



DAMEN SCHELDE NAVAL SHIPBUILDING

M2I MEETINGS MATERIALS

15/12/2020



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DAMEN

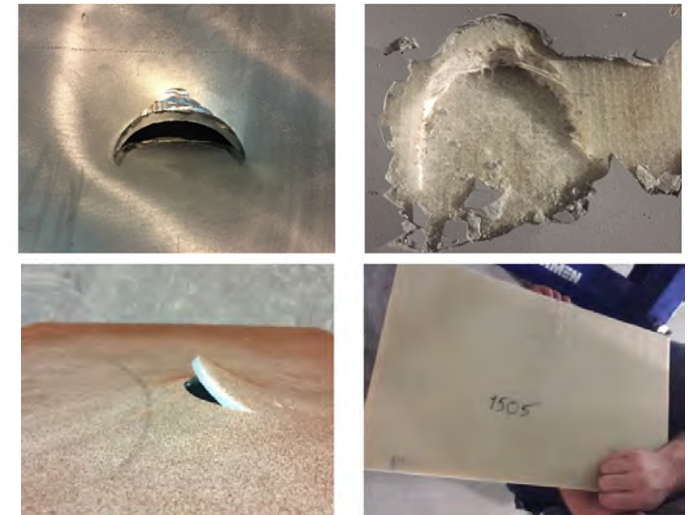
CONTENT

- Motivation and case study
- DAMEN Case study
- Ambition within Qualify
- Plan for validation DAMEN joint
- Progress on the DAMEN Joint
- Next steps

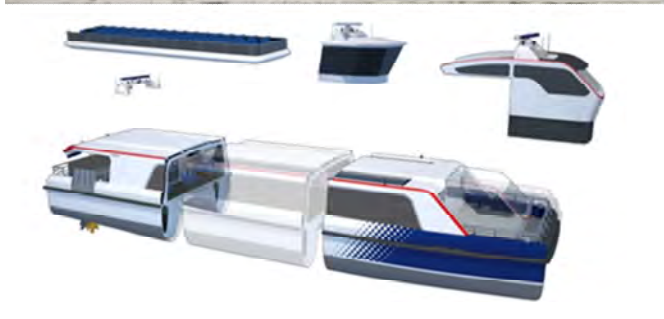
GOAL: COMPOSITE SUPERSTRUCTURE

Enabling hybrid primary structures in a cost-efficient way

- Higher stability
- Higher speed
- More functions on a smaller ship
- **Less fuel consumption**
- Corrosion resistant
- Local damage rather than global
- Damage tolerant
- Relatively easy repair

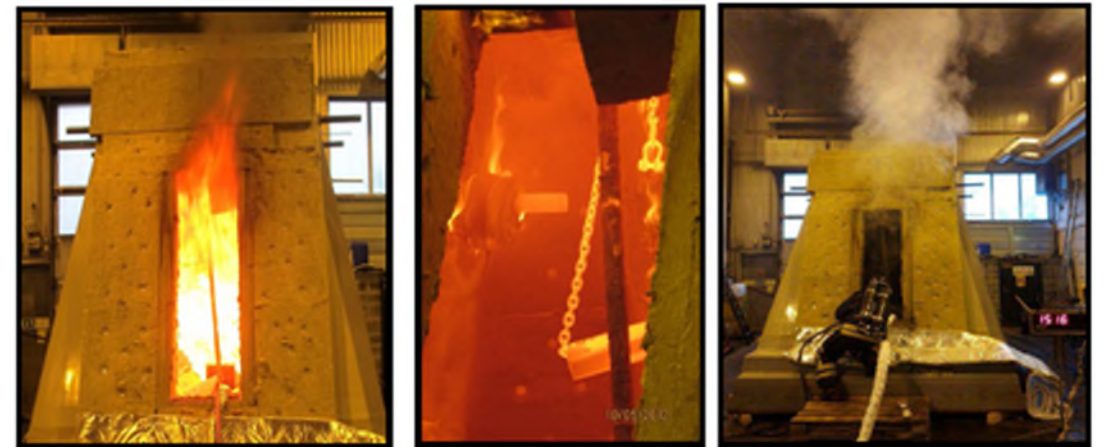
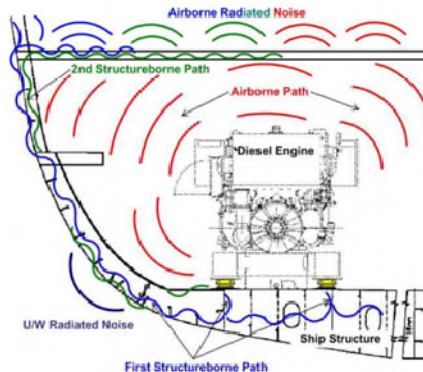
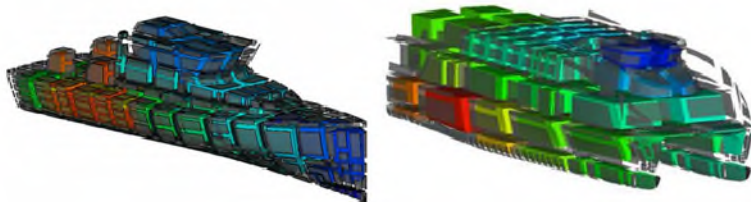


