

2.2.2 WALLS

2.2.2.4 SANDWICH PANELS

GENERAL DESCRIPTION

Precast sandwich panels provide an energy-efficient functional solution for exterior walling. Precast concrete's key benefit comes from its thermal mass, which helps the material store heat and moderate temperature swings. When that advantage is used in insulated sandwich panels the system can produce high R-values (up to 3.0 m².K/W). When the interior space is mechanically heated, heat is stored in the relatively-massive inner layer. When the heat is turned off, the heat is released back into the building. This fabric energy storage evens out the thermal peaks and troughs; the avoidance of such temperatures swings not only means a more comfortable environment, but considerable cost saving.

Apart from the advantage of superior thermal performance, sandwich panel walls offer excellent resistance to many types of forces including blast, impact from vehicles and vandalism. This makes it especially useful for buildings requiring a high degree of security such as correctional facilities.

Other advantages:

- Eliminates the need for beams and columns along the exterior walls.
- High fire resistance, with a maximum 4-hour rating where required.

DESIGN

A typical sandwich panel system consists of two layers of reinforced concrete separated by a layer of rigid insulation.

Internal (Structural) Layer

This layer will be 125–200 mm thick and provides the bulk of the thermal benefits if located inside the insulation layer. The actual panel thickness will depend on the loads that are to be supported and panel height.

Insulation Layer

The insulation layer comprises of a sheet of expanded or extruded polystyrene which is the main contribution to the R-value of the system. The thickness of this layer is dependent on the required R-value of the wall as the R-value is in direct proportion to the material thickness. See 9.1 *Thermal Properties* in this Handbook, for guidelines on selection and calculation of R-value.

External Layer

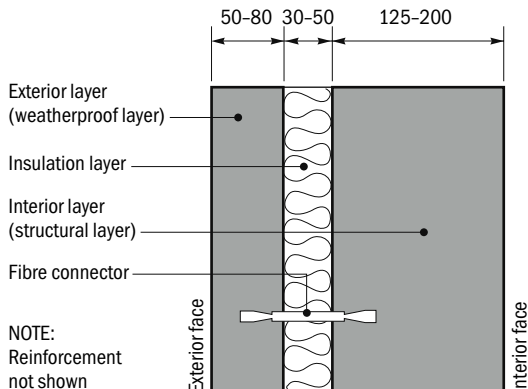
This is the weatherproofing layer and usually the basis of the final cladding. It can be finished in a number of ways to give an impressive architectural finish.

MANUFACTURE

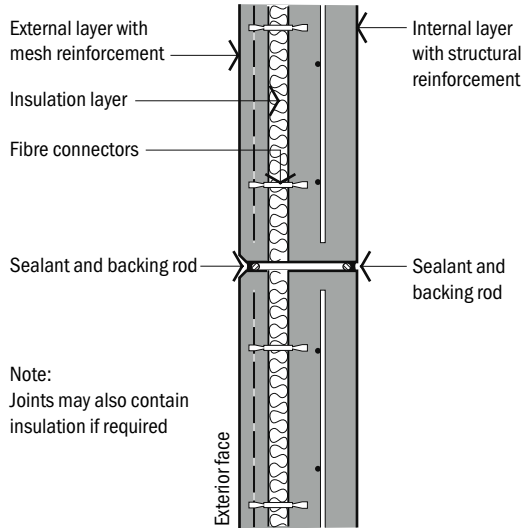
The fastening together of the two layers is a critical aspect. Proprietary flexible connectors made of high-strength fibre composite, which are flexible enough to allow relative movement of the two concrete layers are recommended.

The outer reinforced layer is cast in a traditional mould, and while still wet, has the layer of insulation placed on top. The connectors are inserted through the insulation into fresh concrete on typical 400- to 600-mm centres and securely bonded. The upper reinforced layer of concrete is then poured around the protruding connectors, thus stitching the two layers together.

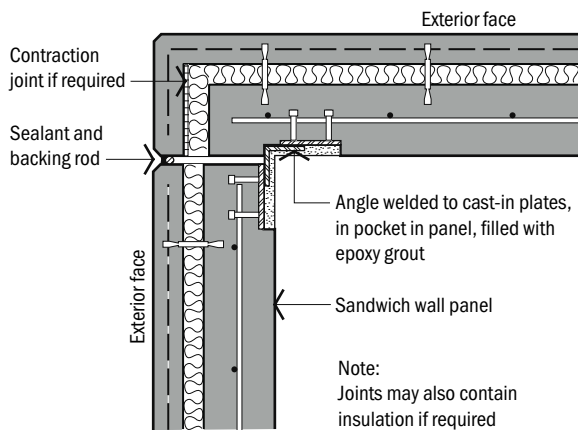
TYPICAL WALL SECTION



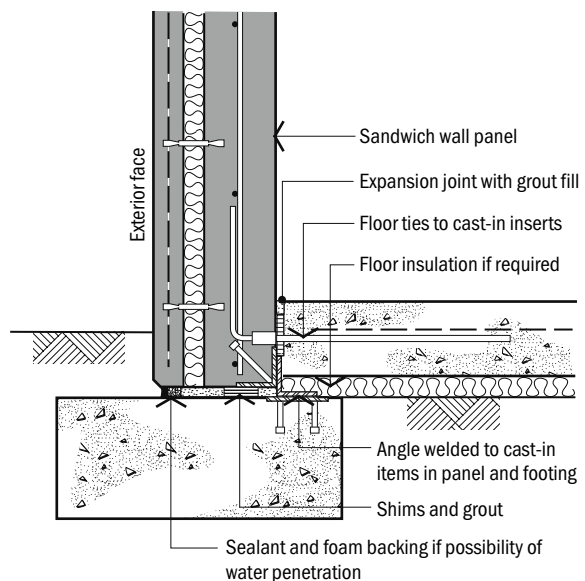
TYPICAL JOINTING/CONNECTION DETAILS



(a) Panel Butt Joint



(b) 90° External Butt Joint



(c) Panel-to-footing Connection