PanelForm

Product Information Guide

www.panelform.com

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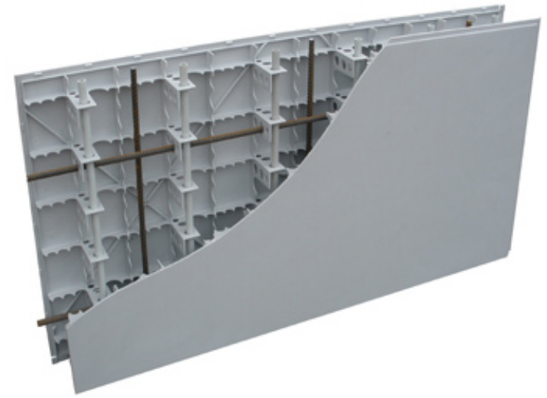
Product Description

PanelForm is a simple modular permanent formwork system used to create solid structures. The 1200x600mm high impact polystyrene panels easily clip together and are then held in place through the insertion of reinforcement bars or plastic conduits into guide holes within the cavity. Once the system is locked together, concrete is poured into the cavity, vibrated and allowed to set which then completes the process. PanelForm becomes the permanent face of the structure which is water and termite proof. PanelForm is a strong and revolutionary permanent formwork system which has the ability to reduce costs and construction time in today's highly competitive DIY and building industries.



PanelForm Assembly Cross Section Image 1.1

Applications

PanelForm is a product with an unlimited amount of applications and capabilities and can be used in the construction of:

- Houses
- Retaining Walls
- Water Tanks
- Swimming Pools
- Cellars
- Silos
- Dams
- Industrial & Commercial Structures
- Partitions
- Columns
- Floating Structures
- Tunnels

Anyone using Panel Form will quickly find more applications.

Finished Dwelling Image 1.2

Pool Construction Image 1.3

Advantages

Cost Effective:
PanelForm is price competitive and dramatically reduces construction time. This superior building system allows for the elimination of many building trades and use of cranes and delivery trucks leading to a quicker building process and less time lost during construction. Panels are easily and quickly snapped together so preparation is minimal.

Strong:
PanelForm produces a strong, integrated structure that is less susceptible to damage from natural disasters (earthquakes, tornados, cyclones, and hurricanes) compared to conventional building systems.

Adaptable:
PanelForm does not require skilled labour for construction. PanelForm building system is extremely adaptable. Structures do not need to be filled with concrete; other suitable fillings could also include mud, clay, rocks etc. Structural walls can be achieved with a combination of concrete columns and any of these alternative materials. Additionally, buildings can be constructed from boundary to boundary with little or no encroachment into neighbouring properties necessary.

Termite & Vermin Proof:
PanelForm structures are unaffected by termites and resistant to infestation by vermin such as rats and cockroaches.

Water Resistant:
PanelForm is water resistant and certified as a thermal water proofing membrane, Part 1.2.2 of the BCA, so there is no need for an additional water-proofing membrane and other associated protection.

Water Storage:
PanelForm walls and columns have the ability to become rainwater tanks and integrated with passive heating and cooling systems.

Engineering:
There are no special engineering requirements for a PanelForm building system; they are same as the requirements for conventional structures. However, PanelForm does provide some engineering advantages. Since PanelForm structures are fully integrated and all structural components (walls and slabs) are self-supporting, dead weight is eliminated. This means that thinner walls and slabs can be designed. In some cases even footings are not required.

Environmental Sustainability

PanelForm panels have the ability to be moulded from many different materials. This includes recycled plastic and many other recycled mouldable materials. The PanelForm system is also designed to minimise product wastage. All off cuts are recyclable and therefore contributions to landfills are dramatically reduced from PanelForm projects.

