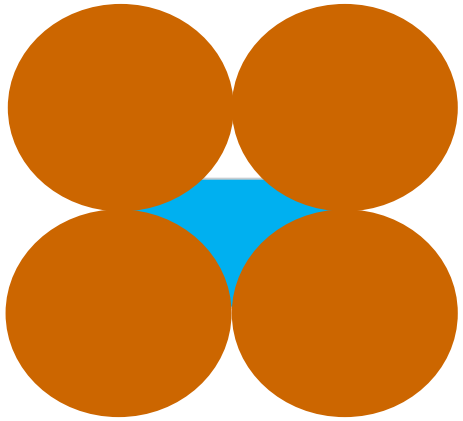
REAL WORLD CARGO BEHAVIOUR

REAL WORLD CARGO BEHAVIOUR

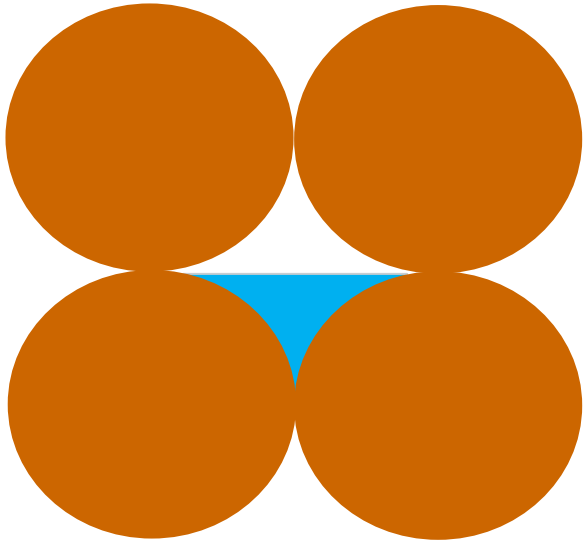
HIGH SAFETY FACTOR



SHIPPING CONDITIONS SCENARIO 2



STANDARD TEST CONDITIONS



SHIPPING CONDITIONS SCENARIO 1

REAL WORLD CARGO BEHAVIOUR

Moisture less than TML ensures cargo stability

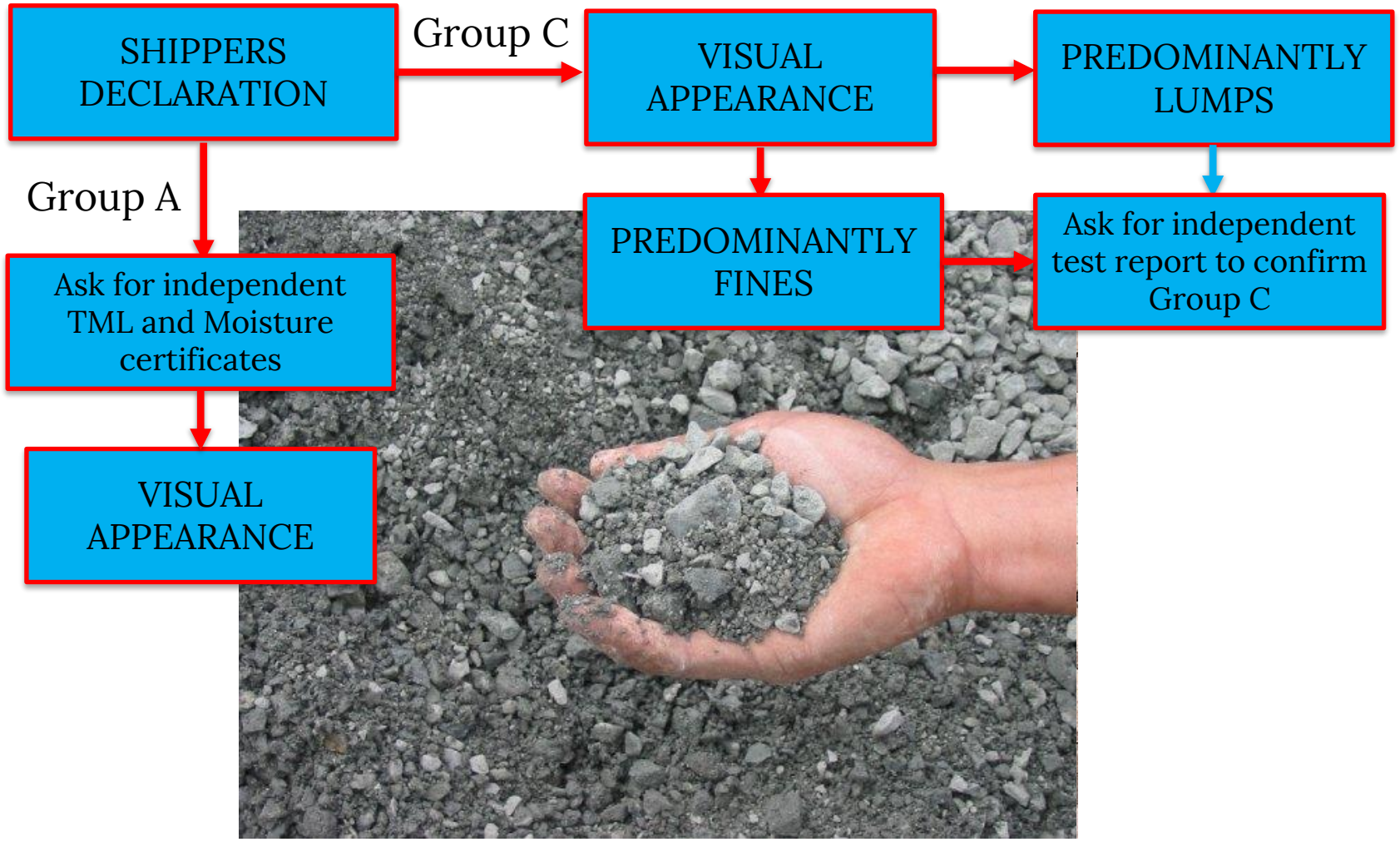
Predicting cargo behaviour during shipment is not possible

