



COMPOSITE PATCH REPAIR OF METALLIC MARINE STRUCTURES

Collaborative Project

Call ID FP7-SST-2008-RTD-1– Proposal N° 233969

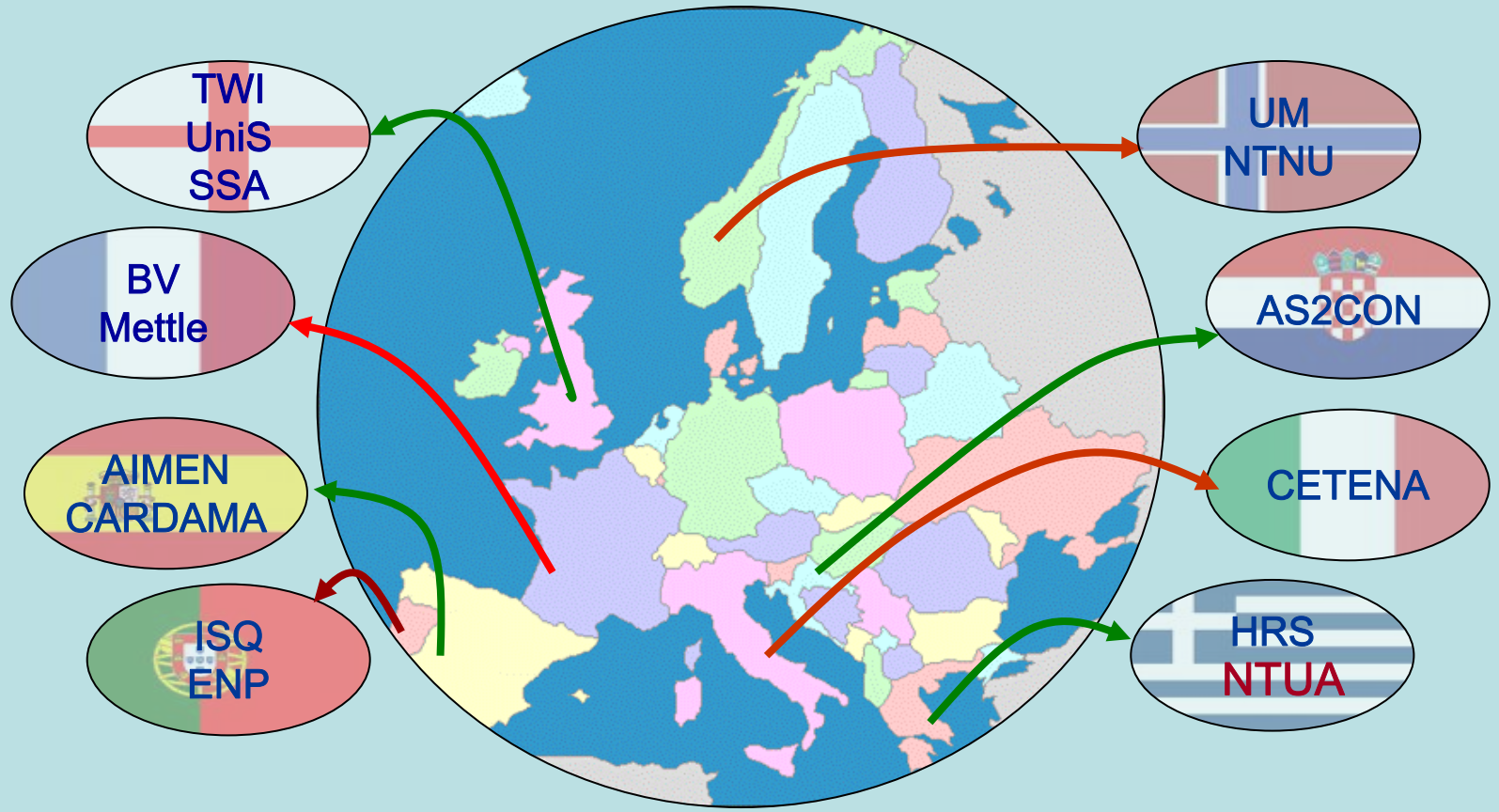
Acronym: "Co-Patch"

www.co-patch.com

Duration: 36 Months (2010 – 2012)