Thermal Rating

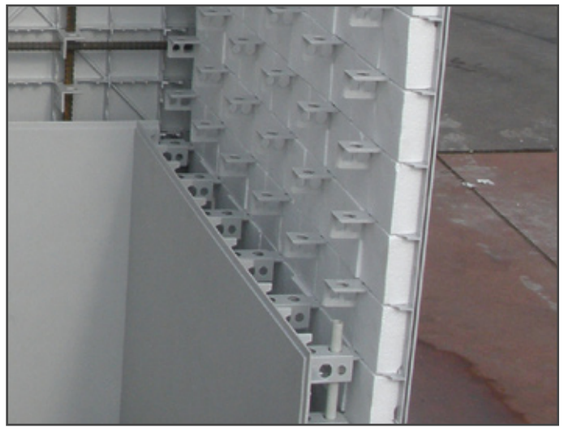
A thermal rating can be achieved if necessary by inserting a polystyrene insulation insert specifically designed for PanelForm *(Image 1.4)*. This is easily concealed inside the PanelForm wall. Higher thermal ratings are achieved by using a thicker insulation pad.

Fire Rating

A single PanelForm panel meets the UL94 flame class rating of HB (recognised under file number E73656). However if filled with concrete as recommended, the fire rating of the wall becomes that of the value of the concrete.

Food Contact

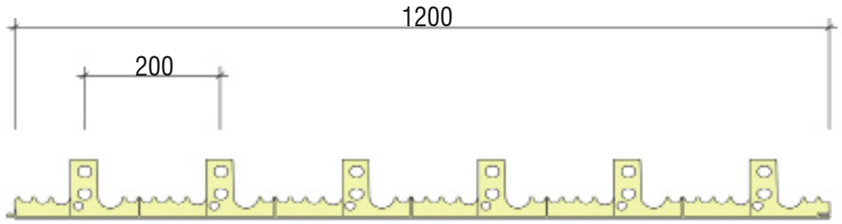
PanelForm conforms to Australian Standard AS 2070 – 1999 –"Plastics materials for food contact". For usage in water tanks, cool rooms, butchers shops, abattoirs, etc.

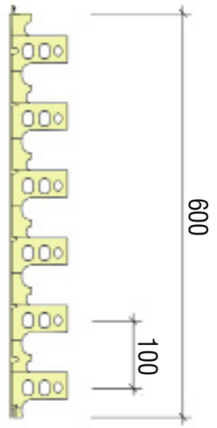


Polystyrene Insulation Insert Image 1.4

Finished Wall Cross Section Image 1.5

Panel Dimensions

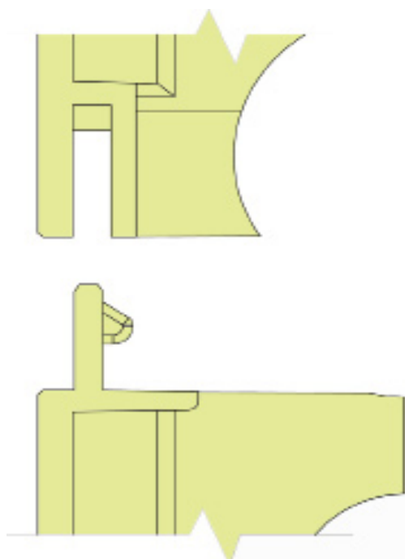




All dimensions are in millimeters (mm)

Tongue & Groove Joints

Panels are joint flush together with a tongue and groove snap lock system which allows for simple, secure and strong on site assembly. The tongue must be located at the top of the panel for construction. (Image 1.6)



Tongue & Groove Joint Image 2.1

Material Technical Information

Material: STYRON 450
For common grade technical technical information refer to page 7 (STYRON 450). Information is also available for download from:

-Dow Plastics - www.plastics.dow.com *or*
-PanelForm - www.panelform.com

Material Technical Information

POLYSTYRENE AUSTRALIA

TECHNICAL INFORMATION

STYRON 450

STYRON 450 is a very high flow, high impact polystyrene designed for injection moulding applications requiring excellent flow and a uniform surface gloss. e.g. large appliance parts, toys, etc.