Moisture greater than TML cargo is not IMSBC Code compliant

Will the cargo become unstable?

YOU CANNOT SHIP A NON-IMSBC CODE COMPLIANT CARGO

PRECAUTIONS



ROLE OF THE CREW

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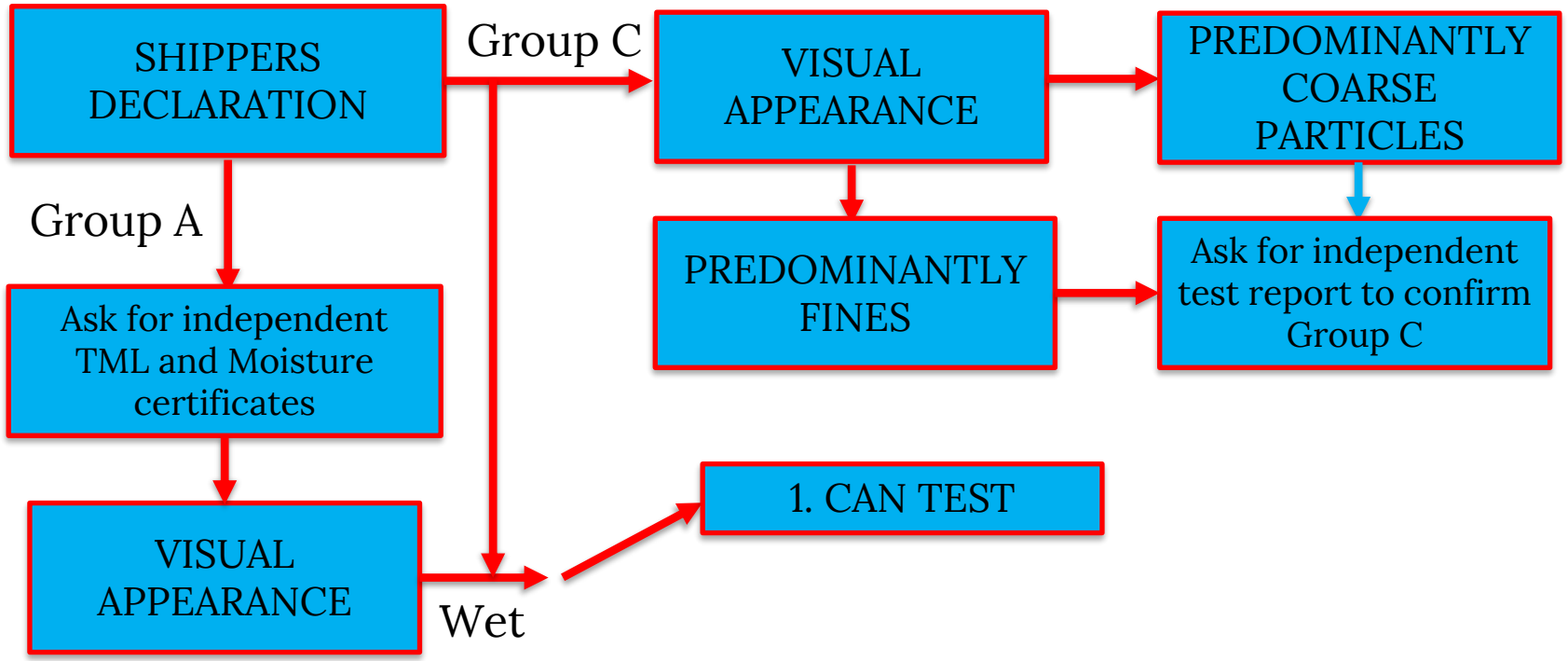