PROJECT PARTICIPANTS



PROJECT COORDINATOR: National Technical University of Athens (NTUA)



Co-Patch Consortium includes:

3 Universities:

- **NATIONAL TECHNICAL UNIVERSITY OF ATHENS (NTUA), Greece**
- **NORGES TEKNISK - NATURVITENSKAPELIGE UNIVERSITET (NTNU), Norway**
- **THE UNIVERSITY OF SURREY (UniS), United Kingdom**

3 Institutes and Joining Technology Centres:

- **TWI Ltd., United Kingdom**
- **INSTITUTO DE SOLDADURA E QUALIDADE (ISQ), Portugal**
- **ASOCIACIÓN DE INVESTIGACIÓN METALÚRGICA DEL NOROESTE (AIMEN), Spain**

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2 Ship Classification Societies:

- ***BUREAU VERITAS (BV), France***
- ***HELLENIC REGISTER OF SHIPPING (HRS), Greece***

4 Shipyards and Shipyard associations:

- ***UMOE MANDAL AS (UM), Norway***
- ***ESTALEIROS NAVAIS DE PENISCHE S.A. (ENP), Portugal***
- ***FRANCISCO CARDAMA S.A. (CARDAMA), Spain***
- ***SHIPBUILDERS AND SHIPREPERAIRS ASSOCIATION (SSA), United Kingdom***

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3 Research and Consultancy Companies:

- ***ALVEUS d.o.o. (AS2CON), Croatia***
- ***CETENA S.p.A.(CETENA), Italy***
- ***METTLE SARL (METTLE), France***

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Objective of the project:

Definition of a new effective repair/reinforcement method for large steel structures with defects

Field of application:

- Marine (vessels, platforms...)
- Civil (bridges, cranes...)



Repair of damages caused by:

- Fatigue
- Corrosion

Upgrade of existent structures for:

- Sustain new loads
- Mitigating initial structural deficiencies

Advantages with respect to conventional repair/reinforcement technologies:

- No hot work
- Application 'in situ'
- No stress concentrations
- Low added weight

Critical aspect of composite patches:

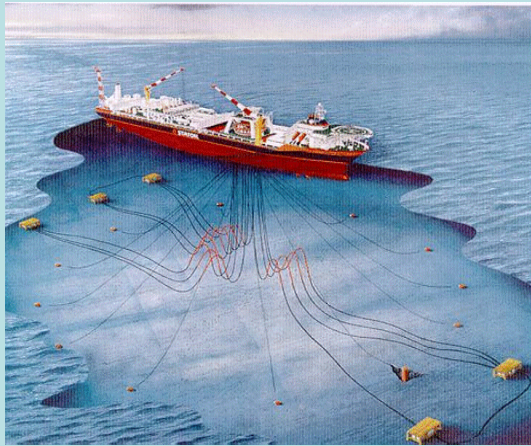
- Long term performance





Composite patches have been applied successfully on naval ships and offshore platforms :

FPSO (Floating Production Storage and Offloading) (Norway)
Repair of the cargo tank bulkhead



Type 21 Frigate (Amazon class)
Repair of the main deck



Type 42 destroyer
Repair of the food lift trunk



RAN Adelaide Class Frigate
Repair of the main deck



... and on Civil Constructions:

- **Hythe Bridge (UK):** reduction of the stress
- **Tickford Bridge (UK):** improvement of the load bearing capacity
- **Slattocks Canal Bridge (UK):** improvement of the load bearing capacity
- **Acton Bridge (UK):** reduction of strain and raising of the fatigue life
- **King Street Bridge (UK):** improvement of the load bearing capacity
- **Corona Bridge (ITA):** improvement thermal and impact performance
- **Christina Creek bridge (USA):** raising of fatigue life
- **Ashland Bridge (USA):** reduction of the stress
- **Interstate Highway – 704 (USA):** improvement of the load bearing capacity
- **State route 82 (USA):** improvement of the load bearing capacity