CURRENT COMPOSITE APPLICATIONS AT DAMEN



RESEARCH FOR LARGER APPLICATIONS

- Production of large-scale composites
- Performance of large-scale composites
- Fire safety
- Noise and vibration
- Quality control
 - Material selection → End product



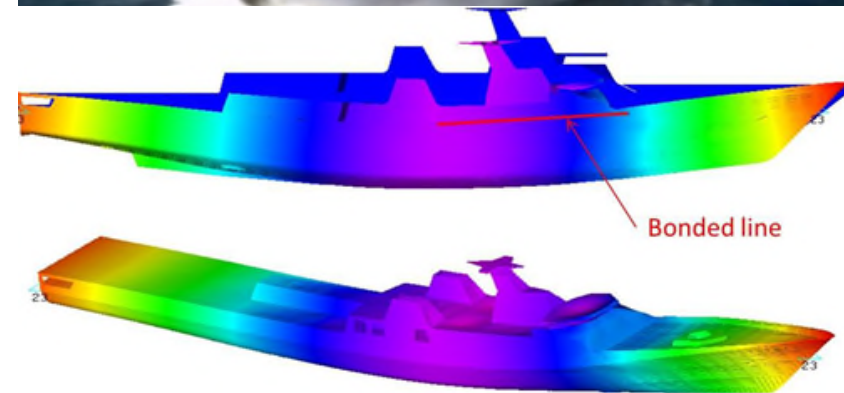


BONDING A SUPERSTRUCTURE