‘CAN TEST’

SAMPLES TESTED WILL NOT BE TRULY REPRESENTATIVE OF THE WHOLE CARGO

CAN TEST MAY INDICATE IF MOISTURE > FMP

CAN TEST WILL NOT CONFIRM MOISTURE IS < TML

CAN TEST WILL NOT PROVE CARGO IS IMSBC CODE COMPLAINT

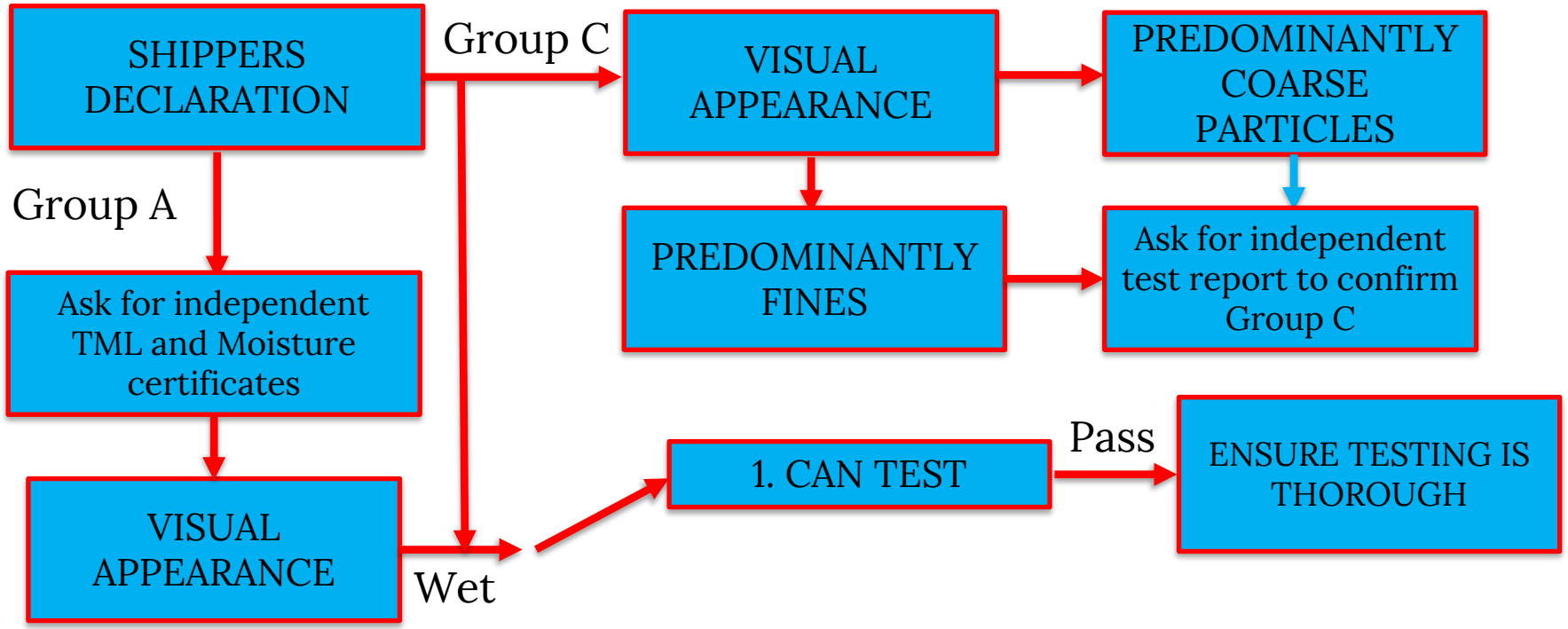
‘CAN TEST’