Physical Properties

Mechanical Properties:	Value	Unit	Standard ASTM
Tensile Strength:	20 (14)	MPa	D638
Tensile Modulus:	n/a	MPa	D638
Ultimate Elongation:	55 (45)	%	D638
Flexural Strength ***:	36 (31)	MPa	D790
Flexural Modulus:	1.6 (1.4)	GPa	D790
Notched Izod Impact*:	71 (68)	J/m	D256
Thermal Properties:			
Vicat Softening Temperature:	94	°C	D1525-B
Heat Deflection Temperature:		°C	D648
Melt Flow Index (200/5):	12	g/10min	D1238
Glow Wire – Pass Temp.:**	550	°C	AS 2420
Other:			
Water Absorption:	0.03 - 0.05%		D570
Mould Shrinkage:	0.4 - 0.6 %		D955
Linear Expansion:($\cdot 10^{-5}$)	5 - 8	mm/mm/°C	D696
Specific Gravity:	1.05		D792
Hardness:	R		D785

Specimen Thickness: *12.7mm, **3.2mm, ***6.4mm
Note: Values in ( ) are compression moulded data

Processing Conditions

Material Preparation	Value	Unit
Drying Temperature:	60 - 80 *	°C
Drying Time:	2 *	h
Injection Moulding		
Melt Temperature:	200 - 220	°C
Mould Temperature:	5 - 60	°C
Barrel Temperature:	170/190/220	°C
Injection Speed:	Medium	
Screw Speed:	40 - 60	RPM
Back Pressure:	0.5 - 1.0	MPa
Clamp Pressure:	2.5 - 3.0	KN/cm^2
Extrusion		
Barrel Temperature:	n/a	°C
Melt Temperature:	n/a	°C
Chill-Roll Temperature:	n/a	°C
Die Temperature:	n/a	°C

Comment:
* Predrying is not necessary except in cases where a good surface finish is required using a highly pigmented grade.

- **Food Contact:**
  Conforms to Australian Standard AS 2070 -1999 - "Plastics materials for food contact use"
- **UL Recognition:**
  Recognized under the file number E 73656. It meets the UL94 Flame Class Rating of HB.

All test results were obtained using unpigmented, dried, moulded material.

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Website: http://www.psa.com.au

Quality Endorsed Company
AS 3902ISO 9002 Standards Australia

Delivery and Storage

Panels are packed by stacking 20 panels on a pallet 1250mm x 650 mm in size by 1300 mm high. They are then shrink wrapped for transporting. Each panel weighs 4.5 kg. The weight of the whole pallet totals approximately 100 kg. All panels should be used and painted within 6 months of delivery; otherwise they should be stored without exposure to the elements.

Building Design Assistance

Further application guides, building sections, details and CAD blocks are provided on the PanelForm web page. PanelForm product development is constantly on-going, as new information is made available, specifications will be provided on our web page; www.panelform.com

Wall Thicknesses

Standard PanelForm wall thicknesses are 122mm & 162mm. However thicker walls can be achieved by using steel trench mesh or manufactured spacers to obtain desired width. *(Refer to Construction Details & Image 3.2)*

Services

During the assembly process, all services (such as electrical, plumbing, mechanical, data and additional conduits) are placed and secured within the wall cavity before concrete or fill is poured.

Wet Areas

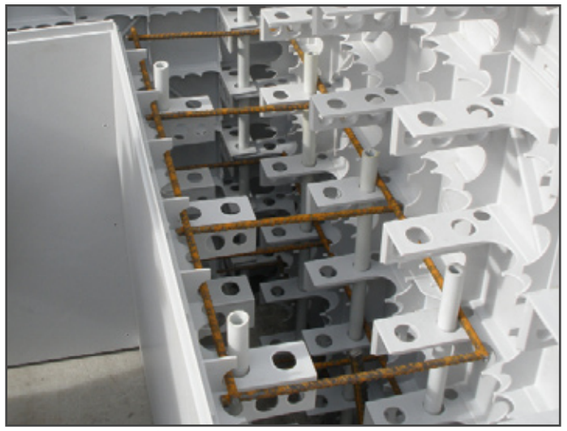
When designing for wet areas, PanelForm is water resistant and certified as a thermal water proofing membrane Part 1.2.2 of the BCA. However waterproof silicon must be applied between the 2mm panel joints.

