

**WONDERMAR II**  
**Workshop Gdansk**  
**01-03-2002**



universal  
**SandWich**  
design tool

Tadeusz Borzecki (TUG)  
and Gregor Berns (MACOR)

Steel Structures

## **SANDWICH DESIGN TOOL - agenda**

- what are SANDWICH panels
- the SANDWICH Project
- design tool development
- design tool architecture
- graphical user interface
- optimisation of SANDWICH panels
- programme modules
- FEM interfaces
- tool concept
- summary

by  
Tadeusz Borzecki  
and  
Gregor Berns

# universal **sandwich** design tool

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**sandwich**  
design tool

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## What are Sandwich panels?



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# advanced composite sandwich steel structures

## The SANDWICH Project



HELSINKI UNIVERSITY OF TECHNOLOGY



MACOR NEPTUN



INFERT GmbH

Jünger



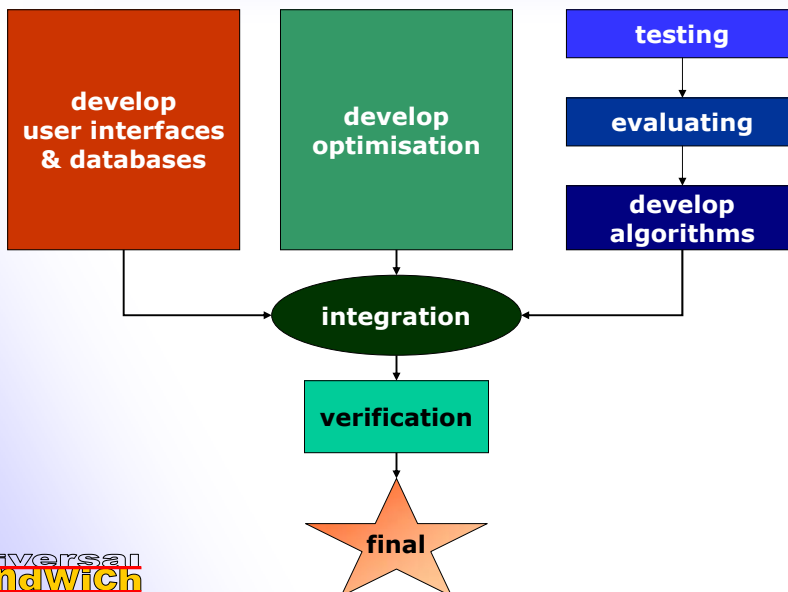
Technical University of Gdańsk



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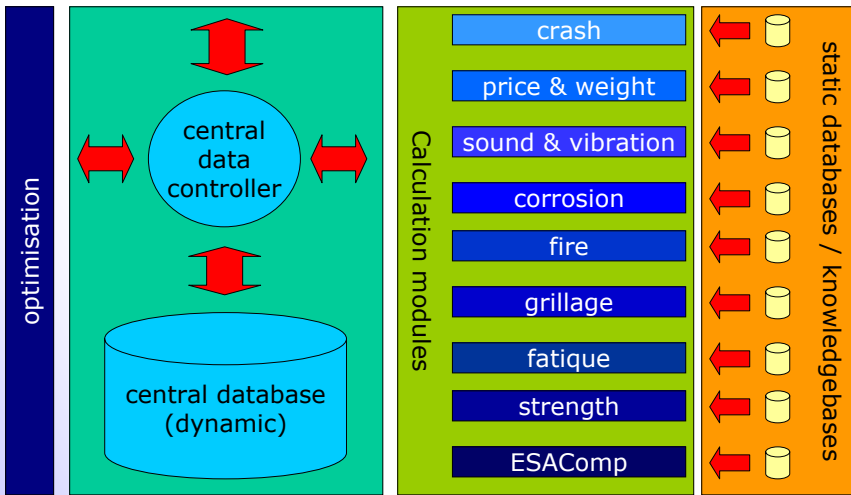
## Tool Development



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# The Design Tool Architecture

graphical user interface



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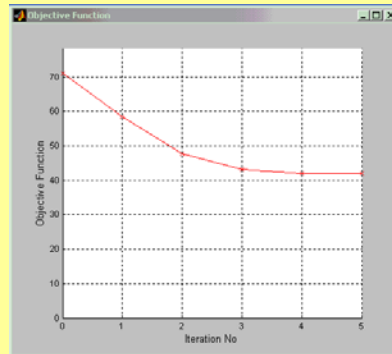
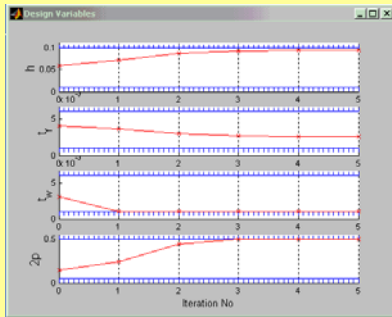
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# Graphical User Interface

The screenshot displays the graphical user interface with several active windows:

- Boundary conditions:** A dialog for defining boundary conditions for Edge 1 and Edge 4. Options include Free, Fixed, Simply supported, Pinned, and No condition choosen.
- Cross-section details:** A window showing a cross-section diagram and input fields for Height (h), Core angle (θ), Upper face thickness (T<sub>1</sub>), Lower face thickness (T<sub>2</sub>), and Core web thickness (T<sub>w</sub>).
- Save sandwich panel:** A main configuration window with sections for:
  - Basic geometry:** Length and Breadth in mm.
  - Materials:** Selections for Upper face material, Lower face material, Core material, and Filling material, each with a 'Save new material' button.
  - Insulation:** Thickness exposed side and Thickness unexposed side in mm.
- Material and Insulation windows:** Small windows for defining material properties and insulation details.
- Operations window:** A panel with buttons for Insert, Edit, and Delete.

## panel optimisation



Results Listing		
Initial	Final	Constraints
Objf = 71.136	Objf = 41.970	
hc = 60.000	hc = 94.80361	
tf = 4.000	tf = 2.59817	
tw = 3.000	tw = 1.00000	
Zp = 150.000	Zp = 500.00000	
h total = 0.08800	h total = 0.10000	h total = 0.10000
displ. = 0.70284	displ. = 0.36730	displ. = 1.00000
stress = 127.97927	stress = 129.99852	stress = 130.00000

## programme modules

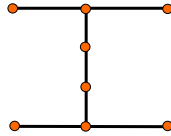
- strength
- corrosion
- fatigue
- fire
- crash/ impact
- sound and vibration
- optimisation
- (grillage)
- ESAComp

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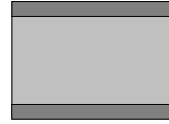


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## FEM interface



general shell, 4 nodes per element  
7 elements, 16 nodes (per unit)



Laminate shell, 4 nodes per element  
1 element, 4 nodes (per unit)

### Export to:



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## design tool concept

- Target audience:
  - salespersons
  - designers
  - customers
- Aims:
  - promote product
  - improve design (speed and quality)
  - improve product attractiveness

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## summary

- easy to use
- accesibility (world wide web)
- platform independence
- modular architecture
- interface to global analysis (FEM)
- filled and empty panels

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**thank you for your attention**  
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steel structures