

FUTURE REGULATIONS
FOR PROJECT CARGO

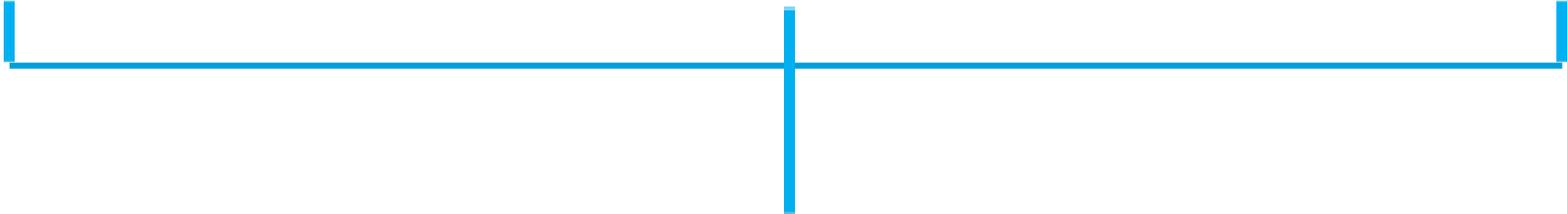


NICE TO MEET YOU



Paul Hoogenhout
Senior Project Engineer

ENGINEERED SOLUTIONS IN HEAVY LIFT & TRANSPORT



R ROLL GROUP

WHAT DO WE WANT TO ACHIEVE?

Increase the standard of safety and quality during transport of project cargo



OVERVIEW OF GOVERNING REGULATIONS

STANDARD FOR ALL CARGO

- Flag state and Classification Society
- International Code on Intact Stability
- CTU Packing Guideline - IMO/ILO/UNECE Code of Practice for Packing of Cargo Transport Units
- Cargo Securing Manual

APPLICABLE FOR PROJECT CARGO

- CSS Code (IMO Code of Safe Practice for Cargo Stowage and Securing)
- DNVGL-ST-N001 Marine Operations and Marine Warranty Standard



Joint Industry Project with the overall aim to improve safety and efficiency of cargo securing by creating a level playing field where there is a unified interpretation of the IMO rules

Heavy Lift Exchange Forum (HLEF)

IN SEARCH OF UNIFIED RULES

Proposed changes to Annex 13

1. Weather dependent load assumptions
2. Speed reduction in head seas
3. Vessel survival criteria in case of a major cargo shift
4. Additional tipping moment due to the rotational inertia
5. Balance of longitudinal sliding and tipping
6. Interpretation of 'on deck high'
7. Wind moment in tipping balance
8. Homogeneity of securing arrangements

Source:

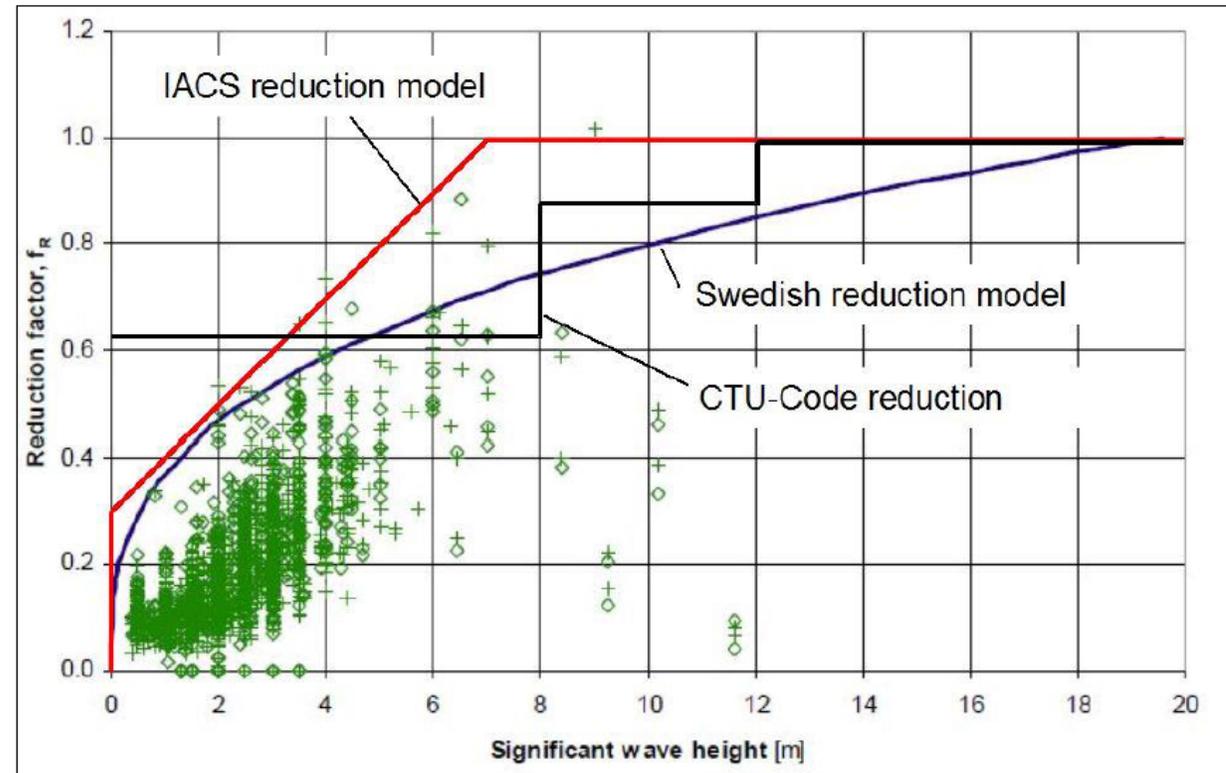
Proposed interpretations of and amendments to the Annex 13 of the IMO Code of Safe Practice for Cargo Stowage and Securing, 31.01.2017 by Prof. Kapt. Hermann Kaps (I.R.), Peter Andersson.