‘CAN TEST’

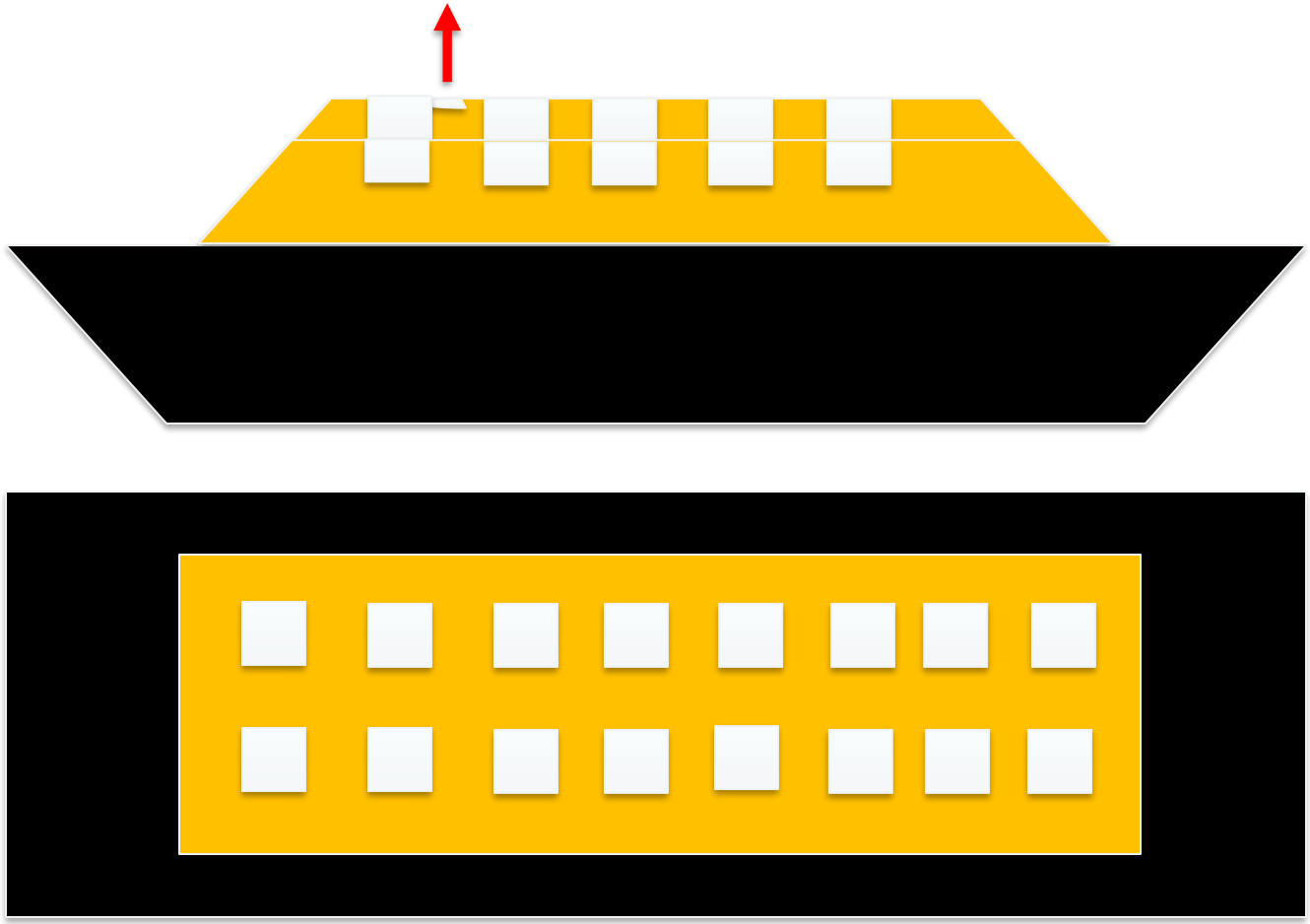
'CAN TEST'