Slattocks Canal Bridge

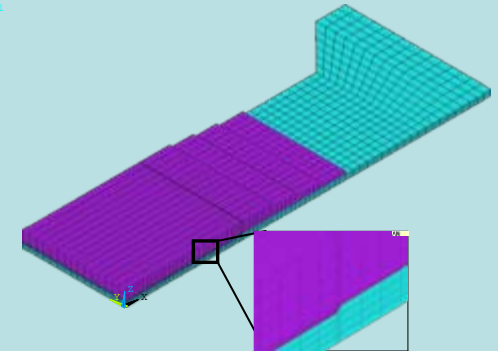


Corona Bridge



PROJECT OBJECTIVES (1)

- To demonstrate that Co-Patch leads to the reinforcement of a steel structural member using:
 - Theoretical analyses
 - Numerical simulations
 - Experimental testing



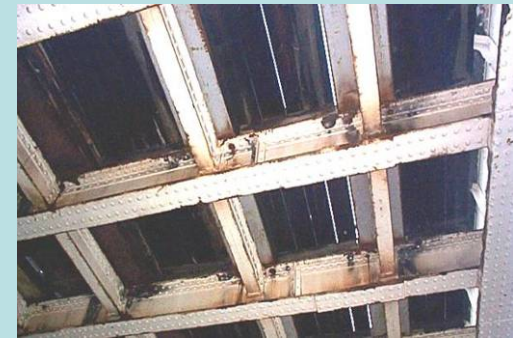
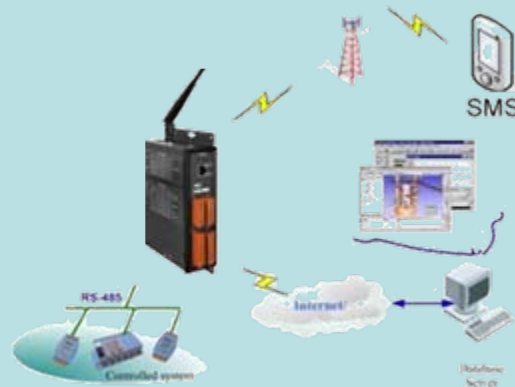
- To determine, evaluate and quantify the efficiency of Co-Patch reinforcements:
 - Small scale testing
 - Medium scale testing
 - Large scale testing



