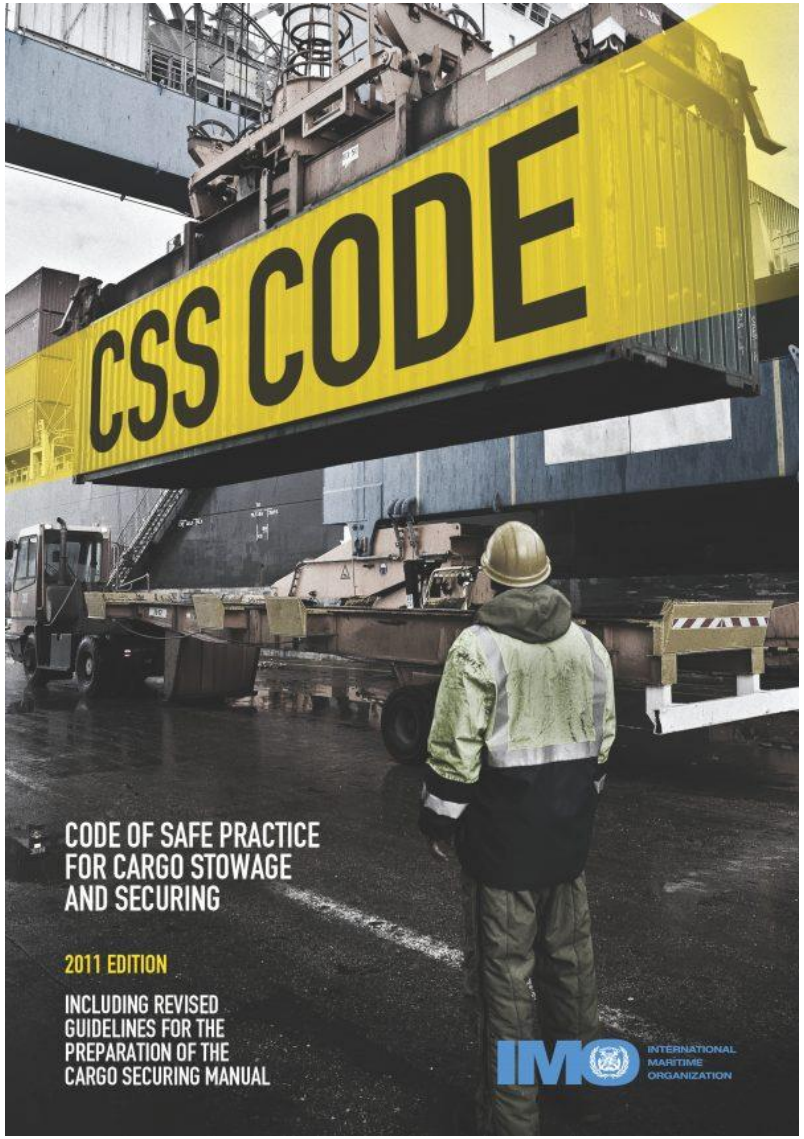
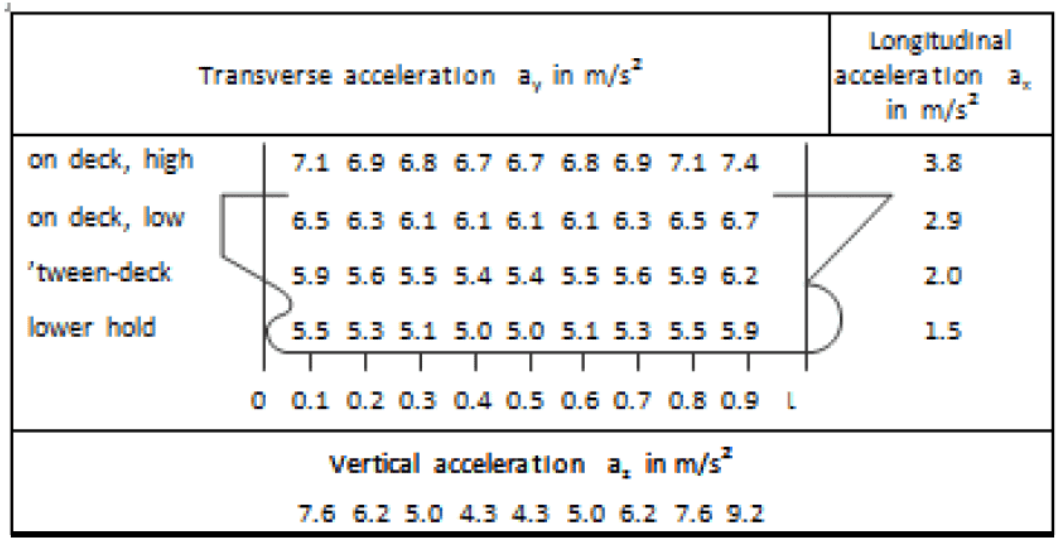
Weather Dependent Lashing
after the amended IMO - CSS code (MSC.1/Circ.1623)



Genesis & Evolution

(with a special thanks to Professor Captain Hermann Kaps)