Tiling and alike, may also be applied as a finish to PanelForm. Adhesives and alike can be used as per manufacturers requirements.

Ceilings & Surfaces

PanelForm panels have the ability to become the finished surface of a ceiling. When forming a concrete floor or roof slab, PanelForm panels are used as the permanent formwork and the smooth face of the panel becomes the finished surface ceiling.

PanelForm Delivery Image 3.1



Trench Mesh Used to Create a Wider Wall Image 3.2

Finished Wall and Ceiling Surfaces Image 3.3

Unflushed Walls & Ceilings Image 3.4

Flushed Walls & Ceilings Image 3.5

Finished & Painted Walls & Ceilings Image 3.6

Finishes

Normal cements, plasters or gap filler may be used (as per manufacturers recommendations) for finishing (painting and filling) internal or external surfaces where desired.

Internal Finishes

Internal joints may be finished with appropriate adhesives (gap filler or dry wall plastering products) may be used.

Preparation and painting is to be applied as recommended by the manufacturer of the products used. Latex paint may be used to achieve a required finish.

External Finishes

- 2mm joints exposed, and paint the skin with an exterior latex paint (following manufacturers directions).
- PanelForm may be flushed with Dulux Acra Patch Fine (or alike). To achieve this, a mixing procedure is to be followed as recommended by the product manufacturer. A normal sanding procedure is then to be applied before painting.
- Textures
  - Roller Textures
  - Sprayed Textures
  - Trowel Textures: *Dulux rendering products or similar, can be used. Preparation and application is to be carried out as per manufacturers details.*

Spray Rendered Wall Image 3.7

Thermal Rating Report

JAMES M FRICKER PTY LTD | Report i266a | PanelForm Pty Ltd

THERMAL INSULATION EVALUATION BY CALCULATION

R1.6 PANELFORM™ CONCRETE WALL WITH VH EPS

Calculation: 266.06

Evaluation for Winter, 12.0°C ambient air temperature, 18.0°C inside air temperature.

Wall Element	m².K/W	°C out	°C in	°C avg	Δt	Assumed Properties mm	Note
Outside air film:	0.040	**12.00**	12.15	12.08	0.15		1
4mm PanelForm™ skin:	0.020	12.15	12.23	12.19	0.08	4.0	3
44mm VH Grade expanded polystyrene:	1.302	12.23	17.18	14.71	4.95	44.0	3,4,5
108mm concrete wythe:	0.075	17.18	17.47	17.32	0.29	108.0	3
4mm PanelForm™ skin:	0.020	17.47	17.54	17.51	0.08	4.0	3
Indoor air film (unreflective surface):	0.120	17.54	**18.00**	17.77	0.46		2
R_{Ti} =	**1.58**	m².K/W			6.00	160.0	

Corresponding Total Conductance (k_{Ti}): 0.63 W/(m².K)

NOTES:

Calculated 16/9/08 9:58 Ref: 266_A.xls

Determinations based upon AS/NZS 4859.1:2002/Amdt 1, Materials for the thermal insulation of buildings

1 AS/NZS 4859.1:2002/Amdt 1, Clause K5(a)
2 AS/NZS 4859.1:2002/Amdt 1, Clause K5(b) EPS = expanded polystyrene
3 2007 AIRAH Technical Handbook pages 164-177
4 This PanelForm™ system comprises concrete cast between Panelform™ moulds, the outer mould containing VH Grade EPS.
5 Assumes k=0.0349 W/m.K for 23°C. R adjusted 0.39%/K in line with AS/NZS 4859.1:2002/Amdt 1, Clause K3.1
6 Indoor & outdoor air temperatures per AS/NZS 4859.1:2002/Amdt 1, Clause K3.1
7 Thermal short-circuiting by frames is not considered here as evaluation is for the insulation path only.
8 This report may not be reproduced except in full. Results may not be quoted without reference to the assumptions.
9 Calculated by James Fricker, M.AIRAH, M.IEAust, CPEng.