QUALIFY PROJECT



DAMEN CASE STUDY SHIP



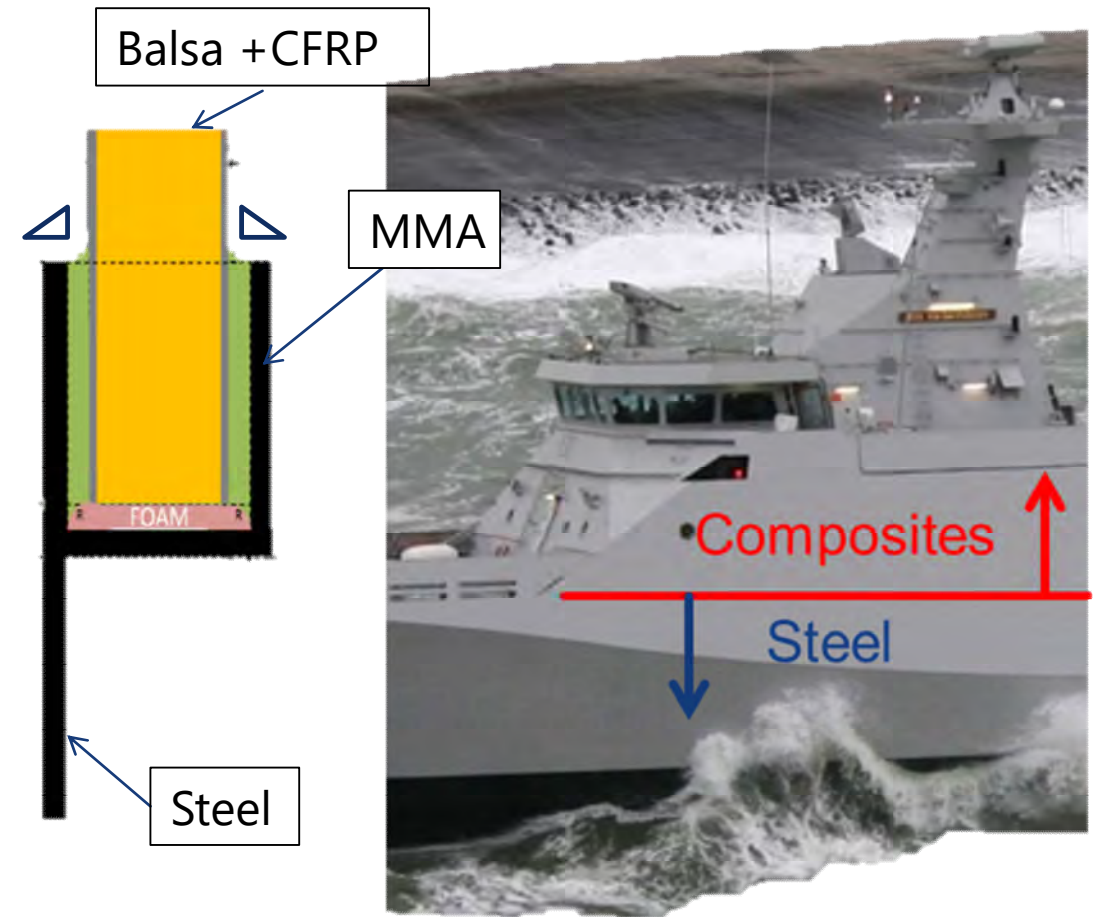
Assembly in shipyard
(Anywhere)

25 years at sea
(Everywhere)



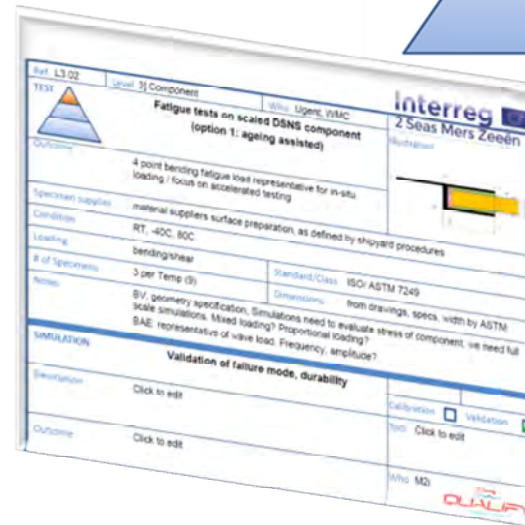
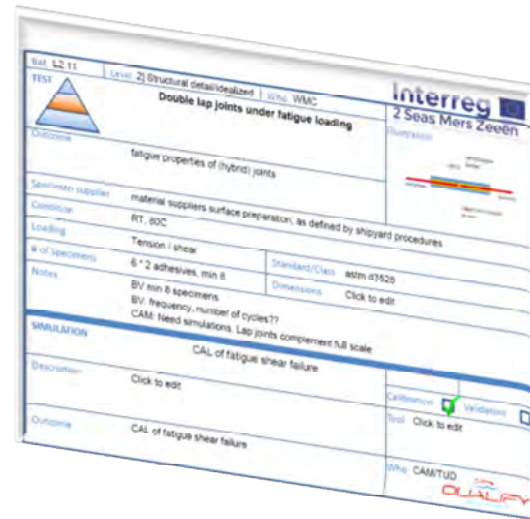
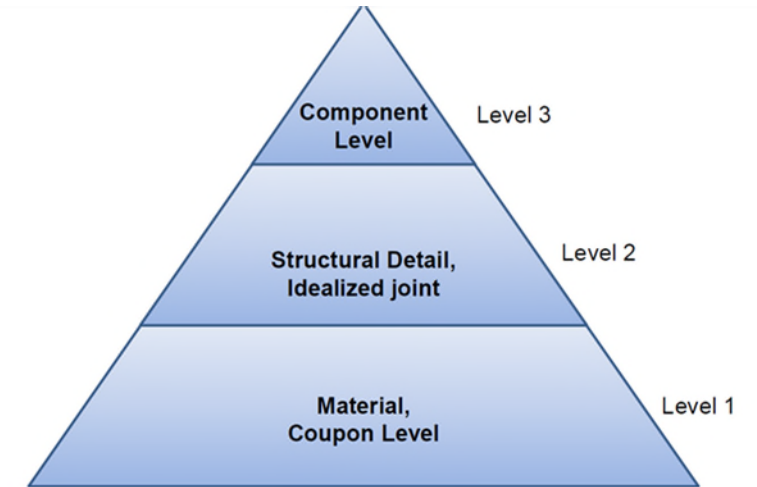
DAMEN CASE STUDY: AMBITION WITHIN QUALIFY

