easie
Ensuring Advancement in Sandwich Construction Through Innovation and Exploitation

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Foreword

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Chairman of the Industrial Management Committee of EASIE


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The Spanish and Portuguese companies I have been working for, for some time now, would not have imagined participating to such a European Research project! The implementation of the program, the administrative preparation, partners and the European Commission to convince, time to spend for the meetings, all those terrifying details are so far from our day today industrial matters and functioning...

Yet, we must recognize that our European SME's really benefit from such projects: they get the opportunity to have direct access to fundamental information on the evolution of their products or processes and more generally on the opportunities offered by the European Community, which we mainly ignore.

When we were contacted to become a partner, it seemed to me we had to go for it, even if I had no real idea of what would be the consequences and results. 2 years later, 6 months after the launching meeting, I am extremely satisfied.

In the meantime, I have accepted to chair the Industrial Management Committee, because I am sure that this project will be useful, will increase the knowledge on our products and on their use and will enable a good development of their market. I really think that our SME's have to get involved, to say their needs, that the universities and industrial companies have to work together in order to get practical and efficient results. It means discussions, definition of needs, tiding up reality and market to theory and research. Thus I am experiencing and appreciating rich human contacts, the rare possibility for us to exchange with distinguished university professors or high specialized laboratory directors. Tomorrow one of my young fellow workers will share this richness in getting himself involved in some of the programs.

Some very practical research programs are explained to you in the following pages, through the work progress of WP2 and WP3, completed by the presentation of one of our active partners, M-Profil, a Croatian sandwich panel manufacturer. Please notice, that the project is directly linked to the standardization reality as the results will be part of the revision of EN 14509 on sandwich panels.

Looking forward to meeting you on our EASIE website,

Michel Decabane

WP1 Improvement of thermal and structural behaviour in openings and joints

WP2 End user Focussed Design Strategy

WP3 Use of sandwich technology to optimise the global resistance of buildings

WP4 Retrofitting, durability and maintenance

WP5 Holistic, elearning based education on sandwich construction

WP6 Training, skill development and dissemination

WP7 Management and Governance

WP2 End user Focussed Design Strategy

Design by Testing

This work package focuses on the **design by testing** of sandwich panels.

The principles and modalities of this method have been discussed in the WG5 of TC128 SC11 and at a number of ECCS meetings.

The aim of the work is to produce a draft annex"Design by testing" for the revised version of the EN 14509.

Design by testing gives the possibility to determine the strength capacity of the panel by large scale tests and this at normal temperature or below a thermal gradient with creep also taken into account.

Thus, all the intrinsic performances of the panel can be reached and normally the load capacity can be increased with a total respect of the safety levels.

This method involves a large amount of calculation and checking in order to build up user friendly software on Excel.

Draft documents produced to date

Since the beginning of the project on 1st October 2008, 30 draft documents have been created or listed in this work package.