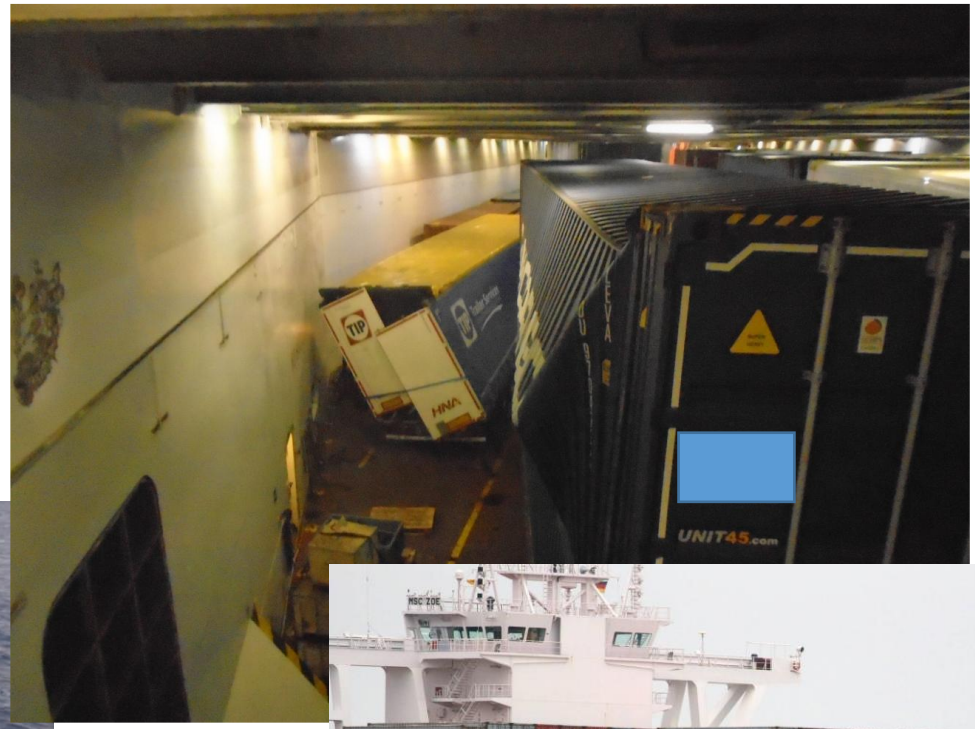
- The CSS code is the international accepted “lashing bible” for cargo vessels
- An IMO guideline, implemented by almost all member states
- The basis for Cargo Securing Manuals and cargo lashing principles for ALL vessel (except container & wet/dry bulk vessels) CSM’s are STATUTORY DOCUMENTS!
- First issued in the 1990’s, with a number of amendments since then
- A calculation method for the “balance of forces”: environmental induced vessel motions / forces versus cargo lashing capacities

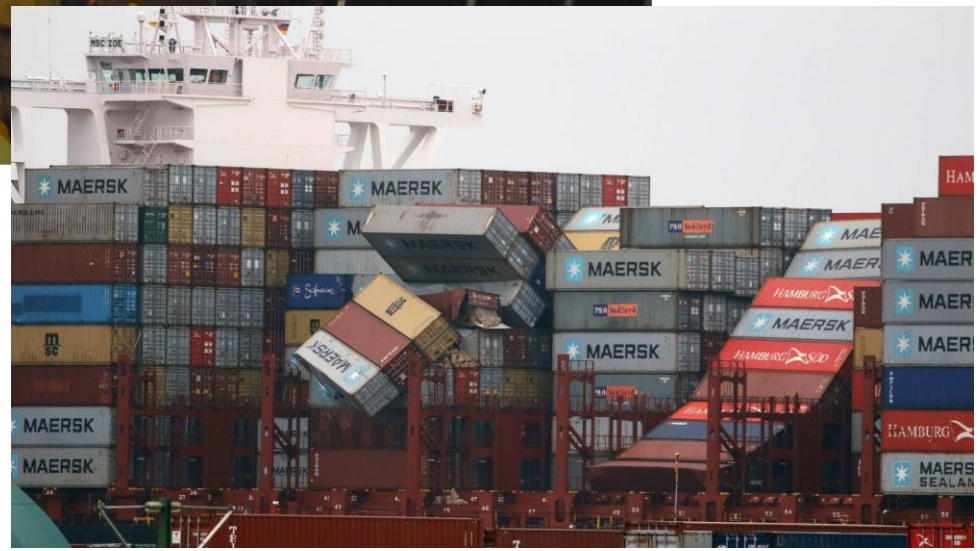


- Basic acceleration matrix for UNRESTIRCTED trades (read: Winter North Atlantic) , valid for a ship of 100 meter length, 15 knots speed and a few other conditions….
  - Corrections to be made for different parameters of length, speed, GM, etc.
  - This matrix is the result of years of discussions, bright minds and a lot of common sense!

SIRI MARINE
SOLUTIONS IN MOTION

The balance of forces !



