

### Foreword

**Paavo Hassinen**

Research scientists in Aalto University, Finland



**EASIE is a three year project providing a platform for research and development work of sandwich constructions. EASIE gives support to small and medium size enterprises to develop technology for the design, manufacture, installation and use of sandwich structures, thus covering the total service life of the sandwich panels with necessary additional components, coverings and services.**

The influence of EASIE is not limited to series of single development projects but it creates general information to the profit of future building practices and recommendations, codes and standards. Subjects of the work packages of EASIE lay basis not only for the future sandwich panel business but also for methods of the evaluations and verifications in codes and standards. The influence of EASIE extends wider than the direct interest of partners, only.

EASIE is a joint project between eleven companies, four associations and four research institutes. It creates a research and development network between the partners from ten countries. EASIE is a model for an effective joint work of partners without geographical limitations.

Current product standards define the requirements and on the other hand, give the methods to measure the quality and quantity of those required properties of building products. An ideal standard leave a door open to further developments of tools and methods in order to allow the use of the most advanced systems available. However, in practice, the standardization means freezing the technology to a certain level; the given tools shall be used even if more advanced methods may come available. From the user's point of view, the tools given in a standard should not be changed too often and they should base on solid technical knowledge with long experience from practice. It can be noticed, that the requirement for flexibility and stability are contradictory requirements to the authors of standards. Standards are today very heavy tools, by defining common rules on the market. Therefore, the importance of the solid technical basis and the correct implementation in to the practice can not be emphasised too much.

In a joint project as EASIE, a common language between the partners is needed. Terms and definitions used by the companies and by the universities may vary substantially. Continuous discussion helps to make starting points, expectations and expected results realistic and similar to every partner. The universities are willing to support the companies but also like to create scientific results and publications. Understanding and acceptance of the industrial partners for the scientific goals is in the list of wishes of the universities. The first year of EASIE has shown very promising attitude and support of the partners to each other. EASIE really seems to be an open project in which all partners benefit from the knowledge of the others.

From the beginning of 2010, Helsinki University of Technology (TKK) is a part of the new Aalto University, together with Helsinki School of Economics and the University of Art and Design. Aalto University is a foundation-based institute, which continues to carry through the responsibilities of TKK. Thus, the work of EASIE project will be continued at Aalto University without any formal adjustments. The only changes will be the contact information in which a smooth transition period will be allowed. Aalto University will be a multidisciplinary institution which promotes independent research subjects and gives the highest level education in technical, economic and cultural sciences. Except the name of architect Aalto, the word aalto in Finnish means a wave - which will carry and promote research work such as the work in EASIE to results for success of all partners and societies.



**WP<sub>1</sub>**

Improvement of thermal and structural behaviour in openings and joints

**WP<sub>2</sub>**

End user Focused Design Strategy

**WP<sub>3</sub>**

Use of sandwich technology to optimise the global resistance of buildings

**WP<sub>4</sub>**

Retrofitting, durability and maintenance

**WP<sub>5</sub>**

Holistic, elearning based education on sandwich construction

**WP<sub>6</sub>**

Training, skill development and dissemination

**WP<sub>7</sub>**

Management and Governance

# WP1 Improvement of thermal and structural behaviour in openings and joints

<b>WP Leader:</b>	LHH Consulting Represented by Dr Lars Heselius
<b>Scientific WP Supporter</b>	Technische Universität Darmstadt (TUD) represented by Prof. Dr. Jörg Lange and Ms Dipl.-Ing. Felicitas Warmuth
<b>Objective of WP3</b>	Studying the thermal behaviour of sandwich panel with special notice to the air tightness of panel joints. Studying the effect of openings on strength of the panel assembly. Developing practical guidelines.



WP1 team

WP1 is focusing on two problem areas: Air permeability of panel joints (causing thermal losses) and effect of openings on panel assembly. Sandwich panels with its structure of high insulating core materials without any thermal bridges have an excellent thermal behaviour. There might be potential leakages in the joint with either wrong joint construction or bad installation.

This effect is studied by experimental tests (see fig. 1 and fig. 2)

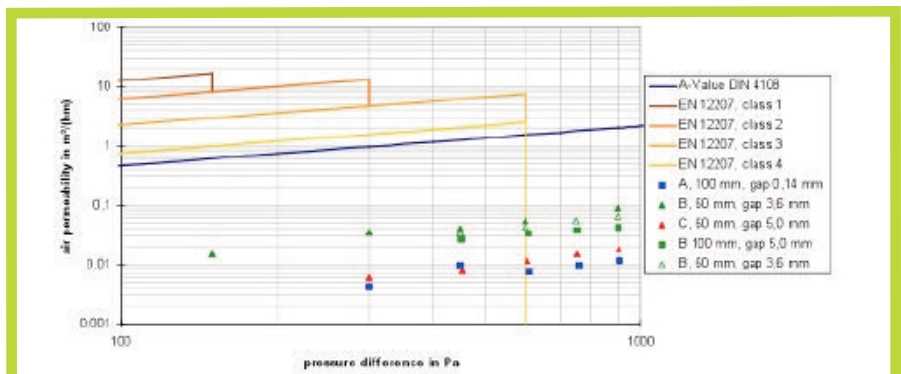


Fig.2 Test results for air leakages through panel joint (TUD).