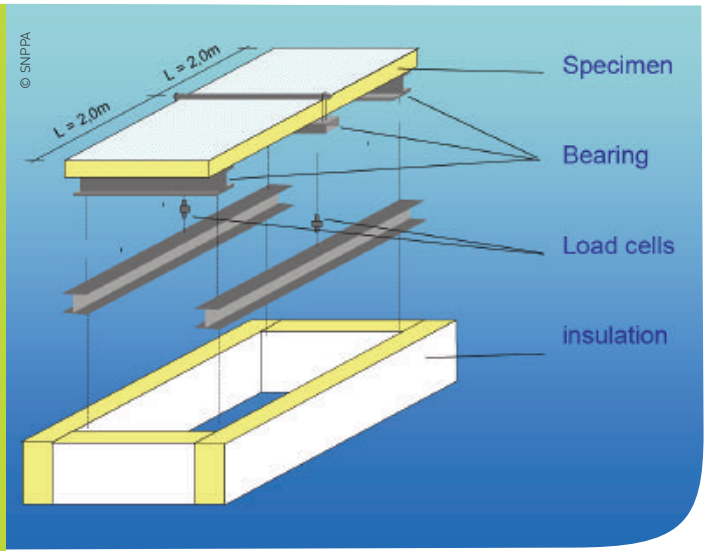
Experimental programme

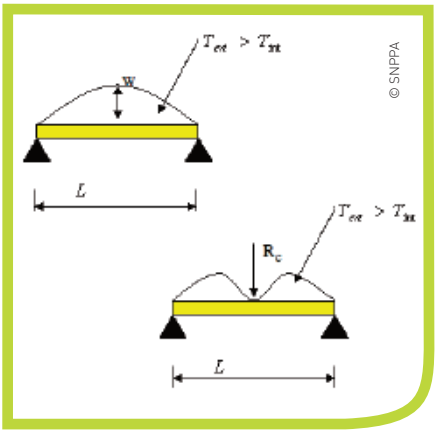
The test program has been calibrated and launched in March 2009 and is due to be completed in January 2010.

Two thermal test procedures have been defined:

- The first procedure is based on flat cladding panels on 2 supports which are first subjected to a thermal gradient in a first phase before being subjected to a load at mid span to have no displacement and simulate a two span panel in a second phase of the tests. The objective of these experiments is to check the thermal behaviour of the panel. This test method will be used by the University of Darmstadt with the panels being supplied by Panelco.
- The second procedure carried out by the University of Helsinki consists of testing roof panels on 2 and 3 supports. The panels are put on a positive or a negative loading at ambient temperature in a first phase and then at a thermal gradient simultaneously with a positive or negative loading in a second phase. The panels are supplied by ArcelorMittal Polska. This method enables to know directly the strength capacity of the panels tested at normal temperature and below a thermal gradient. It will be also be possible to compare the coefficient k1 of the EN 14509 with these tests results
- In addition, the University of Karlsruhe will be testing polyurethane and mineral wool cladding panels, white chamber panels and hidden fastened panels. This in turn will help to verify that the Design by testing procedure applies to all types of panels. The two first series of panels are delivered by Panelco and the hidden fastener panels are delivered by Thyssenkrupp Bausysteme.

Wrinkling stress at elevated temperature
Test set up





In all more than 120 tests will be carried out in the WP2 programme of work.

Comparison and calibration

All these tests will allow for a comparative study of the strength capacity following the EN 14509 and the Design by testing procedure will be carried out and for a comparison and calibration of both methods.

Guidelines

Following the completion of the experimental programme, guidelines will be drafted including both the theoretical formula and the associated bckground and practical examples.

Software and draft annex to the EN14509

A Design by testing software will be produced the last year of the project. Finally a draft annex of Design by testing will be prepared and proposed to TC 128 SC11.

David Izabel,
WP2 Leader
Technical Manager SNPPA
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WP2

WP3 Use of sandwich technology to optimise the global resistance of buildings

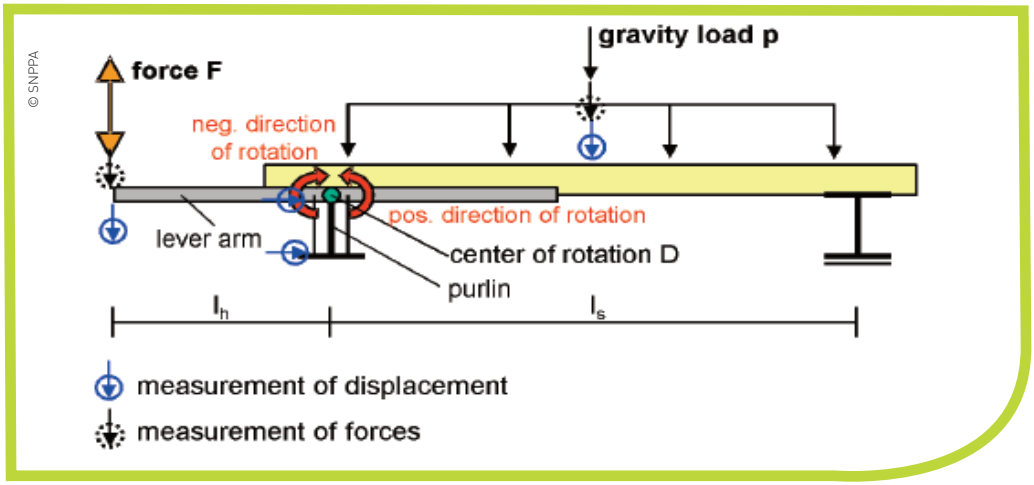
WP Leader:	**ECP Gesellschaft für GFK -Systemlösungen mbH** Represented by H.-Christian Ruhberg, Uwe Lipka
Scientific WP Supporter	**University of Karlsruhe** Represented by Prof. Helmut Saal, Dr. Thomas Misiek, Saskia Käpplein
Objective of WP3	Utilizing the high resistance of sandwich panels to in-plane shear and axial forces to improve the structural behaviour of steel constructions and to derive a design method for axially loaded sandwich panels.