The can test may not show surface moisture when materials have a high clay content, even when moisture exceeds FMP, which may be well above TML

ROLE OF THE CREW



‘CAN TEST’



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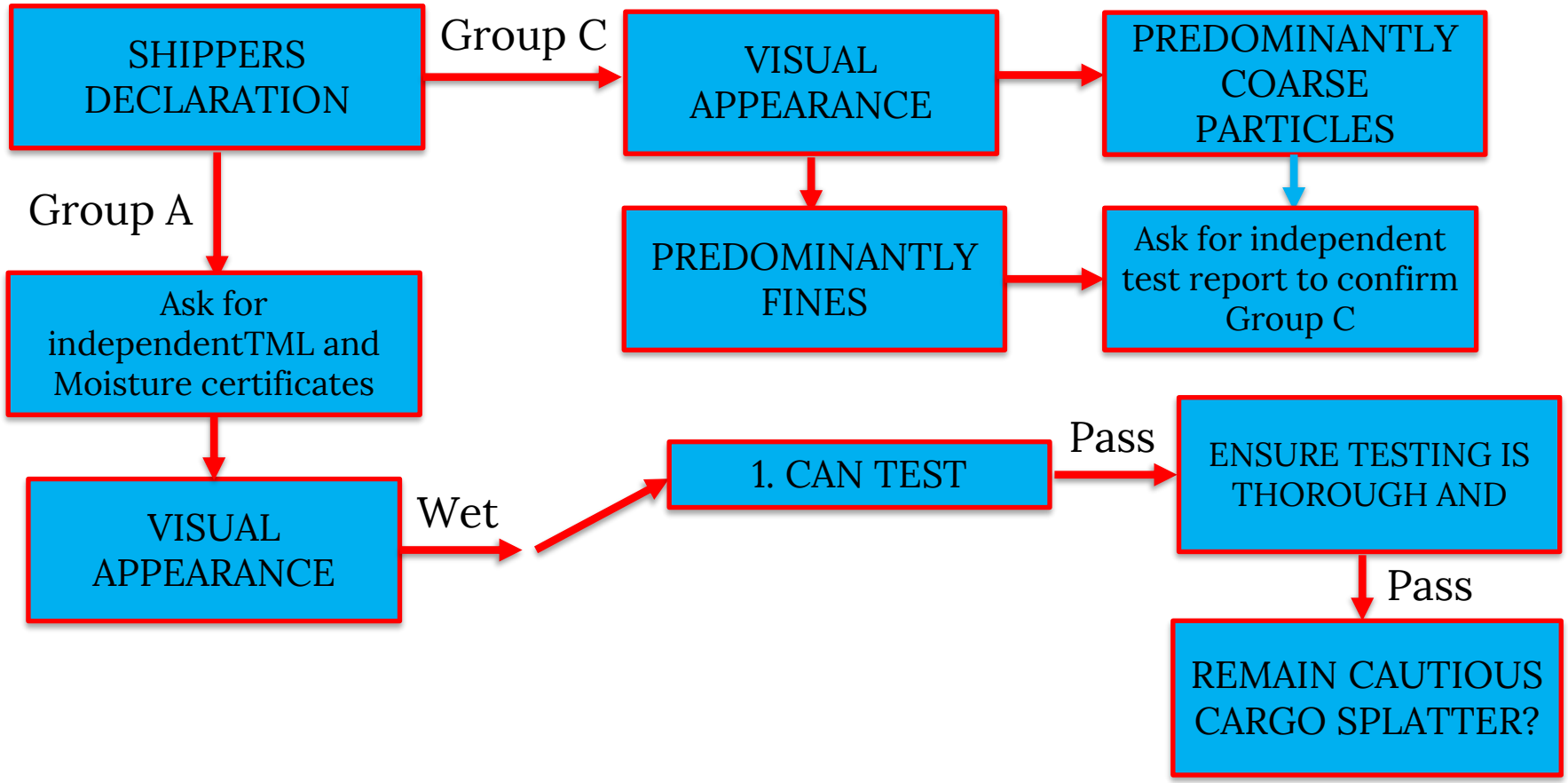