Fig. 1 Test setup for measuring air leakages through panel joint. Technische Universität Darmstadt

Some results are shown in Fig. 2. Sandwich panels are not sensible to making openings in the structure due to its homogenous structure with same mechanical strength in every part of the cross section. The weakening effect is following closely the rule of net cross section with

an additional effect of stress peaks around the corner. As the major work was done by TUD in previous studies WP1 will follow up with studies on the effect of window frames, reinforcing the openings and the potential of the joints to transfer forces to adjacent panels thus avoiding additional supporting structures. In fig. 3 a test is shown with a window installed with frames bonded to the panel. In order to avoid additional substructures around the openings which can give significant additional cost it is of vital importance that loads can be transferred over the panel joint from the panel with opening to adjacent panels without openings. This is tested by several test setups of which one is shown in fig. 4.

The target is to create principles of good practice for joints against thermal losses and to create guidelines for taking account of the effect of openings on panel strength and panel assembly.

WP<sub>1</sub>



Fig.3 Testing strength of panel with window frame installed

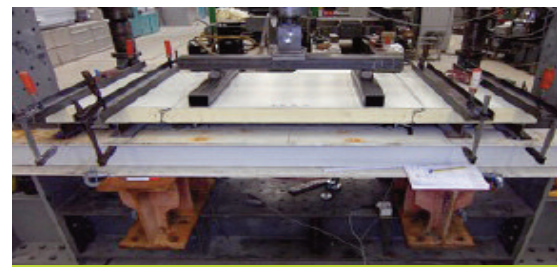


Fig.4 Testing shear strength of panel to panel joint (TUD)

## Interview

**Werner Fech**  
FECH Fenstertechnik,  
GmbH & Co. KG



### Presentation of FECH Fenstertechnik & Co. KG

Fech Fenstertechnik GmbH & Co. KG based in Buttenwiesen (Bavaria) has invented and is distributing the Fech-Jet-System®. The system is a frame system, particularly developed for the needs of sandwich facades. The product is patented and intends to provide a high quality façade system. Besides aesthetic advantages, the system provides superior air and water tightness when compared to conventional systems. At the moment, the system can not be seen as a structural member of the façade, but initial testing has shown the high potential the system has also in this field.

The manager of the company, Werner Fech, is working in the line of business since 1978. In the year 1989 he decided to be self-employed and from this time on the company developed from an "one-man-company" to a medium sized company with 15 employees. The company workshop is specialized in aluminium welding and in the production of window prototypes. The available equipment allows the production of test samples as needed for the EASIE research. For sourcing of the necessary raw materials, Fech Fenstertechnik is in close collaboration with major window producers and with a local aluminium extruder.

The production and erection of sandwich panels increases worldwide. However adequate solutions for the windows and

other openings are still lacking. It is the aim of Fech Fenstertechnik to be able to provide an easy, cost effective window and door system for sandwich facades which is able to perform as a structural



member. Basic research is necessary to reach this goal.

The Fech-Jet-System® has the potential to be the suitable solution.

The advantages of the system are:

- Less time for installation

- Immense cost saving as tinsmith work after window installation is obsolete. This work is incorporated into the system.
- Based on the outcome of future research, an additional supporting construction around the window will become obsolete.
- High aesthetic quality, as distracting screws, rivets and mitre cuts are not needed.
- The welded aluminium frame is available in any RAL colour and can thus be chosen to suit the colour of the sandwich wall elements
- The system is currently optimized towards air and water tightness as well as thermal insulation. A high level of tightness and insulation has been reached particularly for sensitive

areas such as the corner of the opening. The product is long-lasting and minimized in interfering penetrations. Since 2001 the system is patented by the German „Patent- und Markenamt“. Filing a European patent in 2006 has been the next step to an international marke-





ting of the product. Currently costumers are particularly coming from Austria, the Netherlands, Czech Republic and Switzerland. The system is permanently developed further and it is the aim of Fech Fenstertechnik to improve the system constantly and particularly towards its structural performance.

For this presentation we have decided to interview the director of the Germany company, Mr. Werner Fech who gladly answered a few questions.