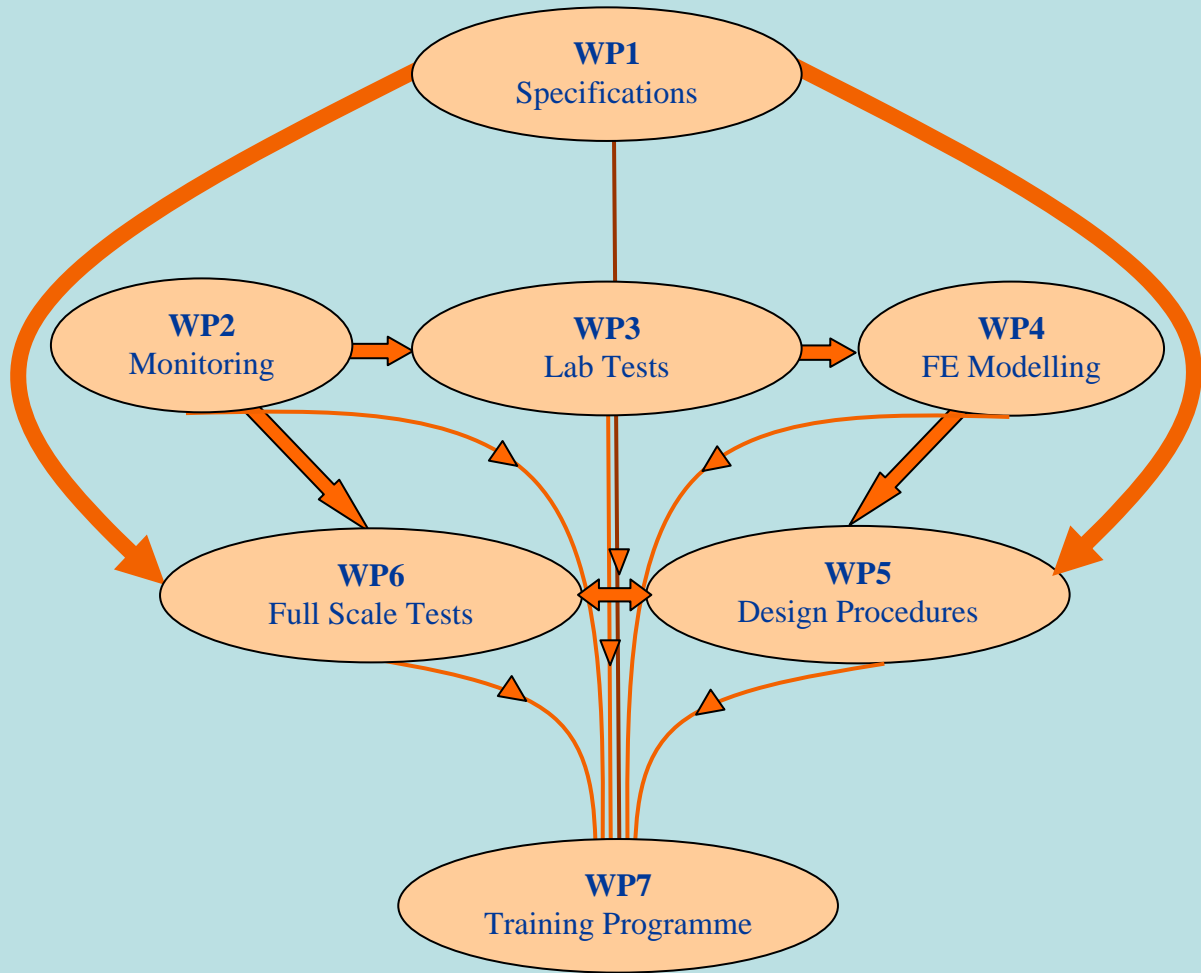


PROJECT OBJECTIVES (2)

- To develop procedures for the design and application of Co-Patch reinforcements
- To evaluate existing or develop new sensor based monitoring techniques



- To demonstrate the effectiveness of the developed design tools and procedures through full-scale tests
- To develop an internationally recognised training programme for personnel





Co-Patch is organized in eight Work Packages (WP)

WP #	TITLE	LEADER
WP1	Specification of application cases	BV
WP2	Monitoring methods & procedures	NTNU
WP3	Laboratory testing	NTUA
WP4	Numerical simulation procedures	CETENA
WP5	Guidelines and design procedures	AIMEN
WP6	Full scale on site tests	BV
WP7	Dissemination and exploitation	TWI
WP8	Management	NTUA