- Quality control production
- Effects environment
- Ageing and corrosion
- Fatigue loading
- Monitoring and inspecting



VALIDATION APPROACH

- Building block approach
- Accelerated ageing tests for 25 years at sea (-40..80C)
- Accelerated fatigue testing
- Crack growth and detection



FULL SCALE TESTS

- Test planned 10/2020 – 03/2020



specification	description	condition	sketch	loading	purpose	# tests
L3.06a	Tensile tests DAMEN component	unaged		static	screening tests to evaluate types of failure and supporting modelling activities	3
	Tensile tests DAMEN component	aged				3
L3.06b	Tensile tests DAMEN component with crack	unaged		static	screening tests supporting modelling activities	3
	Tensile tests DAMEN component with crack	aged				
L3.06c	Tensile tests DAMEN component	unaged		fatigue	screening tests to evaluate types of failure and supporting modelling activities	3
	Tensile tests DAMEN component	aged				3
L3.12	Bending test on panel DAMEN	unaged		static	Combination of in-plane shear and out-of-plane tension/compression stresses (representative for foredeck) / also supporting modelling activities	3
	Bending test on panel DAMEN	unaged		fatigue		3
L3.13	Arcan type test DAMEN component	unaged		static	evaluate combination of horizontal and vertical in-plane shear stresses	3
	Arcan type test DAMEN component	aged				3
L3.13	Arcan type test DAMEN component	unaged		fatigue	evaluate combination of horizontal and vertical in-plane shear stresses	1
	Arcan type test DAMEN component	aged				1
L3.14	Tensile test on bonded joints samples	unaged		Static + fatigue	DAMEN / TNO-DMO specimens	

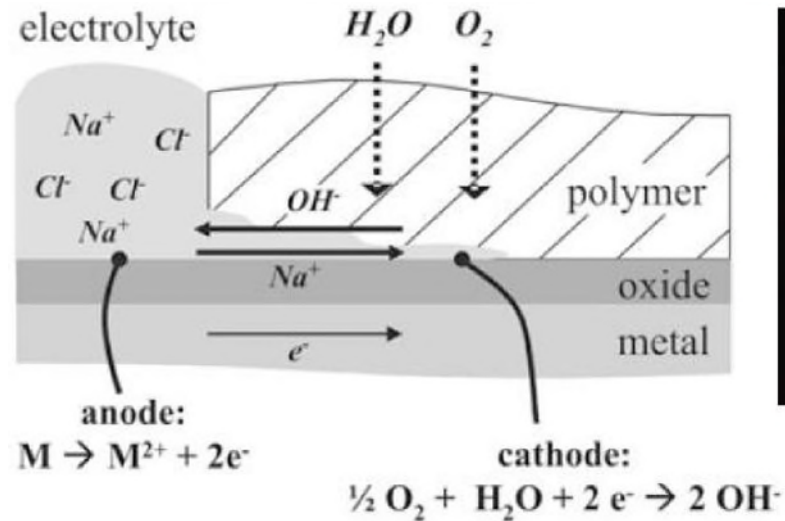
FULL SCALE TESTS – ARCAN SAMPLES

- 1000 mm wide samples
- Wave Bending loading analysis
- Aged/Unaged
- Validation fatigue life
- Condition monitoring