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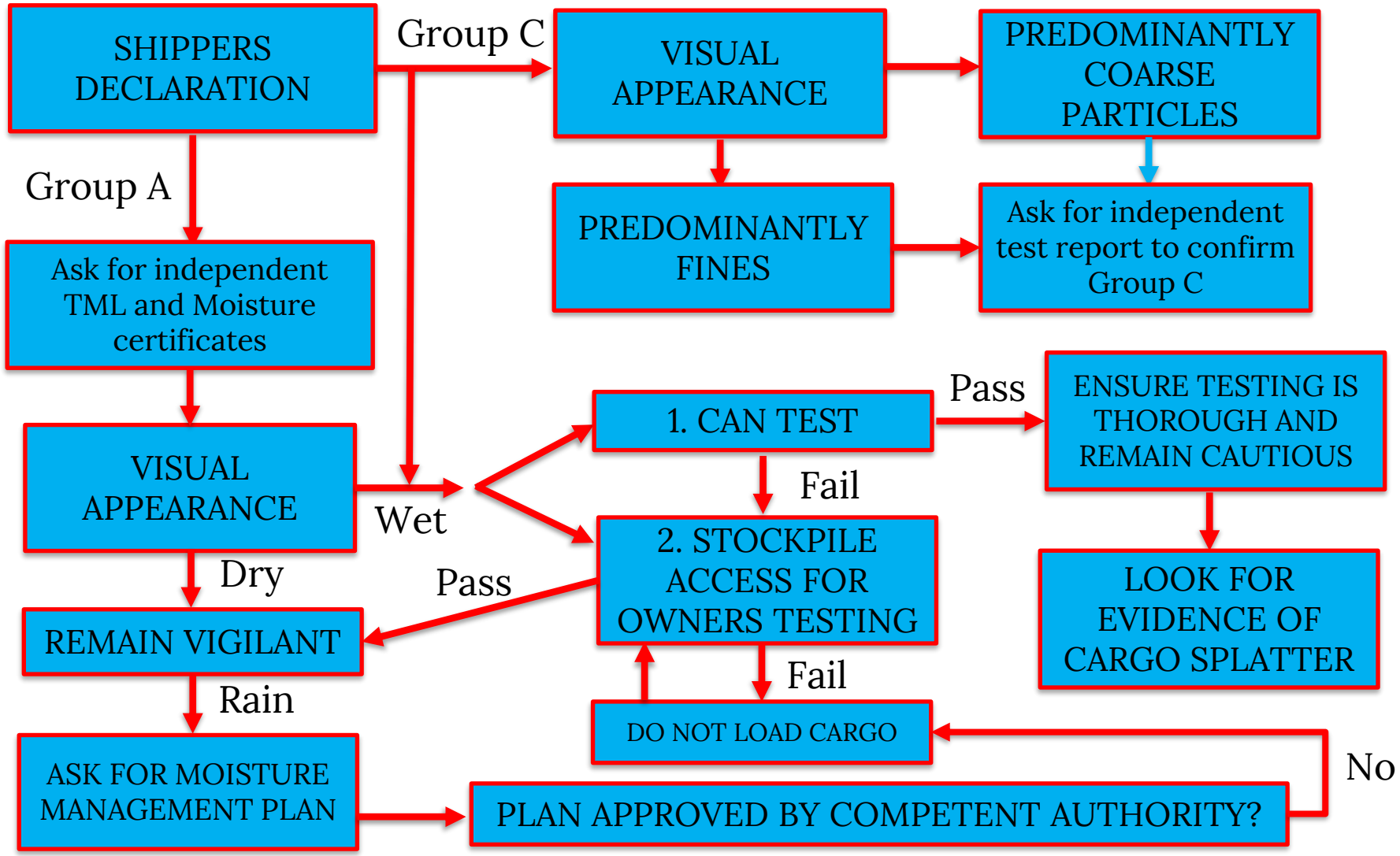