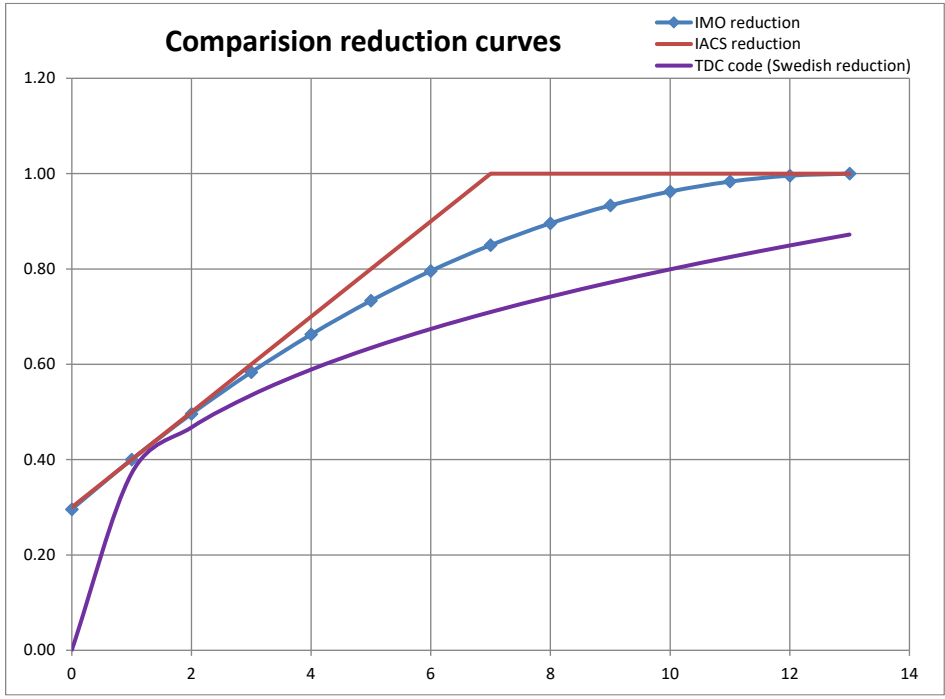


Amendment to the CSS code (2020)
A Unified Interpretation of the Guidelines
(Published by IMO in December 2020 as MSC.1/Circ.1623)

- A complete re-write of Annex 13 (Methods to assess the efficiency of securing arrangements for semi-standardized and non-standardized cargo)
- Specifically including Weather Dependent Lashing operations to reduce the IMO accelerations. Input for the reduction factor is Hs (Significant wave height) in the trading area
- The CSS code now also applies to heavy cargoes and towed transports (heavy cargoes and tows were excluded before)
- A new Appendix 4 to addresses RoRo operations (Friction + performance factor)
- IMO has requested all member states to implement these new guidelines

How can IMO accelerations be reduced during WDL operations (3 + 1 methods)

- 20 year return Hs on the trade route
- Forecasted Hs for voyages < 72 hours
- (this is the preferred method for short-sea)
- Seafastening design for a max Hs
- (This legalizes vessel routing!)
- Full scale monitoring results in irregular seas
- (This is the Siri Marine approach for RoRo / RoPax)
- Whenever WDL operations are carried out:
  - Weather conditions must be monitored
  - Vessel motions must be monitored & recorded