From left to right:
Saskia Käpplein, Prof. Helmut Saal, Uwe Lipka, H.-Christian Ruhberg, Dr. Thomas Misiek

Sandwich panels have traditionally been used as covering and isolating components in buildings, thus being secondary structural components of the building. But sandwich panels also have a high resistance to in-plane shear and axial forces to improve the structural behaviour of steel constructions. These characteristics can also be used for constructions completely abandoning a load-bearing substructure.

Although there is expierience in practice there is not enough scientific verification yet and this is a barrier for making sandwich panels applicable in a much broader range. This on the other hand targets on the improvement of the market environment particulary for SMEs like ECP. The company is producing panels for building, chill room and further applications and dominates WP3 assisted by the RTD performer University of Karlsruhe.

WP3 already finished deliverable D3.1, the survey report defining the types of wall frames for the experimental and analytical investigations. Currently, the tests on the stabilising effects of panels on purlins are performed. Figure 1 shows the principle test assembly: The purlin is rotated around its axis and the force required for this rotation is measured. During the tests, different levels of the gravity loading are applied. As a result of these tests, the load-bearing capacity of purlins covered by sandwich panels can be increased. This will be a head start in the market of products covering buildings. These tests and their complementary numerical and theoretical investigations will be compiled in deliverable D3.2 which has to be presented in 2010.



Parallel to these tests, the preparations for the tests investigating the resistance to in-plane shear and axial forces are running. Furthermore a simple application of a sandwich building without any load-bearing substructure is constructed at the premises of ECP (Figure 2). It base upon ECP's experience in constructing of small sized modules and will serve as a demonstrator, allowing long-time investigations on such applications under realistic loading conditions parallel to testing procedures and investigations above mentioned.

WP3

Interview

Zdravko Valec
Director of
M-Profil ltd., Croatia

M-profil was founded in 1995. What was the beginning like?

The company was founded in 1995 with the headquarters in Sveti Križ Začretje with three employees. Primary activity then was the sale and assembly of roofs, exclusively in the northwestern part of Croatia. The following year the company was moved to a rented space where we began our own production of steel sheets. In 2001, M-Profile settled at the current address, into our own business premises that encompass a business building and three manufacturing halls. At that time, the market demands for our products were growing and we can say that the experience we have acquired until the beginning of the expansion of construction works in Croatia, especially in the area of mounting construction of steel structures, helped us to become the leader in that segment. The income growth rate of M-Profil in the last three years is, in average about 35% per year.

Your company is present in the neighbouring countries as well. Which are these countries and has this expansion of the company fulfilled your expectations?

As the demand for our products in the Croatian market grew, the need for additional manufacturing facilities has inspired us to consider capital investments in the neighbouring countries. Today we are the majority shareholders of several companies in the region where a part of the manufacturing facilities is located. When founding these companies we were led by the idea that the offer in these companies should supplement our offer. For example, in Bosnia the company M-Steel Sarajevo manufactures various metal roofing profiles. Jelšingrad in Prnjavor specialises in the manufacturing of machines for the framing of metal and steel constructions. The manufacturing facility for containers is situated on the same location. In Serbia, we are the owners of two more companies M-Profil Stara Pazova, for the manufacture of welded meshes and of M-Prointex in Mladenovac that has machinery for the manufacture of non-woven textiles. During the expansion of our company our objective was to become the owner of a company whose activities could supplement our primary activity, in order for us in time, to become a reliable partner that can offer complete solutions in the construction of mounted structures. In that sense, the expansion has fulfilled our expectations and opened new markets for us, where we can quickly and efficiently react to the needs of the local market.