FULL SCALE SAMPLES- ARCAN SAMPLES- AGEING

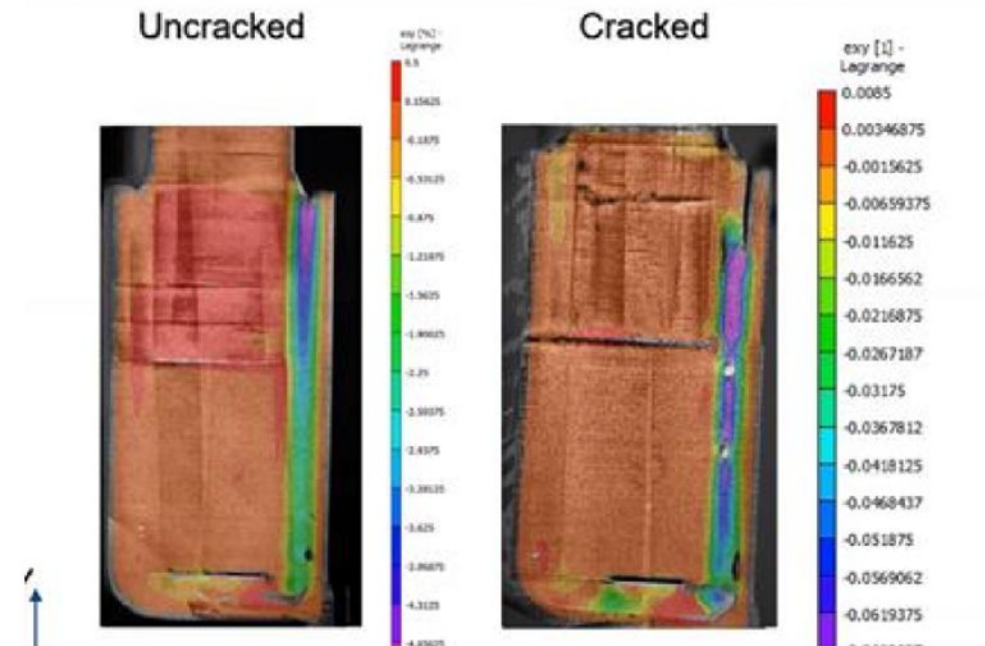
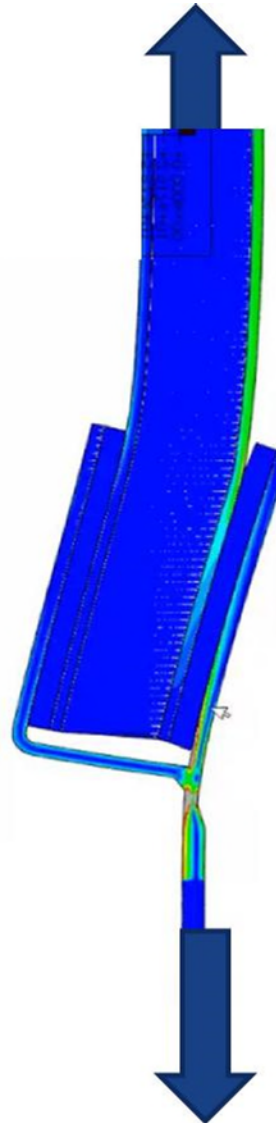


- Diffusion front & corrosion effect analyzed on small scale samples
- Scoping test on ageing performed ASTM B117
- Now:
 - Crack tip analysis Identify the time limiting step
 - Maximal temperature for ageing