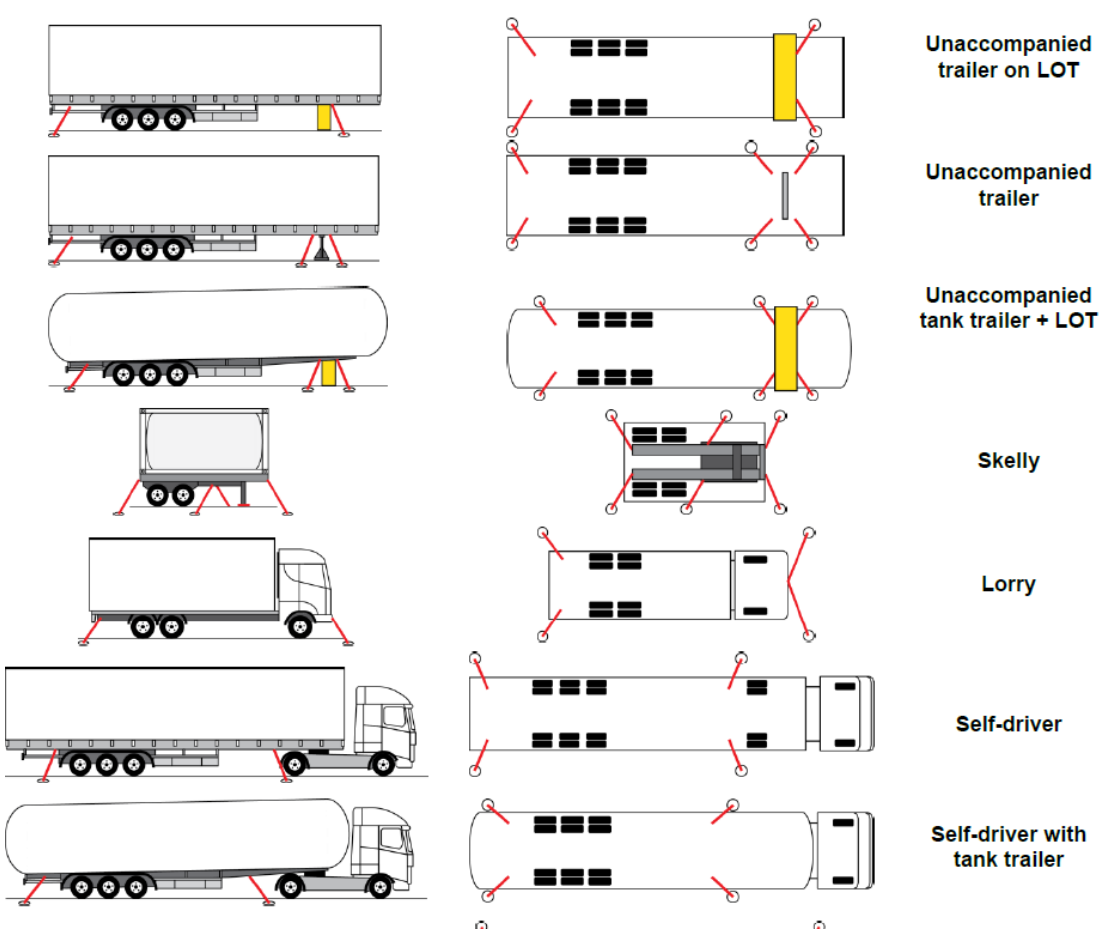


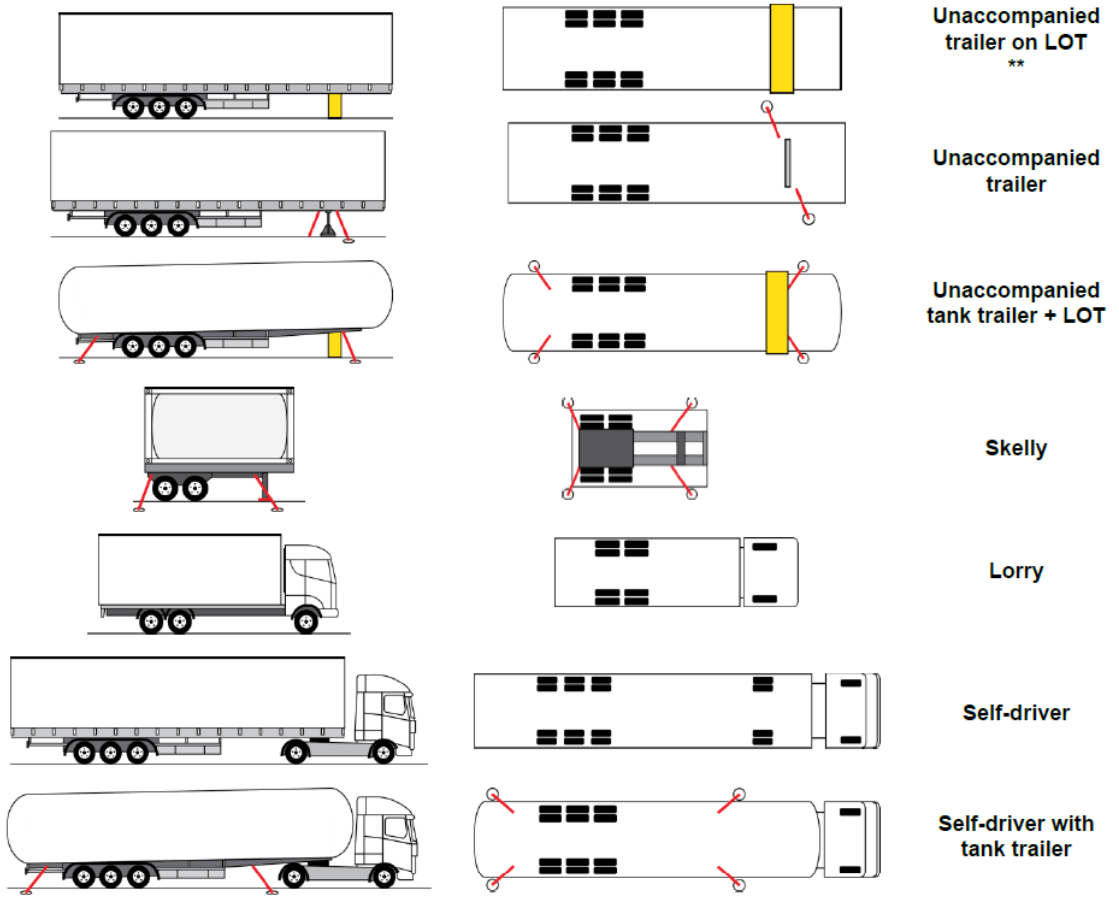
A “level playing field” for the RoRo / RoPax industry

- After 15 or more years of discusions, finally a unified interpretation of the CSS guidelines
- Applicable world-wide with only the significant wave height in the trade area as input (Providing the implementation by your Flag-state of the MSC.1/Circ.1623 amendment to the CSS Code)
- Clear instructions how a reduction to the IMO accelerations must be applied
- A more realistic matrix of friction coefficients (For the RoRo / RoPax only!) Increased to 0.45 for air-rubber tyres on a dry steel surface)
- And a “performance factor” specifically for RoRo / RoPax vessels

SIRI MARINE
SOLUTIONS IN MOTION

What can it do for you?