You have specialised in the construction of buildings made of steel and in the manufacturing of final elements. What are these products?

The basic activity of the company is the manufacturing of steel constructions, sheets and thermal panels that are made according to the measure of the project and are transported to the construction site, ready to be mounted. I must point out that we have equipped 15,000m² of closed space in 5 manufacture halls in Zabok and Zagreb with the most advanced technology for the production of our leading products.
We manufacture sandwich panels with the polystyrene core insulation, stone wool and a bit less, with polyurethane insulation. The advantage of building with sandwich panels is that all the elements are adapted to the design of the project and enable a fast construction, therefore lower operational expenditures during the construction of a building. Since the steel sheets are resistant to climatic conditions, the maintenance expenditures after the construction are minimum. We manufacture 12,000 tons of steel constructions, we process 2.5 million m² of flat sheets and we make 12,000 tons of welded meshes per year

What would Croatia`s entering the European Union mean for your company?

All are products are separately attested and certified in accordance with the valid standards and some products, for example thermal panels, are attested according to the standards that are not yet in force in Croatia, but are obligatory in the EU. Therefore, we are getting ready for Croatia`s entry to the EU, and this will open a new market for us. We already export into some countries of the EU,

although it is not a very significant percentage. M-profil continually follows trends in the EU in our segment of construction. We scan the market and in accordance with it, we develop our products. These are all preparatory activities for the more advance entrance to the EU market, where the exporting possibilities are great.

What are your expectations of the EASIE project?

The possibility of joining a consortium that is founded with a goal to research and implement new building modes with sandwich panels, we have accepted with great interest, since M-profil wishes to become the leading company in the manufacture of sandwich panels and the construction of buildings in the region of south-eastern Europe. Our mission is to offer complete service to our clients in solving their needs for business premises of top quality at moderate prices. We wish to be recognised as a reliable partner with good-quality products and short time deliveries for every client and project. With the partnership in the EASIE project we expect to find out and implement new possibilities of the functioning of sandwich panels in the construction of buildings. To be in the company of those who are first to probe, gives us competitive advantage in a qualitative sense, which is very important, since we wish to place our product in Europe. We are looking forward in harmonising the norms and standards that are implemented in the manufacturing of sandwich panels, because only in that way, we can promote this excellent product in a high-quality manner. These are the reasons, due to which today, we are proud of our membership in the consortium.

Focus

EN 14509

The European standard for sandwich panels (double metal skin) was definitely cited at the JOUE last December, after 2 years of delay. The standard voted in 2006 could not be published because of a legal action undertaken by EURIMA (the European association of Mineral wool manufacturers) against the use of the SBI test for sandwich panels, without any consultation with the European sandwich panel manufacturers. They started long discussions with CEN and the Commission spreading troubles and confusion.

The 3 European Associations EPPF, Panama International and EPAQ organised themselves and acted jointly to demonstrate the biased argumentation of Eurima, founded on incomplete scientific demonstrations. Moreover, Eurima's proposal would have led the European profession to an economic disaster whereas it was not technically founded. The technical and economic argumentation of the sandwich panel manufacturer representatives hit their goal and gained the support of the Commission. Finally, CEN proposed an amendment which was agreed by the Commission.

EPPF, Panama International and EPAQ succeeded, the standard is published and the official dates of application are the following: ce marking possible as from January 1st 2009, compulsory as from October 1st 2010.

Schedule

June 17th	WP5	Meeting in Darmstadt
November 11th	WP7	Sixth monthly review meeting in Helsinki

For more information : **www.easie.eu**