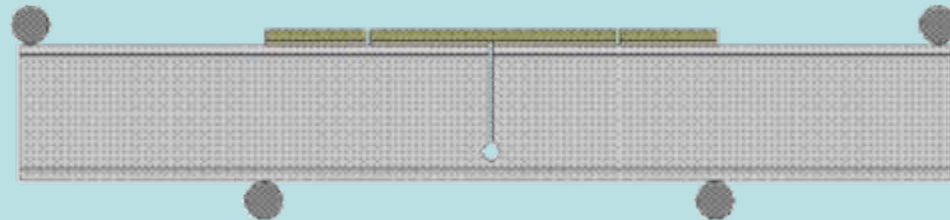
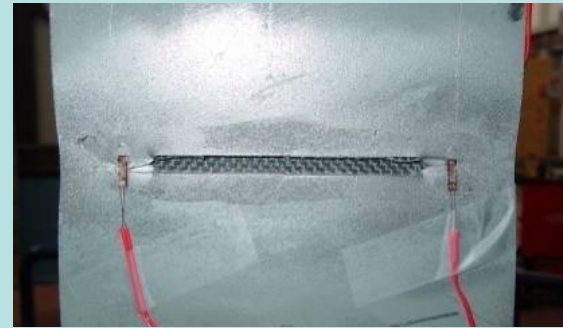
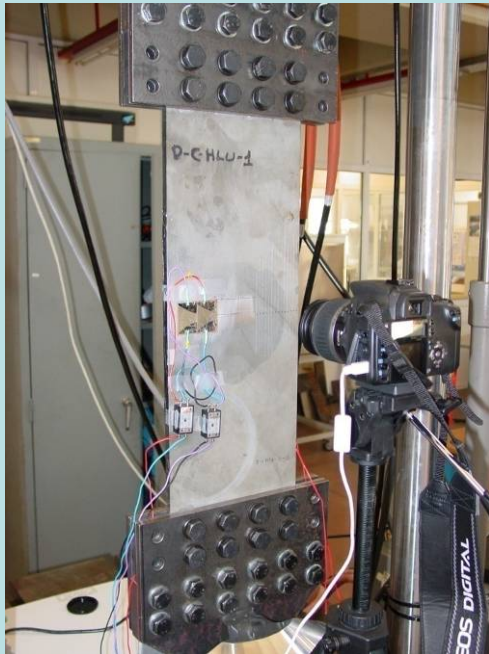


Project Work includes:

Materials selection and characterization

Mid-scale static and fatigue tests

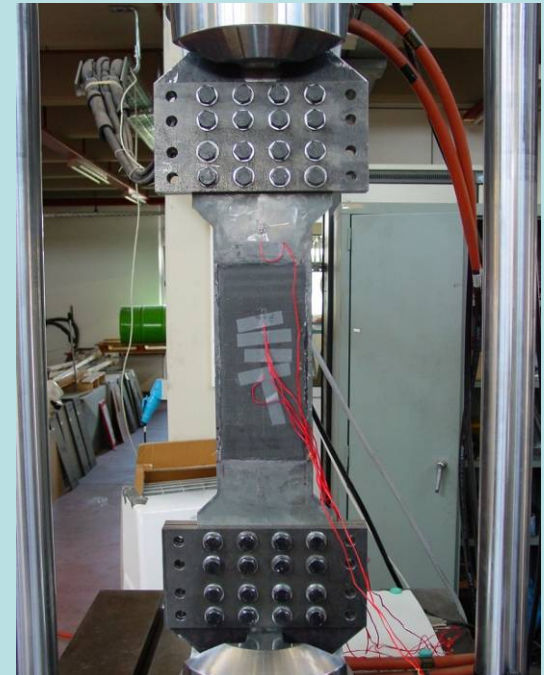
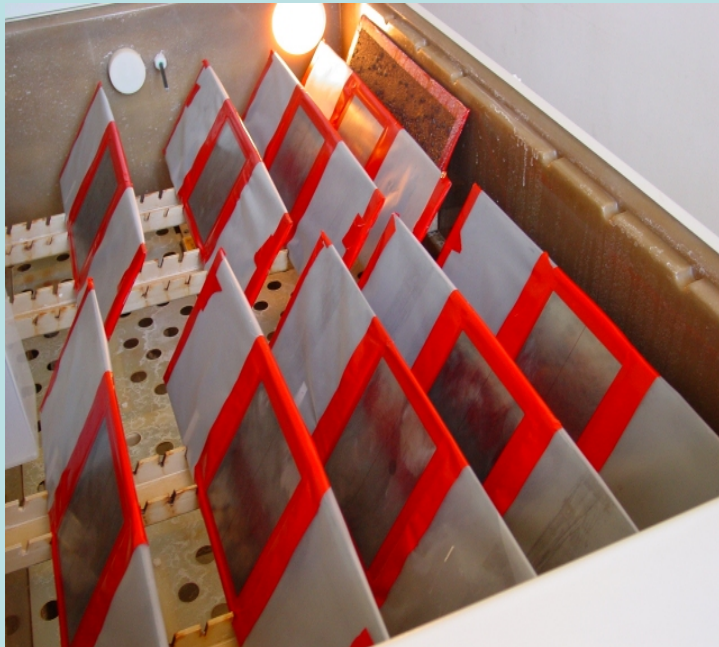
Patched plates and beams with defects