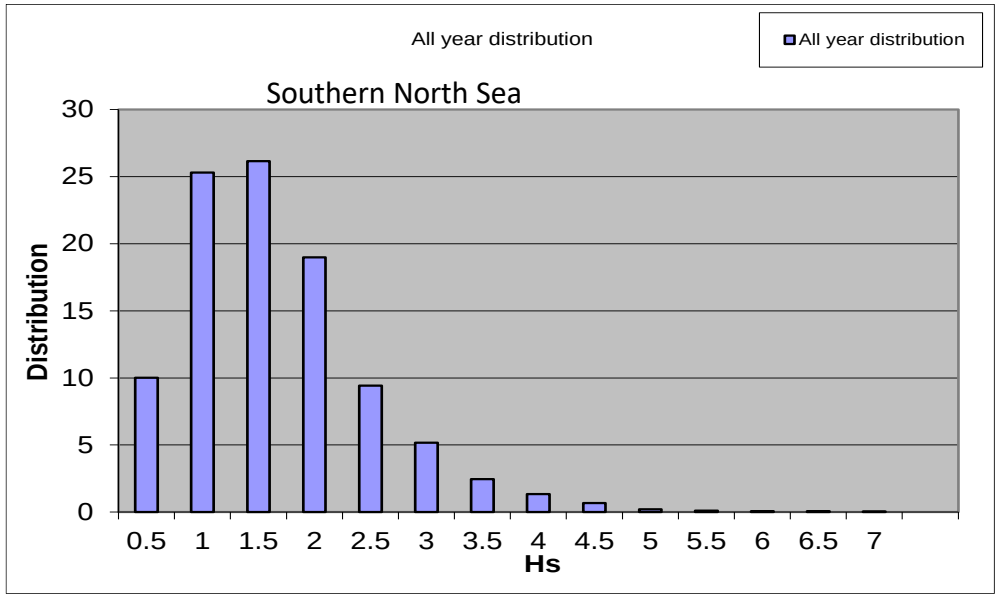
Heavy Lashing for Hs > 3,0 / 3,5 meter

Light Lashing for Hs < 3,0 / 3,5 meter

How do you define the limiting wave height for LIGHT lashing?

- The objective has been to allow 0 lashings for self-drivers and 2 lashings only for trailers on traditional trestles
- Full scale measurements over the past 18 years on > 90 RoRo / RoPax vessels have shown that a limiting wave height of approx. 3.0 meter Hs causes vessel motions that allow for LIGHT lashing application (2.5 for very small RoRo vessels, 3.5 for the larger RoRo/RoPax vessels)
- Recorded motions / accelerations are used in the calculations and provide sufficient safety margins
- Long term statistics show that Hs < 3.0 meter occurs in > 95% in Southern North Sea, Irish Sea, Italian coastal waters, Balearic Sea
- The Central North Sea & Skagerrak score > 90%; Bay of Biscay scores around 80%, but this is greatly influences by the winter months
- The percentages shown are all-year numbers
- To the best of my knowledge, cargo incidents have NOT occurred when LIGHT lashing was practised!

Wave statistics examples



Central North Sea

Monthly distribution of sign. wave height (m)