Thank You for Listening

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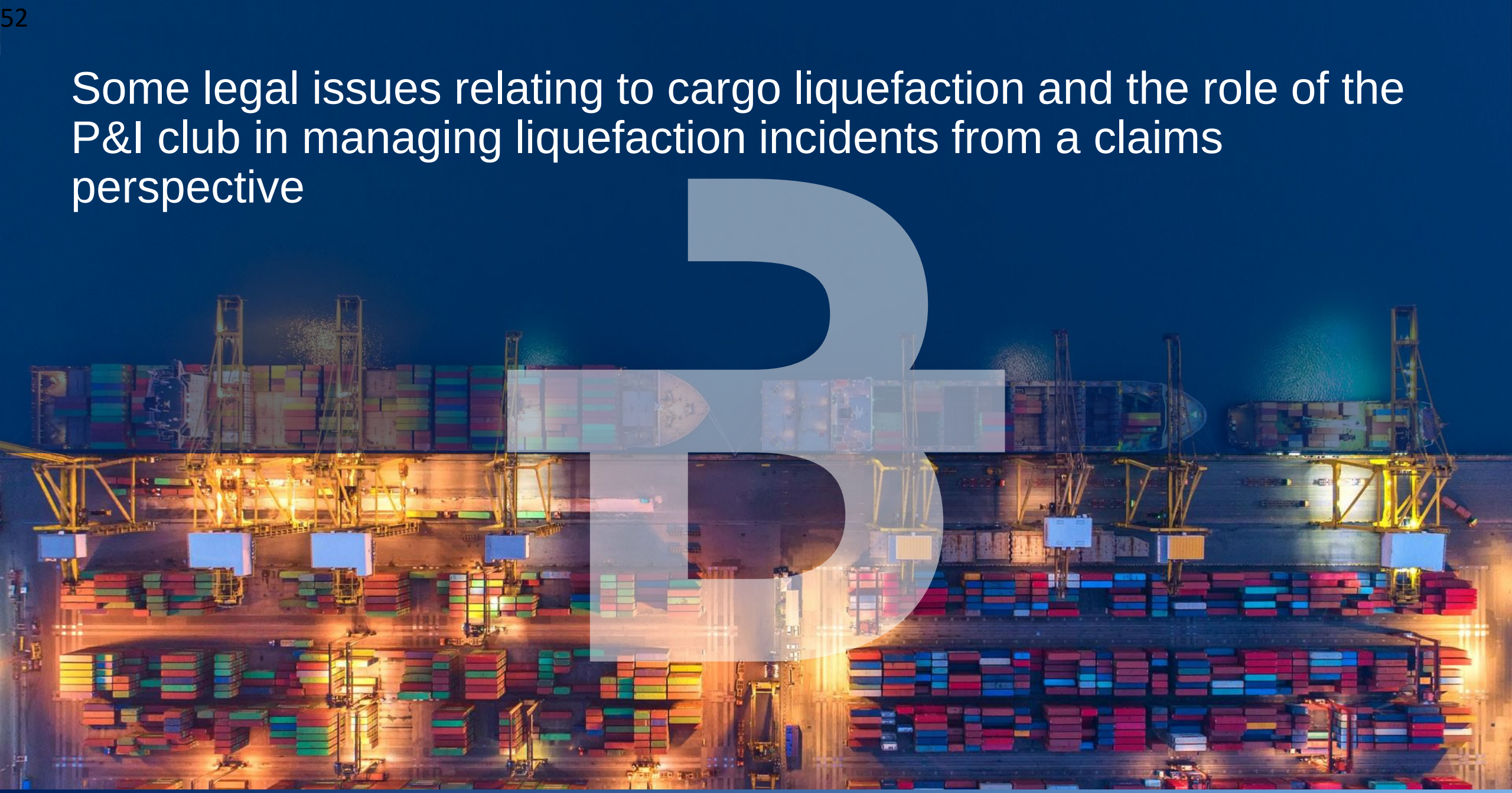
Liquefaction of Solid Bulk Cargoes – Risks & Precautions

Claims perspective

Colin Chung
Fleet Manager
Britannia P&I

Some legal issues relating to cargo liquefaction and the role of the P&I club in managing liquefaction incidents from a claims perspective



Cargo liquefaction

- Cargo liquefaction remains one of the greatest contributors to loss of life and causes of ship losses.
- According to INTERCARGO - loss of 70 lives or 76.1% of the total loss of life with five casualties between 2012 and 2021.

