Structural testing of composite panels

metecno BONDOR metecno

Structural testing of composite panels

Insulated Sandwich Panels

Benefits of Insulated Panels

Failure Modes

Structural Lab demo test

What is an insulated sandwich panel

- Three main components to a composite panel:
  - Top skin
  - Core
  - Bottom skin
- Various core materials with different properties suitable for different applications
- Main two manufacturing processes:
  - Roll forming of the skins and lamination process under pressure
  - Expanding the PIR (rigid foam) at high temperature between two profiled steel skins on a continuous line

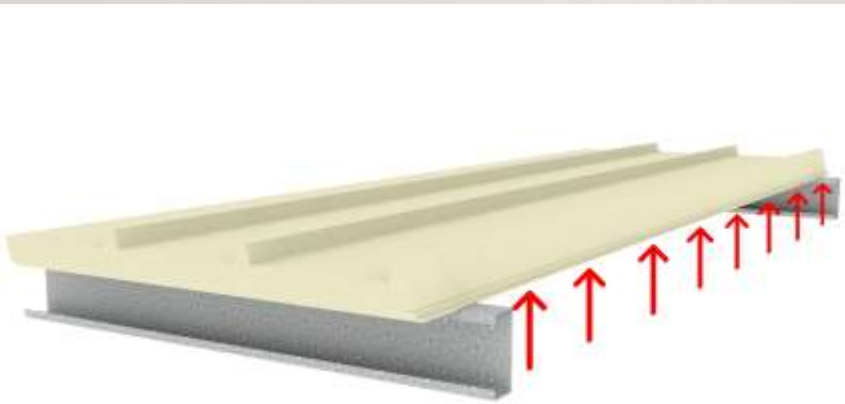
Why insulated panels

- Bending capacity of the composite is governed by the **steel skins & panel thickness**
- Shear capacity depends on the **core properties & thickness**
- When combined with a core, the steel skins will provide **superior strength** compared to single skin products with separate insulation layers
- Sandwich panels are **lighter** than traditional building material
- Due to light weight and **longer span** of the composite products, cost of the roof structure (size of the structural members) will be reduced
- Insulating properties of sandwich panels contribute to the **energy efficiency** of buildings
- **Acoustic** performance of the panel blocks out unwanted noise
- Sandwich panels can be **installed relatively easily and quickly** compared to other roofing product

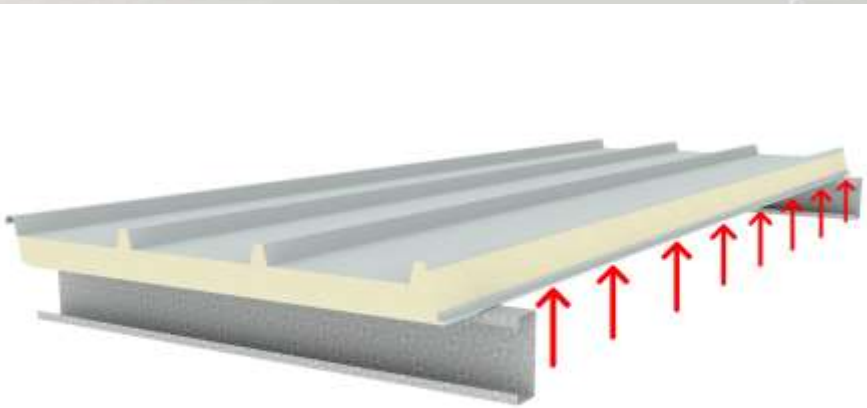
Maximum UDL for a 3m single span

Top skin 0.7 kPa

Bottom skin 0.0056 kPa



Core 0.4 kPa

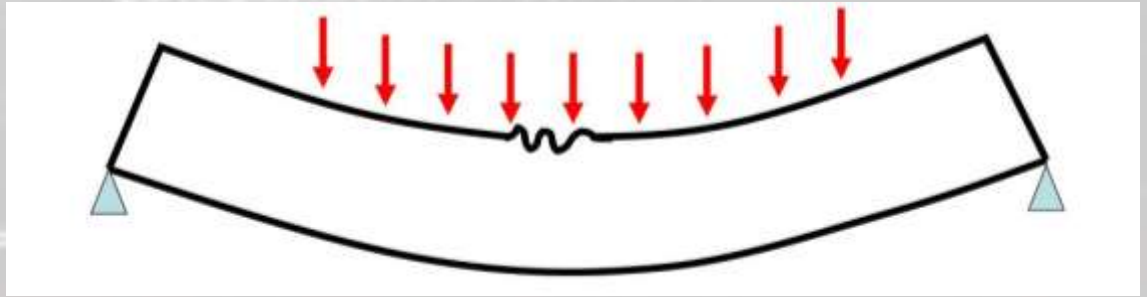


Composite panel 5.5 kPa

Modes of failure

Bending / wrinkling

- Longer spans
- Governed by:
  - Compression capacity of the skin material
  - Effectiveness of the skin profile
  - Bonding between the skin and core material
  - Core grade and thickness



Modes of failure

Core shear

- At discontinuous ends near supports
- More common in wall panels
- Shorter spans
- Governed by:
  - properties of the core
  - High shear loads near supports
  - Can be avoided by reducing the span and/or selecting a thicker panel

Modes of failure

Skin delamination

- Predominant in shorter spans
- Governed by:
  - High shear loads
  - Controlled during manufacturing process
  - Quality Assurance
  - High skin temperature

Modes of failure

Screw pull-out

- At intermediate supports of multi-span products
- Governed by:
  - Diameter of the screw
  - Thread per inch of screw
  - BMT and grade of the structural steel support / grade of and embedment into timber
  - Number of fasteners

Modes of failure

Screw pull-through

- At intermediate supports of multi-span products
- Governed by:
  - Size and stiffness of the washer
  - Steel skin material, profile, foam infill
  - Can be mitigated by increasing the number of screws and the effective area of the washer

Structural lab

- During R&D stage
- Before product launch to generate technical material
- During the life of the product – to improve properties
- As new Standards are introduced
- One off and project specific designs