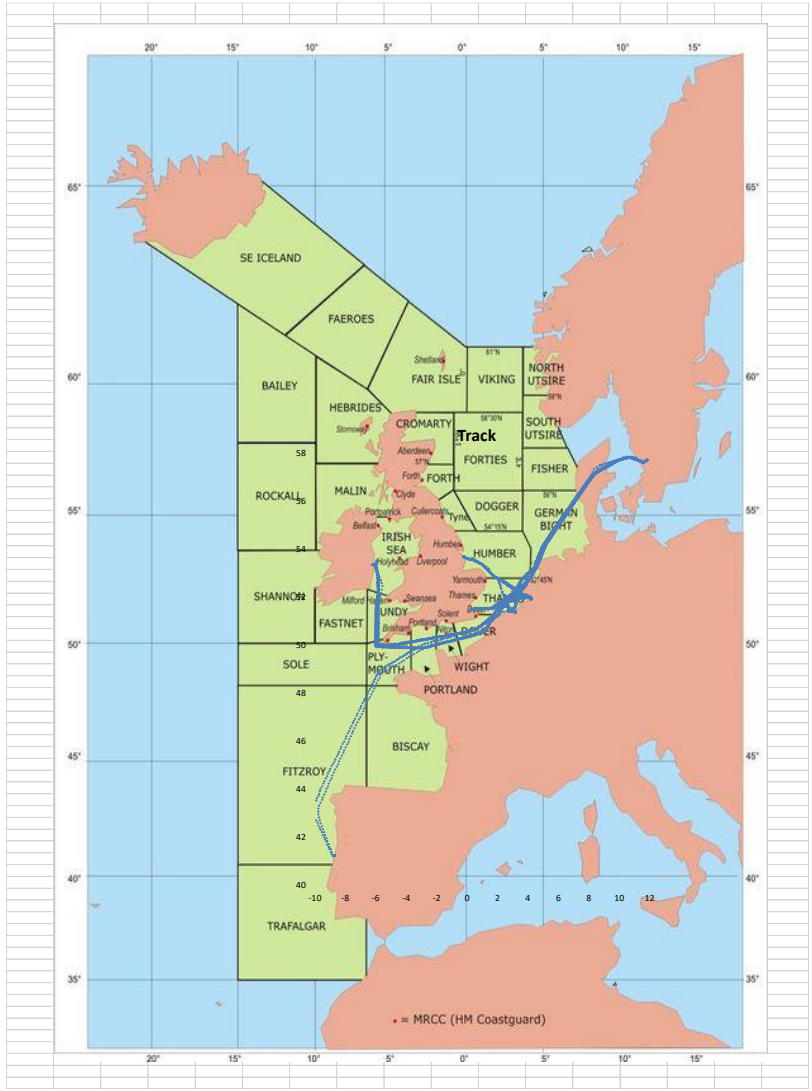
lower	upper	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0.5	1.3	2	2.9	9.4	8	9.4	15.5	9.1	3.9	2.3	1.1	0.7
0.5	1	8.8	10.1	11.1	26.7	24.3	25.9	37.2	29.5	17.3	8.4	5.7	6.8
1	1.5	16.3	15	20	24.5	30.1	26.8	23.4	23.7	25.4	18.3	17	14.1
1.5	2	17.1	14.5	17.8	16.8	19.4	18.3	12.6	20.9	18.1	24.7	27.2	17.1
2	2.5	13.4	16.8	17.3	12	10.3	8.7	5.5	10.5	12.9	14.5	15.2	20.3
2.5	3	15.8	15	10.6	5.5	6.9	6.8	3.1	4.2	9	11.3	13.4	14
3	3.5	8.9	7.4	8.2	2.1	0.9	3.2	1.6	1.3	5.3	8.2	8.5	8.7
3.5	4	7.1	7.5	4.9	0.9	0.1	0.5	0.8	0.2	3.5	5.1	7	9.4
4	4.5	5.7	3.6	2.9	0.6	0	0.4	0.3	0.2	0.8	3.1	2.7	4.5
4.5	5	3.5	2.3	2.8	0.3	0	0.1	0	0.4	1.9	1.7	0.6	1.1
5	5.5	0.7	3.6	1.1	0.7	0	0	0	0	1.5	1	0.5	1.5
5.5	6	0.2	0.7	0.2	0.1	0	0	0	0	0.3	0.7	1.1	0.6
6	6.5	0.1	0.9	0	0.3	0	0	0	0	0	0.6	0	0.5
6.5	7	0.2	0.6	0	0	0	0	0	0	0	0.1	0	0.5
7	7.5	0.5	0	0	0	0	0	0	0	0	0	0	0
7.5	8	0.2	0	0	0	0	0	0	0	0	0	0	0
8	8.5	0	0	0	0	0	0	0	0	0	0	0	0
8.5	9	0.1	0	0	0	0	0	0	0	0	0	0	0
9	9.5	0	0	0	0	0	0	0	0	0	0	0	0
total		100	100	100	100	100	100	100	100	100	100	100	100

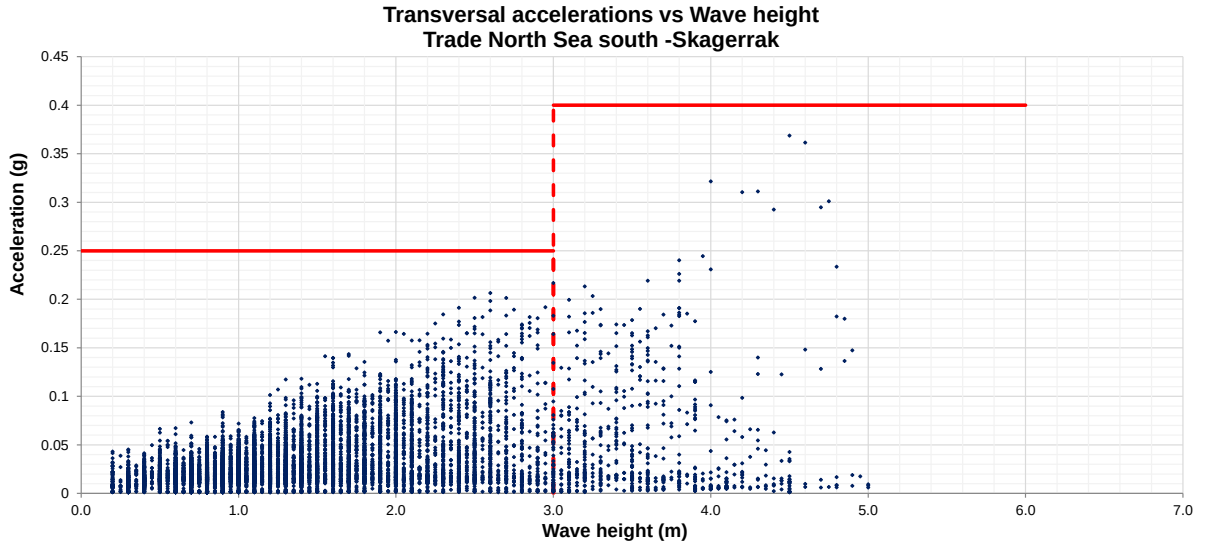
	% > 3,0 meter	27.2	26.6	20.1	5	1	4.2	2.7	2.1	13.3	20.5	20.4	26.8
	% > 3,5 meter	18.3	19.2	11.9	2.9	0.1	1	1.1	0.8	8	12.3	11.9	18.1