8 PROPOSED CHANGES TO ANNEX 13

PROPOSAL 1

Weather dependent load assumptions

Choose one of the reduction models



8 PROPOSED CHANGES TO ANNEX 13

PROPOSAL 2

Speed reduction in head seas

Use 80% Fz

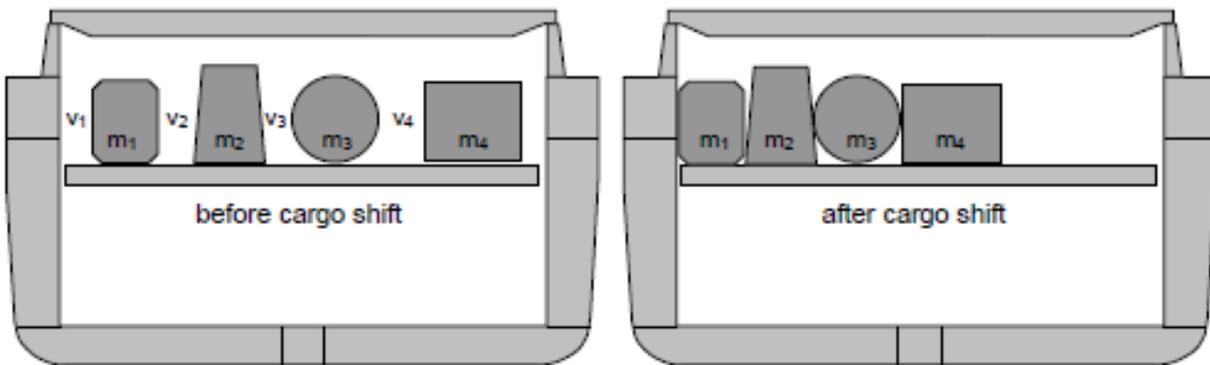


8 PROPOSED CHANGES TO ANNEX 13

PROPOSAL 3

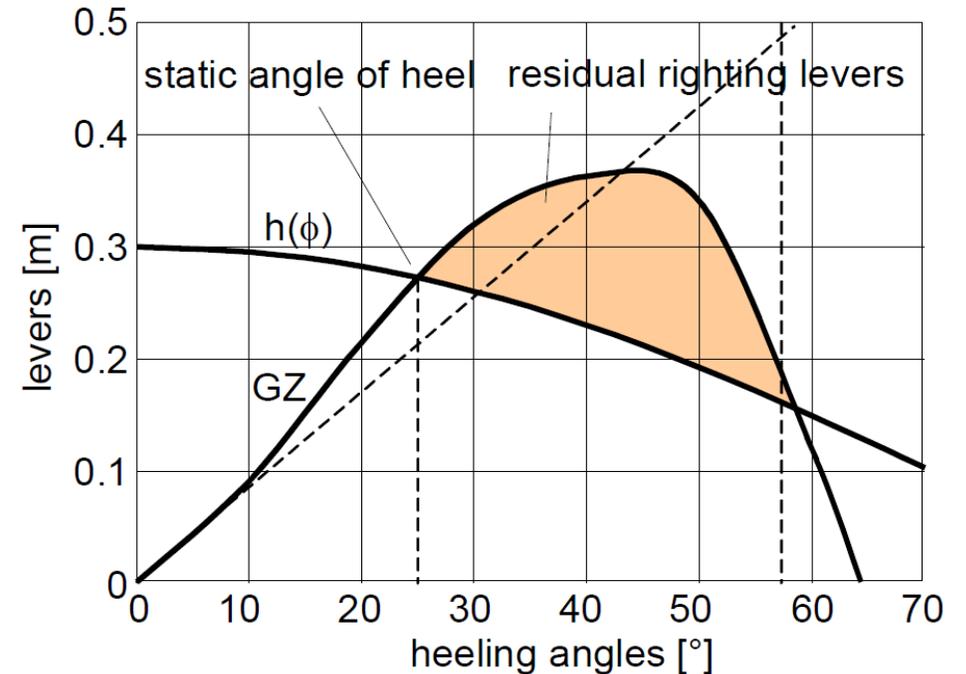
Vessel survival criteria in case of a major cargo shift

Sufficient stability after cargo shifting



Before counter ballasting:

- Static heeling angle < 25 degrees
- GZ has at least 20 degrees of positive range after shift
- Max. GZ reaches at least 0.1 m. within 10 deg. Beyond the static angle of heel



