

Plasti-Fab Design Manual

Precast Concrete Wall Panels





Precast Concrete Wall Panels

Precast concrete panels in walls and floors can be easily and economically insulated by incorporating Plasti-Fab PlastiSpan insulation into the panel at time of manufacture. The panel when placed provides a fully insulated finished wall or floor section.

Wall Panels

The precast concrete panel is usually constructed so the interior shell of the panel is structural and will support wind loads or any other loads expected. Since it is insulated from the weather it will not be subjected to extremes of thermal expansion and contraction and will be a more suitable unit. The windows are mounted on the interior shell which is more stable. The interior shell acts as a heat source for the window, warming it and allowing for a higher relative humidity in the building before condensation occurs on the window.

A panel can be constructed so the insulation runs to the vertical edge of a panel or a concrete web can be poured at the vertical edge to connect the inner and outer faces of the panel in order to satisfy the requirements of the building code. The fire rating of the panel will depend on the thickness of inner shell.

The exterior shell is connected to the interior shell by shear ties that pass through the insulation. Shear ties can be heavy gauge expanded metal, welded wire fabric, rebar, or specially fabricated welded wire trusses. The shear tie extends into each shell to the reinforcing mesh but is not attached to it. It is positioned vertically but can be supplemented by horizontal ties. The outer shell is isolated from the rest of the building and exposed to the elements so the shear ties should be designed to allow movement due to thermal expansion and contraction.

The thermal short created by the concrete web at the edge of the panel can normally be ignored. If the concrete web area represents a significant part of the wall area, the condensation aspect should be checked and the heat loss calculation for the wall adjusted.

PlastiSpan insulation can also be placed on the interior of uninsulated precast concrete panels after erection. Follow specifications for insulating poured concrete walls. See the PlastiSpan brochure "Wall Insulation: Interior Systems."



Canadian Building Digest No. 93 and No. 94 published by the Division of Building Research, National Research Council, discuss various design problems to be considered with precast panels.

Method of Manufacture

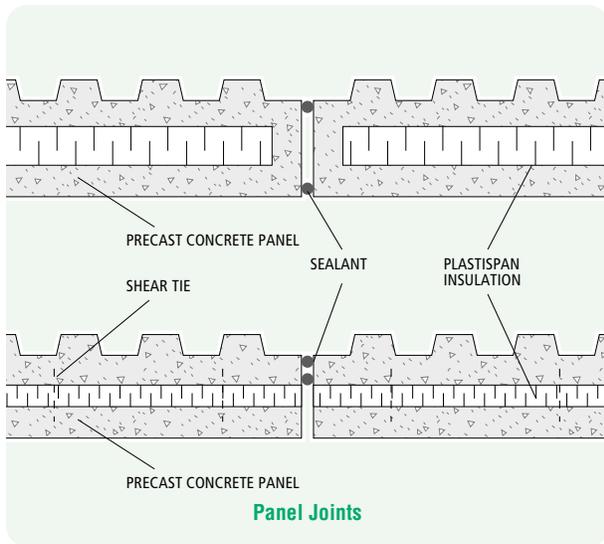
The panel is usually poured exterior face down so any architectural details can be incorporated into the mould. Concrete is poured over the exterior shell reinforcing to the depth required for the thickness of the exterior skins – vibrate as necessary.

Shear ties are worked into the wet concrete or in some cases the shear ties are placed as the concrete is poured.

Some designs require a bond breaker between insulation and exterior shell. 2 mil polyethylene will provide this requirement.

PlastiSpan insulation boards are placed over wet concrete allowing space for concrete web around perimeter where necessary. Reinforcing for inner shell is placed. Pour concrete to finished thickness of panel. Vibrate as necessary. Trowel surface of concrete as required. Let concrete set and cure in usual manner. Handle panel as usual.

**Wall Insulation:
Precast Concrete Wall Panels**



Floor Panels

PlastiSpan insulation is placed into precast concrete floor slabs to provide a convenient method of forming a concrete joist system. The floor panel is closed on both sides and the end as required for fire rated construction. The insulation enclosed in the panel allows for fast and easy assembly, a flat surface top and bottom with the lightest possible panel weight.

Design Considerations

The panel is designed as a multiple concrete joist. The thickness of the floor panel can be adjusted by using thicker pieces of PlastiSpan insulation. PlastiSpan insulation should be used whenever concrete is not required for its load bearing properties. The panel's load bearing capacity can be varied by the design of reinforcing steel in the bottom shell.

The total thickness of concrete in the panel is usually accepted in order to determine the fire rating of the panel. Fire testing to verify this rating has been completed in other countries. Where the panels are designed for long spans it is desirable to separate the PlastiSpan insulation along the length of the panel to divide the flammable component into two or more compartments.

Method of Manufacture

Panels are normally manufactured by placing the reinforcing steel for the shell into the form. Concrete is poured to the thickness of the lower shell. Then PlastiSpan insulation is immediately placed using a jig or spacers and held in position with a clamping device.

The remaining reinforcing steel for the panel is placed and the concrete poured. The panel is finished in the normal manner and after setting is handled according to the usual practice of the manufacturer.

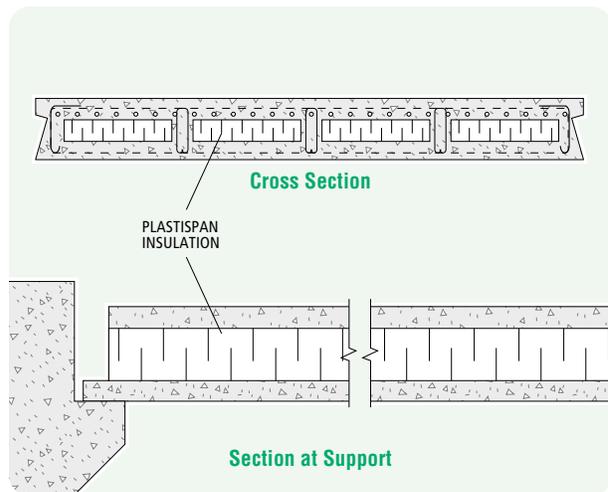
Erection

Follow the accepted erection specifications of the manufacturer.

Finishes

A spray on finish is usual as a ceiling finish on the underside of the panel.

When used as a roof panel the insulation on the panel may be used to calculate the thermal resistance over the area to be covered by the roof. Additional insulation over the slab is often required in conjunction with the roof membrane to reduce the effect of the thermal short at the concrete webs.



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