Mid-scale long-term tests

Patched plates with defects



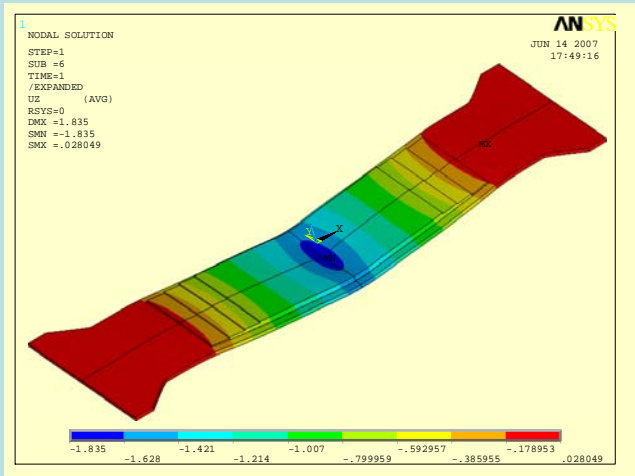
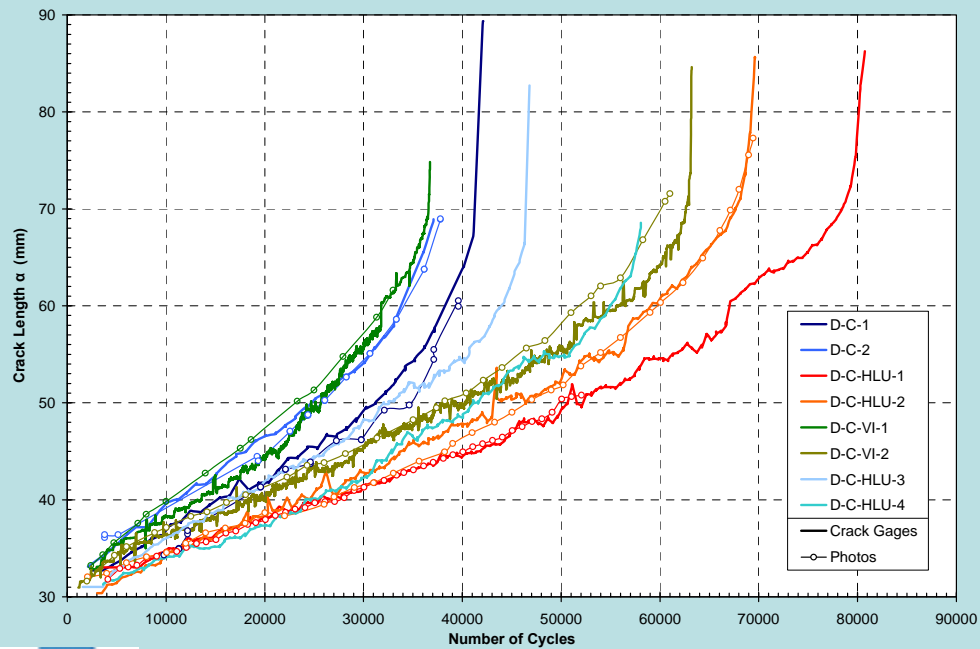
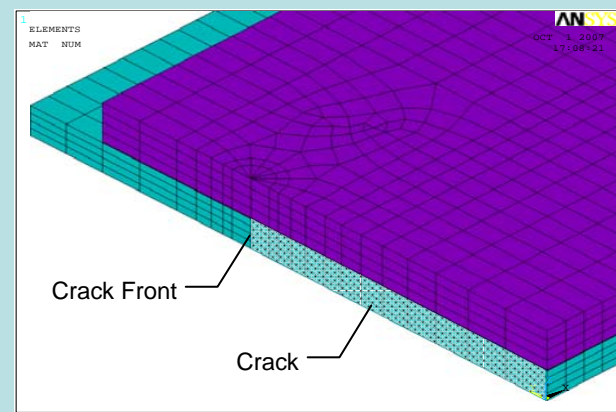
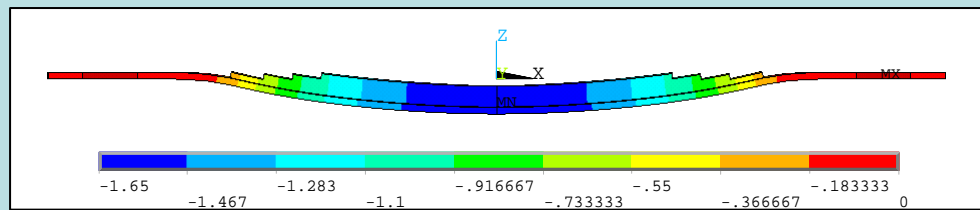