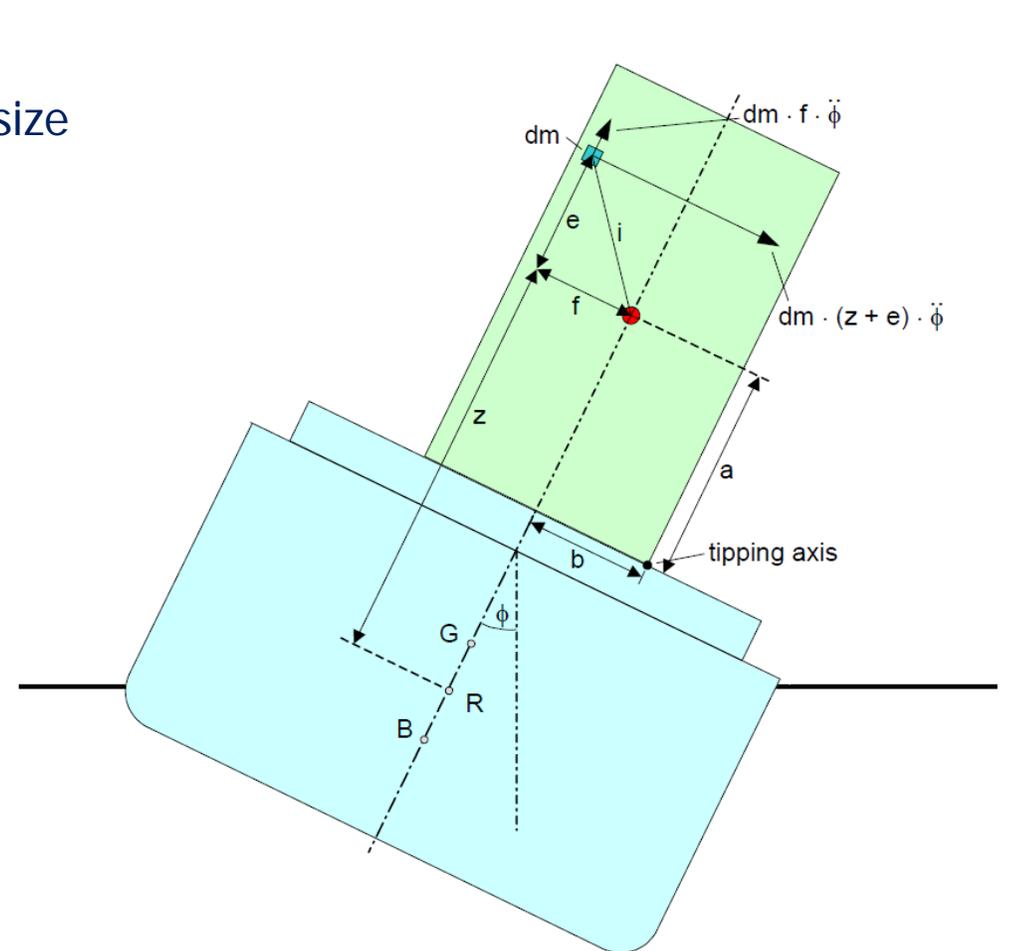
8 PROPOSED CHANGES TO ANNEX 13

PROPOSAL 4

Additional tipping moment due to increase of cargo size

Add additional tipping moment

$$M_y = \underbrace{m \cdot [(g + a_z) \cdot \sin \phi + z \cdot \ddot{\phi}] \cdot a}_{\text{ordinary tipping moment}} + \underbrace{\ddot{\phi} \cdot \int (i^2 \cdot dm)}_{\text{additional tipping moment}} \quad [\text{kN} \cdot \text{m}]$$