Liquefaction – two scenarios

Scenario 1

A cargo in fact loaded is suspected to have liquefied, resulting in loss.

Scenario 2

A cargo is tendered for loading (or which has already in fact been loaded) is suspected to be prone to liquefaction

Questions arising if liquefaction is suspected

- Is the cargo dangerous?
- Has the cargo been declared correctly?
- Does the Master have time to check out the situation?
- Has there been a breach of charter party?
- Is the vessel off-hire?
- Who pays for the delays?

Liquefaction – possible losses / damages

1. Hire / off-hire or damages
2. Damages for repudiation by Owners
3. Damages for repudiation by Charterers

Today’s talk

1. Dangerous cargo
2. Master’s right to assess the condition and safety of the cargo

Dangerous cargo

Two aspects:

1. Physical risk to vessel and/or cargo – dangerous cargo
2. Compliance with IMSBC Code – lawful cargo

The crux of any dispute

- Physical safety of the cargo and/or
- Compliance with the IMSBC Code

If the cargo is in fact safe/compliant as regards risk of liquefaction:

- No question of dangerous cargo will arise
- Rights of off-hire will be harder to resist i.e. the vessel will likely be off-hire
- Delay by the Master in loading will not necessarily be an actionable breach

If the cargo is <u>not</u> safe / compliant:

- Questions of dangerous cargo will arise
- No rights of off-hire are likely to arise.
- Claims by owners for an indemnity can be pursued
- Delay or refusal in loading will likely be justified

Dangerous cargo

- Broad meaning under Hague Rules and English law (common law)
- Physical damage to vessel or other cargo
- Article IV, rule 6 of the Hague Rules defines dangerous cargo as

  "Goods of an inflammable, explosive or dangerous nature to the shipment whereof the carrier, master or agent of the carrier has not consented with knowledge of their nature and character"
- Implied term against shipment of dangerous cargo

Lawful cargo

- Compliance with IMSBC Code
- BIMCO Bulk Cargoes that can Liquefy Clause for Charter Parties 2012
- Providing compliant documentation
- Unless and until correct documentation is provided, the cargo is not “lawful”

Master’s right to assess the condition and safety of the cargo

- NYPE clause 8 – the employment clause

  “That the Captain shall prosecute his voyages with the utmost despatch…The Captain (although appointed by the Owners), shall be under the orders and directions of the Charterers as regards employment and agency”

- Clause 8 imposes a duty on the master to carry out voyages ordered by the charterer without interruption and as quickly as possible

Exception to duty to proceed with due despatch

- Safety of the vessel and/or cargo
- Hill Harmony [2001] 1 Lloyd's Rep 147

Lord Hobhouse

> "The master remains responsible for the safety of the vessel, her crew and cargo. If an order is given compliance with which exposes the vessel to a risk which the owners have not agreed to bear, the master is entitled to refuse to obey it: indeed…in extreme cases the master is under an obligation not to obey the order."

The Houda [1994] 2 Lloyd’s Rep. 541

- The Master is entitled to a reasonable time to assess the cargo before agreeing to load it

Master’s right to delay

- Delay may be justified by orders exposing ship to liquefaction
- Can tests
- Section 8.4 of IMSBC Code:

  “If free moisture or a fluid condition appears, arrangements should be made to have additional laboratory tests conducted on the material before it is accepted for loading.”
- Master entitled to ask for samples to be sent to an additional laboratory for testing and to wait for test results from the laboratory before taking any decision to load

Conclusion

Legal summary

- Dangerous cargo means not only physical danger to the vessel and other cargo but also a legal compliance with IMSBC Code.
- Master is entitled to reasonable time before agreeing to load cargo if reasonable concerns that the cargo may liquefy.

Conclusion

Practical guidance for members

1. Always consult P&I Club (LP and Claims) if dealing with a cargo with which members are unfamiliar
2. Appoint a surveyor to check cargo before / during loading
3. Be prepared to appoint a liquefaction expert
4. Be prepared for possible delays due to testing at a laboratory
5. Lawyers may need to be appointed – possible prolonged delays

Q&A

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