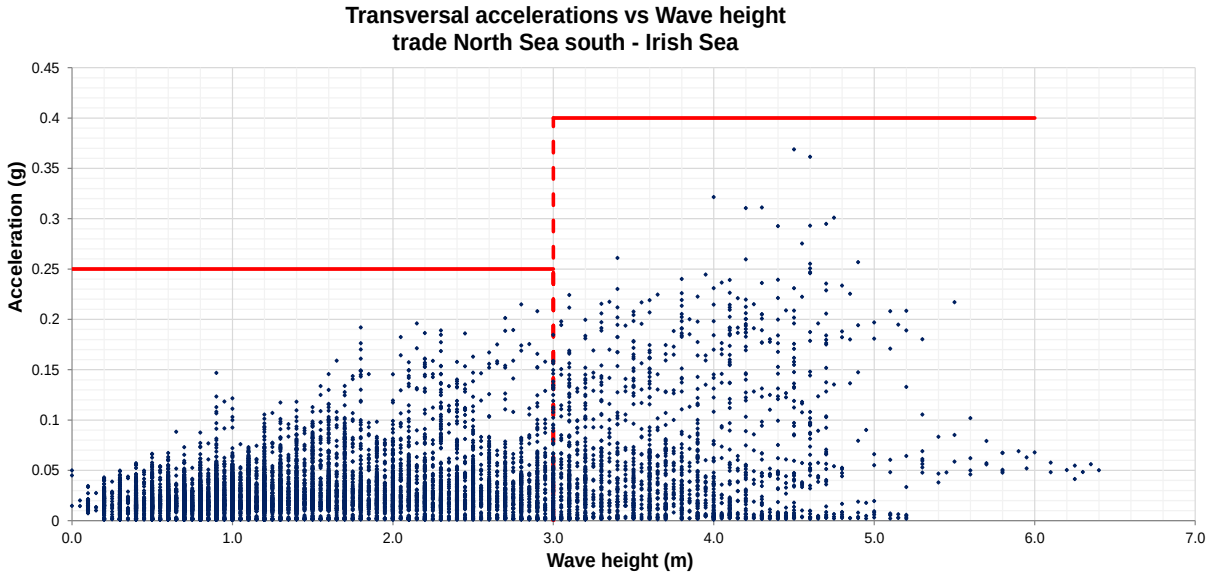
Golf of Genoa - 43.1N/8.6EE				**10 & 100 year extreme: 5.6 & 6.8 m**											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		All year	Hs<3.0m
0-0.5	1.65%	1.63%	1.93%	2.15%	3.38%	3.54%	4.17%	4.50%	3.87%	2.88%	1.73%	1.55%		32.97%	32.97%
0.5-1	2.35%	2.26%	2.53%	2.64%	2.66%	2.36%	2.19%	2.11%	2.17%	2.42%	2.34%	2.08%		28.10%	28.10%
1-1.5	1.82%	1.71%	1.75%	1.59%	1.30%	1.16%	1.14%	0.99%	1.15%	1.57%	1.82%	1.91%		17.90%	17.90%
1.5-2	1.25%	1.03%	1.02%	0.91%	0.64%	0.65%	0.55%	0.49%	0.52%	0.74%	1.12%	1.30%		10.22%	10.22%
2-2.5	0.74%	0.54%	0.58%	0.51%	0.26%	0.32%	0.27%	0.25%	0.29%	0.44%	0.61%	0.74%		5.56%	5.56%
2.5-3	0.38%	0.27%	0.39%	0.27%	0.15%	0.12%	0.13%	0.11%	0.14%	0.23%	0.35%	0.42%		2.95%	2.95%
3-3.5	0.18%	0.15%	0.19%	0.11%	0.06%	0.05%	0.03%	0.04%	0.04%	0.13%	0.14%	0.29%		1.41%	
3.5-4	0.07%	0.07%	0.07%	0.04%	0.02%	0.02%	0.01%	0.01%	0.02%	0.06%	0.07%	0.14%		0.59%	
4-4.5	0.03%	0.05%	0.02%		0.01%					0.02%	0.02%	0.05%		0.20%	
4.5-5	0.01%	0.02%	0.01%								0.01%	0.01%		0.07%	
5-5.5														0.00%	
5.5-6															
6-6.5															
6.5-7															
														99.96%	**97.70%**

Full scale monitoring results

Note: full-scale monitoring results in acceleration forces that are approx. 40% lower than the reduction formula in the amended Annex 13 for Hs 3.0 m.