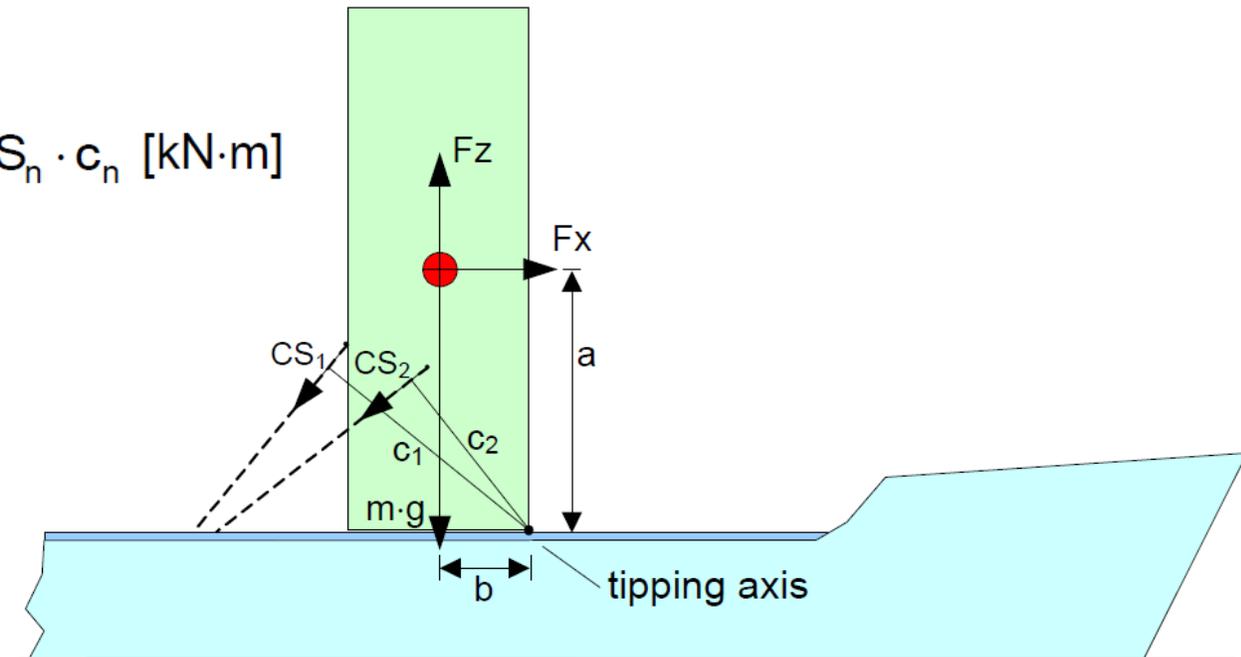
8 PROPOSED CHANGES TO ANNEX 13

PROPOSAL 5

Balance of longitudinal sliding and tipping

Reduce vertical acceleration in load combination

$$F_x \cdot a \leq b \cdot (m \cdot g - 0.8 \cdot F_z) + CS_1 \cdot c_1 + CS_2 \cdot c_2 + \dots + CS_n \cdot c_n \quad [\text{kN} \cdot \text{m}]$$



8 PROPOSED CHANGES TO ANNEX 13

PROPOSAL 6

Interpretation of 'on deck high'

Use actual formulas instead of tables

Transverse acceleration a_y in m/s^2										Longitudinal acceleration a_x in m/s^2		
on deck, high	7.1	6.9	6.8	6.7	6.7	6.8	6.9	7.1	7.4	3.8		
on deck, low	6.5	6.3	6.1	6.1	6.1	6.1	6.3	6.5	6.7	2.9		
'tween-deck	5.9	5.6	5.5	5.4	5.4	5.5	5.6	5.9	6.2	2.0		
lower hold	5.5	5.3	5.1	5.0	5.0	5.1	5.3	5.5	5.9	1.5		
	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	L	
Vertical acceleration a_z in m/s^2												
	7.6	6.2	5.0	4.3	4.3	5.0	6.2	7.6	9.2			

$$a_{x0} = \pm a_0 \cdot \sqrt{0.06 + A^2 - 0.25 \cdot A}$$

$$a_{y0} = \pm a_0 \cdot \sqrt{0.6 + 2.5 \cdot \left(\frac{x}{L} + 0.05\right)^2 + K \cdot \left(1 + 0.6 \cdot K \cdot \frac{z}{B}\right)^2}$$

$$a_{z0} = \pm a_0 \cdot \sqrt{1 + \left(5.3 - \frac{45}{L}\right)^2 \cdot \left(\frac{x}{L} + 0.05\right)^2 \cdot \left(\frac{0.6}{C_b}\right)^{3/2}}$$

therein:

$$a_0 = 0.2 \cdot \frac{v}{\sqrt{L}} + \frac{34 - 600/L}{L}$$

$$A = \left(0.7 - \frac{L}{1200} + \frac{5 \cdot z}{L}\right) \cdot \left(\frac{0.6}{C_b}\right)$$

$$K = \frac{13 \cdot GM}{B}, \text{ but never less than } 1.0$$

Length Lpp [m]	137,00	$a_0 =$	0,498	
Breadth moulded B [m]	22,60	$K =$	1,381	
Service speed v [knots]	16,50	$X =$	27,50	m
Metacentric height GM [m]	2,40	$Z =$	9,90	m
Mean draught Tm [m]	7,90	$A =$	0,812	
CB	0,70	$a_x =$	2,598	m/s^2
Cargo LCG [m]	96,00	$a_y =$	6,590	m/s^2
Cargo VCG [m]	17,80	$a_z =$	5,404	m/s^2