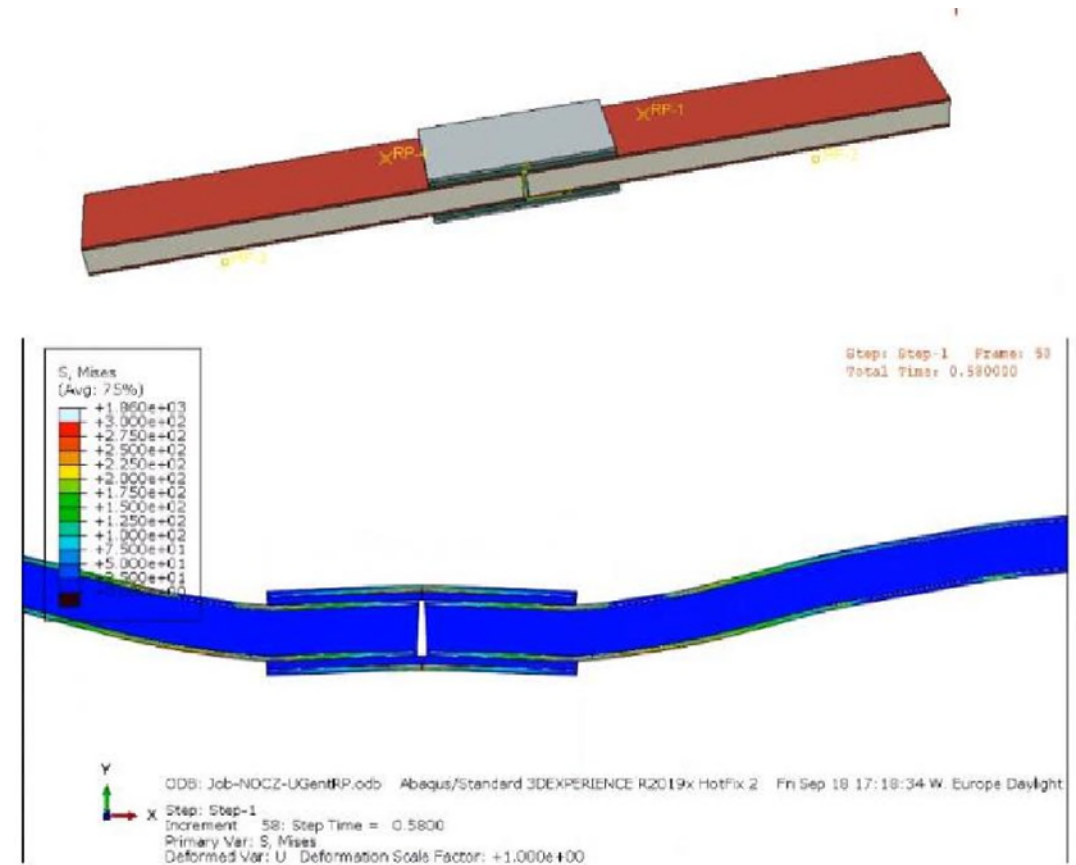
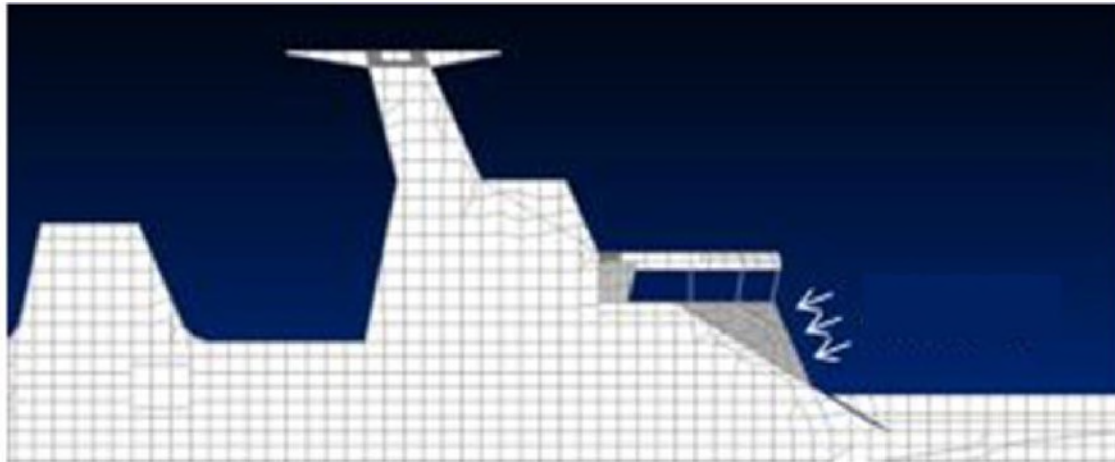
TENSILE SAMPLES