**You have specialized in the construction of windows and doors. What can you explain about your products?**

Our product is a combination of a win-

dow / door and a welded aluminium-frame at the outside.

This specialized system, called Fech-Jet-System®, offers to our clients a lot of advantages, which make our product completely different from the conventional window-system:

- Screws or rivets are not needed
- Easy installation
- Variety of colors
- Most cases without sub-construction
- Two different profiles : pvc & aluminium

**How will FECH contribute to the success of the project?**

- We can contribute to improve the knowledge of the profile e.g. aluminium
- Using our system we think we can

improve also, the quality and the prestige of panel buildings

- Thank of we don't work with standard measures, we are very flexible to build everything we need for the project
- And of course we will contribute to improve the knowledge of the individual windows and doors

**What are your hopes and expectations of the EASIE project?**

We want to have legal proof or evidence for the statics of our system and then with it, there is no doubt about them, to convince the market and the university. And of course we want to popularize our system and deliver it "all over the world".

WP<sub>1</sub>

## Focus



**Daniel A Spagni**  
Managing Director  
of the Advanced Research  
Partnership (ARP) in the UK

**The Third meeting of the Management Committee of EASIE was held on 11th November 2009 at the Department of Structural Engineering and Building Technology of Helsinki University of Technology (TKK) in Finland.**

Welcoming the Partners, Professor Paavola, explained that this was probably one of the last few international meetings to take place at the University before its change of name and status. As of 1st January 2010, a new university, Aalto University will be created with the merger of Helsinki School of Economics, the University of Art and Design Helsinki and Helsinki University of Technology, all leading and renowned institutions in their respective fields and in their own right. The combination of three universities opens up new possibilities for strong multi-disciplinary education and research. The new university's ambitious goal is to be one of the leading institutions in the world in terms of research and education in its own specialized disciplines.

The meeting was also timed to coincide with the 2009 Congress on Advancements for Metal Buildings jointly organised by the European Quality Assurance Association for Panels and Profiles (EPAQ), the European Profiles and Panels Producers Federation (EPPF) and Panama International.

The Partners all welcomed the opportunity to take stock of the progress made after one year of work not only on the scientific and technical programme but also on a range of strategic issues such as codification and industry practices.

The second half of 2009 had seen the development of a complex and wide ranging experimental programme including large scale thermal and mechanical tests to try to better understand some of the theoretical issues relating to the design by testing method, to assess how the global resistance of buildings could be optimise and to evaluate the impact of openings and joints on the performance of wall and roof sandwich panels.

Dr Sheffer of RBM Europe gave a very interesting on work which his company had carried out on the durability and maintenance of sandwich panels including ageing parameters, the repair of blistering, delamination, corrosion and defects. The results presented were based on a detailed analysis of over 200 real cases classified according to the type of problem which had been experienced, the location of the problem areas in the building and the type of core used in the manufacturing of the panel.

RBM in collaboration with ThyssenKrupp had investigated the use of a new repair technology using glue injection and vacuum/compression method. This method was giving very good results for the repair of small blisters of up to 250mm while for larger size blisters the advice was still to replace the affected panel.

A very important output of EASIE will address the fact that sandwich construction is generally not taught in universities and the resulting impact on the profile of the industry and its take-up of new technologies. The plan was for the development of an internet-based teaching unit on the design of sandwich panels including lectures on the use and design of sandwich panels, an online library and database and an online register. A comprehensive list of lectures had now been produced, with a sample lecture available on the project's website ([www.easie.eu](http://www.easie.eu)), a shortlist of lecturers had been prepared and the collection of relevant literature and codes on sandwich panel was well underway.

In closing the meeting, The EASIE Coordinator, Professor Naujoks, said that he was looking forward with a great deal of anticipation to the next meeting of the Partners in Brussels in May 2010 which will coincide with a review by the European Commission of the first 18 months of EASIE

WP<sub>7</sub>

# Schedule

<b>February 23<sup>rd</sup></b>	<b>WP<sub>5</sub></b> and <b>WP<sub>6</sub></b> in Paris
<b>March 12<sup>th</sup></b>	<b>WP<sub>2</sub></b> meeting in Paris
<b>March 23<sup>rd</sup></b>	ISOTECNICAMEX III, Mexico
<b>April 22<sup>th</sup></b>	First EASIE workshop in Zagreb
<b>May 18<sup>th</sup></b>	<b>WP<sub>4</sub></b> in Brussels
<b>May 19<sup>th</sup></b>	Industrial and Management meeting in Brussels
<b>September</b>	PAN & PRO and EPAQ annual congress in Oporto

For more information : [www.easie.eu](http://www.easie.eu)