



Project no.

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**SAND.CORe**

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## **Publishable final activity report**

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## History:

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3	06.07.12	Final draft	EJ	FR
4	21.07.06	Final Draft	EJ	FR
5	07.07.06	Corrections after partners comments	EJ	
6	15.09.06	Final version for CEC	EJ/FR	

## Table of contents:

<b>1</b>	<b>SUMMARY OF THE OBJECTIVES .....</b>	<b>3</b>
<b>2</b>	<b>WORK PERFORMED .....</b>	<b>3</b>
<b>3</b>	<b>END RESULTS .....</b>	<b>4</b>

## 1 Summary of the objectives

SAND.CORE aimed to foster the application of innovative sandwich structures in the European transport, in particular the maritime sector. This was done by benchmarking, harmonising and complementing previous research work and evaluating state-of-the-art knowledge and experiences. The project produced a Best Practice Handbook which will make research results and experiences more easily available to the European research community and industry.

The overall objective of the project was to boost the applications of sandwich structures in the rail and maritime transport sectors. The project aimed to collect structure and publish information from previous research and applications about sandwich panels, which was widespread over the industry and other parties (research, classification societies, suppliers, shipyards...). Therefore, there was a need to co-ordinate research, to conduct knowledge transfer and foster the application of various types of sandwich structures.

SAND.CORE achieved its objectives with a work plan, which was divided into co-ordination and management work packages. Co-ordination activities included the creation of a sandwich catalogue, the collection of available information on sandwich solutions as well as benchmarking studies. Various actors of different industrial sectors worked together in the project, thus creating a basis for future collaboration and exchange of information. Exploitation and dissemination activities, like a public website, a best practice handbook, a User Group and several public workshops provided benefit to the consortium, industry, the educational system and the broader public.

## 2 Work performed

**Workpackage 1:** Available information in the field of sandwich structures has been analysed and knowledge has been exchanged between partners through three tasks: existing and future applications, technologies and knowledge, and rules and regulations.

**Workpackage 2:** An internet communication platform has been developed and was made available at an early phase of the project under <http://www.sandcore.net>. After having harmonized and standardized the different available results and information on sandwich, a methods catalogue, a solution selection tree and a test data catalogue have been developed. They can be found on the website.

**Workpackage 3:** Out of a list of potential cases, a list of 5 benchmarking cases has been selected jointly by the project partners: a wheel loaded strength deck of a RoRo ship, balco-

nies for cruise ships, outer shell of superstructure for offshore patrol vessels, crash-worthy side structures and a rail vehicle cab shell. The purpose of the benchmark studies was to redesign existing practices using the available knowledge about various sandwich options and to compare / combine available solutions for the selected cases. Following a risk assessment, new design solutions of different sandwich applications have been performed for each benchmarking case. The work of these studies finished with a cost – benefit estimation of the sandwich solutions developed.

**Workpackage 4:** A Best Practice Guide on sandwich structure has been created. The Guide is structured into the three sandwich types most commonly used in the maritime and rail sectors: all-metal, hybrid-metal (a combination of metallic and non-metallic materials) and composites. The deliverable gives a comprehensive overview on current best practice (focused on the maritime field) on the general types of sandwich structures, design of sandwich structures, sandwich manufacturing, joining, assembly and outfitting, inspection and repair, legislation and approval as well as on application case studies. The document is primarily tailored to the needs of practical designers in industry, which have plenty of experience about the product they design, but lack an overview of best practice related to sandwich structures. It also provides links to further sources of information.

In addition, future research needs have been discussed among the consortium and listed in an additional document.

**Workpackage 5:** In order to disseminate the results and knowledge of the project and to make contact with other industries and projects, 3 workshops were organised during the project. In the same context, a User Group with 5 members was initiated. The User Group proved an efficient tool to exchange information with external parties and to discuss the views of the consortium with a wider community of experts. A promotional Sandwich CD-Rom was created and distributed to the public of the meeting in Newcastle. This CD-ROM will be updated with the new Best Practice Guideline elaborated during the extension period of the project.

### 3 End results

**Workpackage 1:** A state of the art (deliverable D1) compiling the work carried out in WP1 has been realised and submitted to the CEC in October 2004. The objectives of WP1 have been fulfilled from the point of view of the consortium and the User Group members, that is to say: A harmonized knowledge and information on sandwich panels has been collected. In accordance with the Commission services some gaps identified in the deliverable were filled during the extension period in the latest version of the Best Practice Guideline.

**Workpackage 2:** The internet platform created has worked successfully all along the project. Deliverable D2.1 (description of website) and deliverable D2.2 (report on sandwich methods and test data catalogue) were delivered in May 2005. It has turned out in the course of the work, that harmonization of the design and test methods and impact on standardization was difficult within the given consortium. It was therefore agreed with the Project Officer, that more efforts were put into the Best Practice Handbook, which will give direct benefit to industrial users.

**Workpackage 3:** A report on the benchmark studies (deliverable D3) which summarises the work carried out in the four tasks of WP3 was sent to CEC in November 2005. The objectives of this workpackage have been reached: through the promotion of intensified practical application of sandwich structure new design solutions have been developed and optimised. Their costs and benefits have been evaluated.

**Workpackage 4:** The Best Practice Handbook (deliverable D 4.1) has been sent to CEC in November 2005. The BPH allows potential users to optimize their risk and avoid duplication of work by summarising all the knowledge gathered during SAND.CORé. Following a discussion with the Commission services in December 2005 / January 2006, the Best Practice Handbook was further improved during the extension period. The final version of the public Best Practice Guide (deliverable D 4.1.2) was delivered to CEC in June 2006

The future research needs have been defined during a meeting in Hamburg on 14<sup>th</sup> November 2005. The deliverable D4.2 – Future Research Needs will be sent in August 2005.

**Workpackage 5:** The objectives of WP5 have been fulfilled through the multiple public events, the creation of the User Group and the publication of the CD-Rom. The promotional CD-Rom (deliverable D5) has been given to the European Commission in December 2005 during the meeting in Newcastle.