Laminate and application method testing



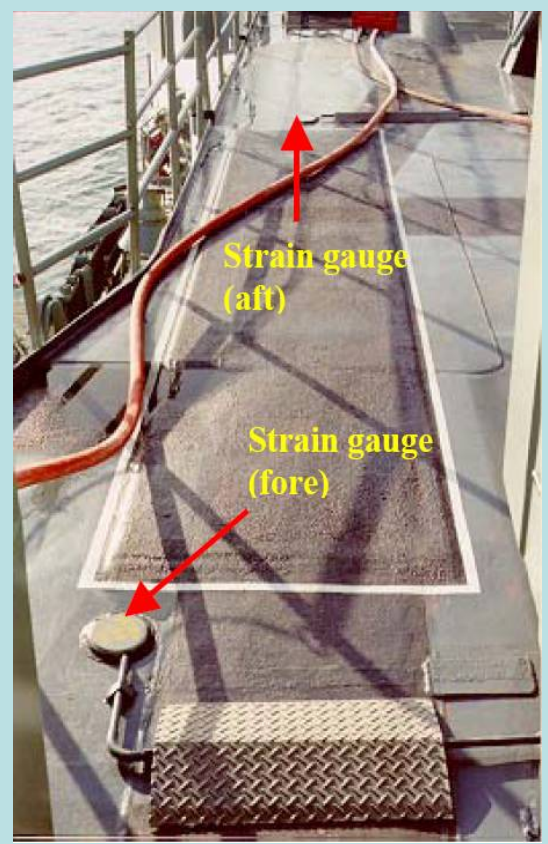


Numerical analyses of the patch strength





Full-scale tests





*Co-Patch Consortium
would like to
extend our Invitation*



*to join our project as
an invaluable
Stakeholder*



Participation in the Stakeholder Forum is open to:

- Shipyards
- Ship owners
- Repair contractors
- Classification societies
- Insurance companies
- Authorities (port, highway, railway...)
- Charters

Potential benefits for the stakeholder:

- Information and immediate update about the development of a new state of the art repair technology suitable for their structures
- Immediate, direct and first-hand access to the results of the project
- The chance to affect the development of this technology by contributing their corresponding experience, towards a final product which will best fit to their demands and requirements
- The potential of creating new business activities
- The chance to participate in a forum together with other major European organizations and explore the possibility of future collaborations





Stakeholder forum's expectation:

- To agree on what is needed to approve composite patch repair as long-term repair and what steps are needed to get there
- To identify opportunities and document the business case for using composite patch repair (alternative repair methods, cost drivers, decision making)
- To create a dialogue on the permanence and (economic) viability of patch repairs
- To demonstrate that composite patch repairs or reinforcements can be environmentally stable and therefore, that they can be used as long-term repair measures on steel marine structures and steel civil engineering infrastructure applications
- Information and update about their specific repair needs and particularities
- Feedback regarding intermediate project results and milestones
- Eventually, to make available their structures (ships, bridges, etc.) to apply and test the new technology

Possible forms of participation:

- Stakeholder Forum
- Online discussion
- Email discussion
- Making available one or more steel structure for Co-Patch repair and monitoring



Co-Patch

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