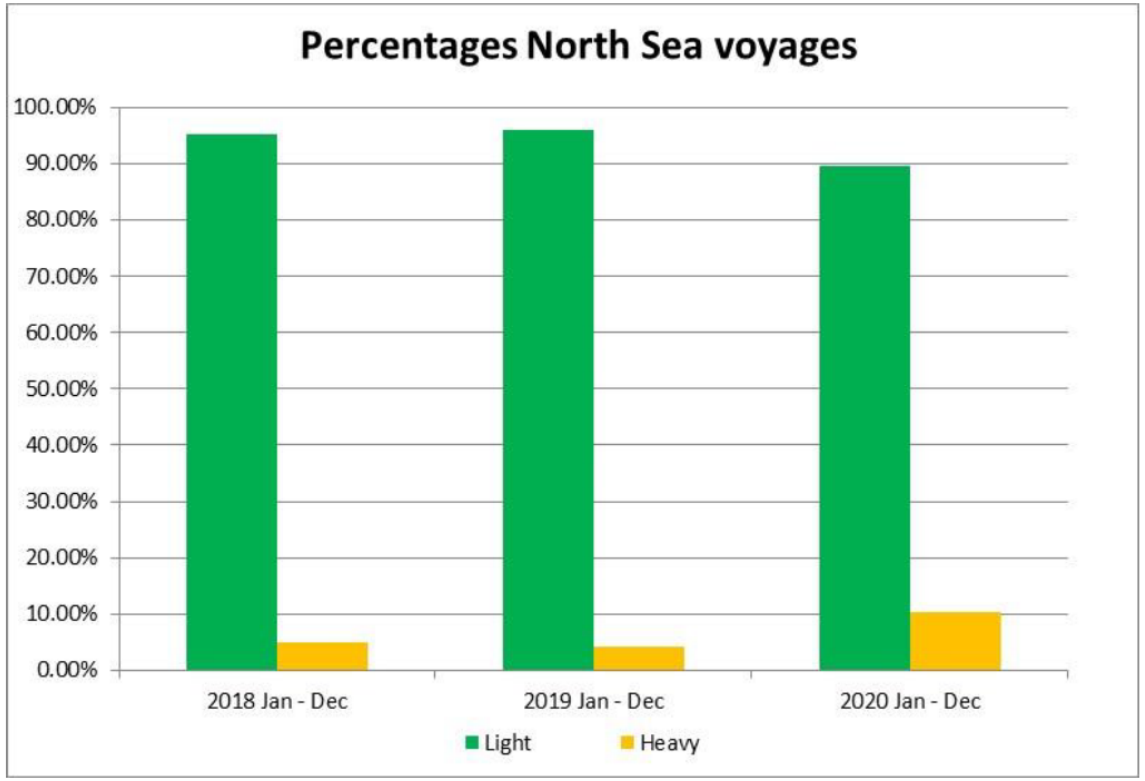




LIGHT vs HEAVY lashing

Class of vessel:	Name vessel:	Period:	% Light lashing:	% Heavy Lashing:	Voyages Light	Voyages Heavy
		2018 Jan - Dec	95.17%	4.83%	276	14
		2019 Jan - Dec	95.92%	4.08%	235	10
		2020 Jan - Dec	89.58%	10.42%	275	32

Figure 1. Percentages Southern North Sea trade.



Your advantages

(The very obvious and the not-so obvious!)
(Does WDL contribute to sustainability in the maritime industry?)

- Significant reduction in external lashing costs / stevedores
- Significant work-load reduction for your crews
- Reduction in turn-around time in port
- On-time departure > close the ramp immediately after the last self-driver is on board
- On-time departure > Fuel consumption / CO2 reduction
- On-time departure > happy clients
- No waiting time for self-drivers on arrival
- Reduction in equipment maintenance / replacement
- Sustainability is more than fuel & CO2 reduction alone

What can we do for you?

- Involved in vessel motion monitoring and cargo safety since 2003. Launching Client in 2003: P&O Ferries on their North Sea routes
- A wealth of in-depth knowledge in WDL operations
- A huge data-base of vessel motions & weather data
- Provision of monitoring equipment & services
- Consultancy during start-up and implementation, optimize WDL operations, reporting
- More than 90 RoRo / RoPax vessels worldwide have Siri systems & services on board
- Assistance or writing of WDL documentation & approvals
- Training & instructions to on-shore and on-board staff
- Dedicated staff in a small transparent organisation

Siri Light application

- Developed and designed for WDL operations
- In full compliance with the amended CSS code
- Simple installation & simple display
- Alarm functionality (traffic light)
- Remote access & support via Siri webportal
- Logging functionality
  - For voyage reporting
  - For incident investigations

Work in progress

- Web application
  - Vessel routing and statistical or forecasted weather on the routes
  - Provision of reduction factors for the planned routes / trades
  - Provision of the reduced acceleration matrix
  - Calculation of seafastening / lashing of cargoes
- Until launched, all of the above can be provided by the Siri Marine staff on request
- By the way: based on the same technology and born from our practical knowledge, a new Siri TRIM optimization system has been developed

Implementation

- WDL sensor systems do NOT replace common sense and good seamanship
- Sensor systems, weather forecasting services, etc. are only tools to the Master to enable him/her to make the right decisions at the right time
- A word of caution:
  - Plan the implementation of WDL operations carefully
  - Get the on-board staff “on-board”. Changes are often seen as threats
  - Start slowly, get feed-back, listen to concerns and react to questions

Thank you for your attention!

Questions? We have a stand in the exhibition area.
And this presentation plus all amended Annex 13 information can be emailed to you on request.