8 PROPOSED CHANGES TO ANNEX 13

PROPOSAL 7

Wind moment in tipping balance

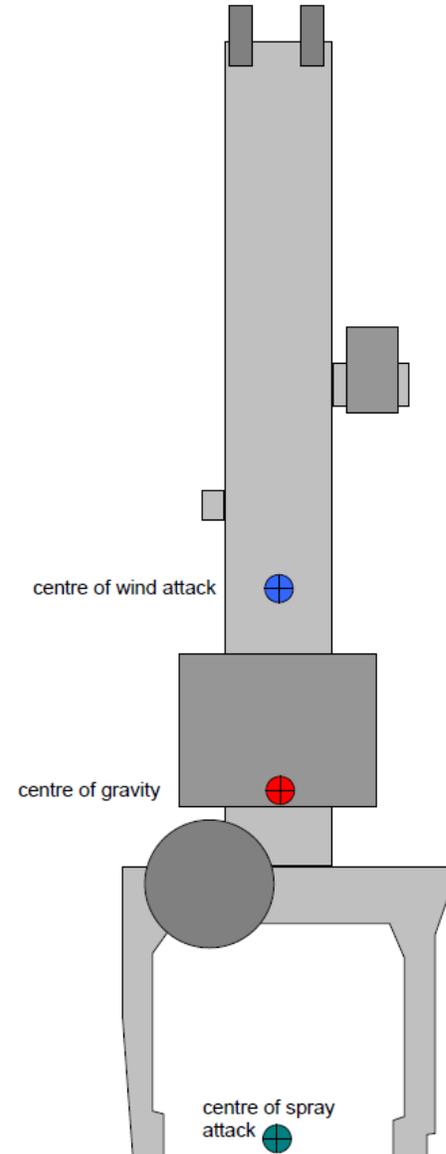
Use centre of attack for wind moment

	F_x	a	F_x · a
gravity/inertia	1373 kN	13.0 m	17849 kN·m
wind	170 kN	20.0 m	3400 kN·m
spray	4 kN	1.0 m	4 kN·m
Total	1547 kN		21253 kN·m

The conventionally computed tipping moment would be only:

Total	1547 kN	13.0 m	20111 kN·m
--------------	----------------	---------------	-------------------