- Strong peeling load
- No direct link to the real conditions
- Test the robustness of the model
- Cracks in worst case scenario
- 100 mm width

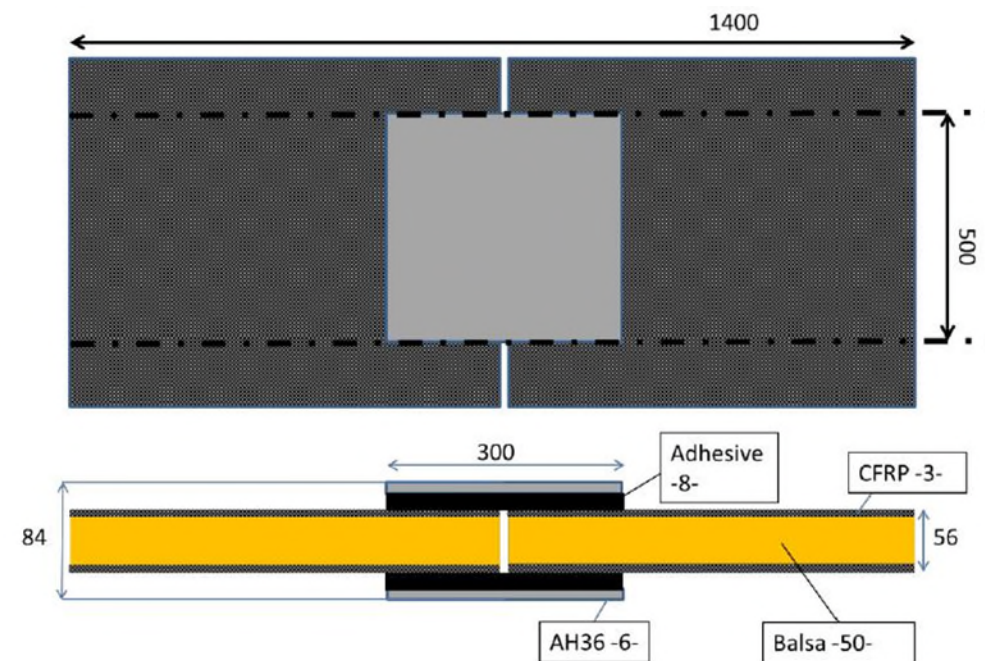
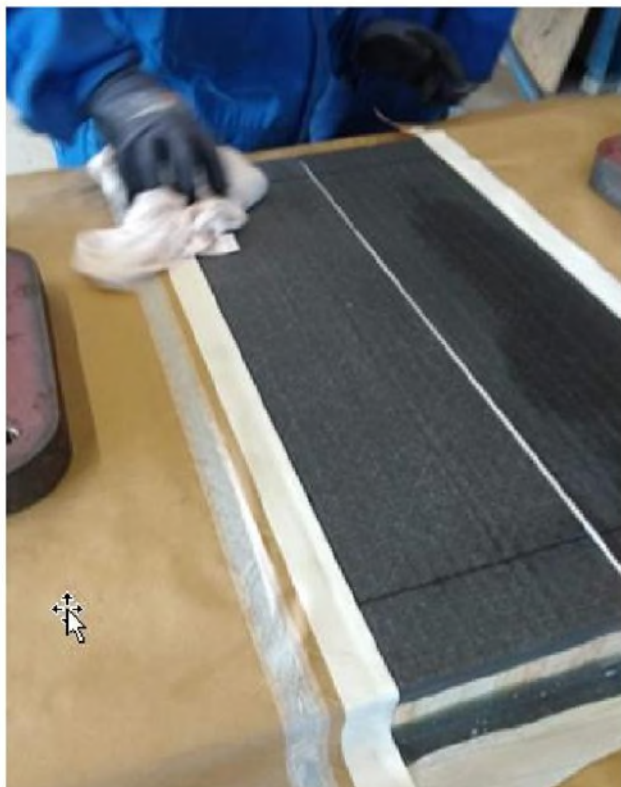


BENDING SAMPLES

□ Simulating out of plane load from sea pressure



BENDING SAMPLES



THANK YOU FOR YOUR ATTENTION!

■ <https://www.qualify-euproject.com/about-project>