Difference is ~6% in this example

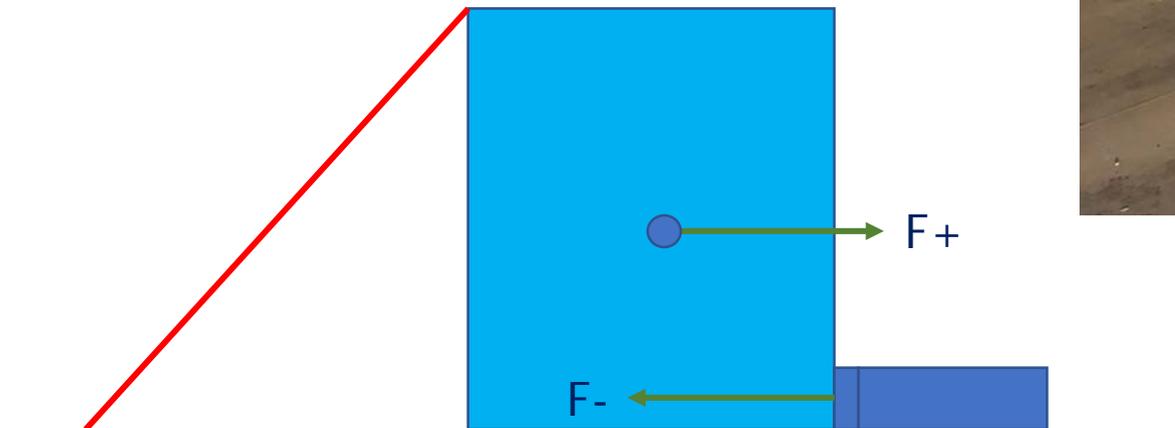


8 PROPOSED CHANGES TO ANNEX 13

PROPOSAL 8

Homogeneity of securing arrangements

Don't combine hard and soft seafastening



WAY FORWARD

Annex 13

- Assumes unrestricted sailing
- Extreme amount of securing required

DNVGL ST-N001

- Allows weather restricted sailings
- More expert knowledge required



WAY FORWARD

What is project cargo?



What is project cargo?



Sea transport can be considered special or exceptional when:

- Unusual shipping parameters (size, weight and specialist handling)
- Value
- Exceptional loads on vessel structure
- Abnormal stability condition
- Weather sensitive
- Deviations from regular service
- Warranty necessary

- What is an expert?
- > Suggest certification/quality label for MWS & experts



WAY FORWARD

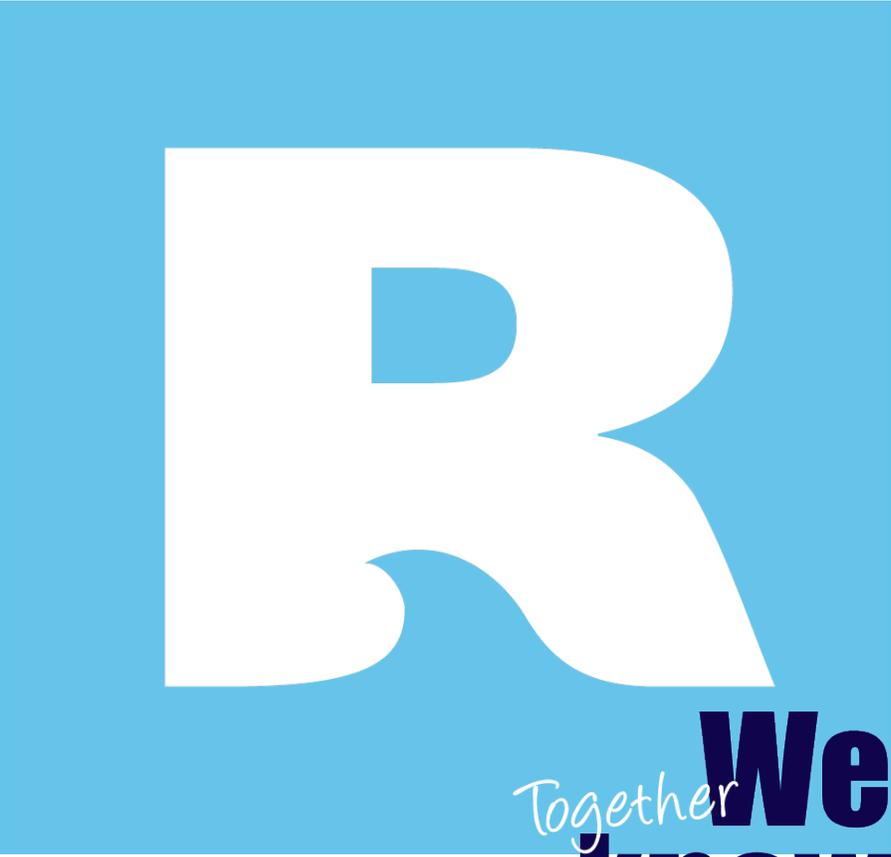
- Increase knowledge at cargo owners
 - > Make sure cargo is suitable for transport over land and sea (uniform acceleration for cargo design basis ship type, route, duration etc.)



Future guidelines for module designers and fabricators (ASCE)

- Design & construction
- Load-out
- Seafastening
- Transport
- Load-in
- Land transport
- Installation





Together **We
know
how**