CONCLUSION:

For the above wall arrangement the WINTER Total R-value per AS4859.1:2002/Amdt 1, Clause K3.1 is:

R1.58 m².K/W for an air temperature difference of 18°-12° = 6K

Similarly, the SUMMER Total R-value per AS/NZS 4859.1:2002/Amdt 1, Clause K3.1 is:

R1.50 m².K/W for an air temperature difference of 36°-24° = 12K

Signed: James Fricker

The Institution of Engineers Australia

James M. Fricker
MIEAust CPEng
Chartered Professional Engineer
Membership No. 1179647

CSIRO Report

"CSIRO proposed an investigation… that would asses the performance of the PanelForm system for its intended purpose.

The PanelForm system is described as a permanent formwork system in that it provides the necessary structure to support wet concrete. Once the concrete has cured, the system permanently remains in place, integrated with the concrete and its reinforcement, to provide and exterior surface to receive the desired finish or may already contain an aesthetic finish included during manufacture.

The investigation and testing were designed to examine the following areas of the PanelForm system.

a. The load capacity of the webs retaining the vertical reinforcement;

b. The flow characteristics of the concrete inside the panel system;
c. The bond characteristics between the Flame Retardant HIPS webs and concrete;
d. Bracing system to support erected system;
e. Effects of using common concrete vibration methods;
f. Surface planeness
g. Compressive strength of specimens taken from the system; and
h. Flexural strength;

A comparative study was performed on concrete panels built with PanelForm and conventional formwork. All the specimens were concreted at the same time with 25 Grade ready mixed concrete. Because of the honey-combed structure of the PanelForm, "block-fill" type concrete was chosen with the slump of 90mm. Both PanelForm and conventional panels were poker-vibrated using a 25mm poker. All stages of concreting were performed by tradesmen.

Investigation revealed that the concept of PanelForm can be effectively used as a potential self-supporting formwork for concreting. It may be able to significantly reduce the cost of conventional formwork which requires external supports. It could give the user an advantage in time and cost.

Because of the honey-combed structure the PanelForm formwork, concrete with a higher slump similar to block-fill should be used and vibrated properly. The compressive strength of 125mm thick PanelForm concrete was found to be as good as conventional concrete.

PanelForm concept appears to be a simple, yet effective revolutionary formwork system."

"A Brief Report on Performance Assessment of PanelForm Formwork System, 5 October 2004"

CSIRO

CSIRO reference: NR2003/0049
Job number FU86BTS3320

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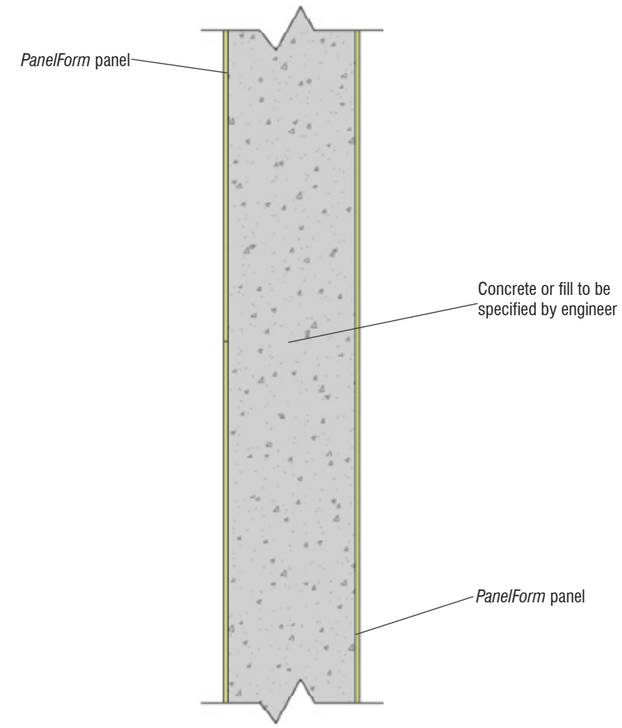
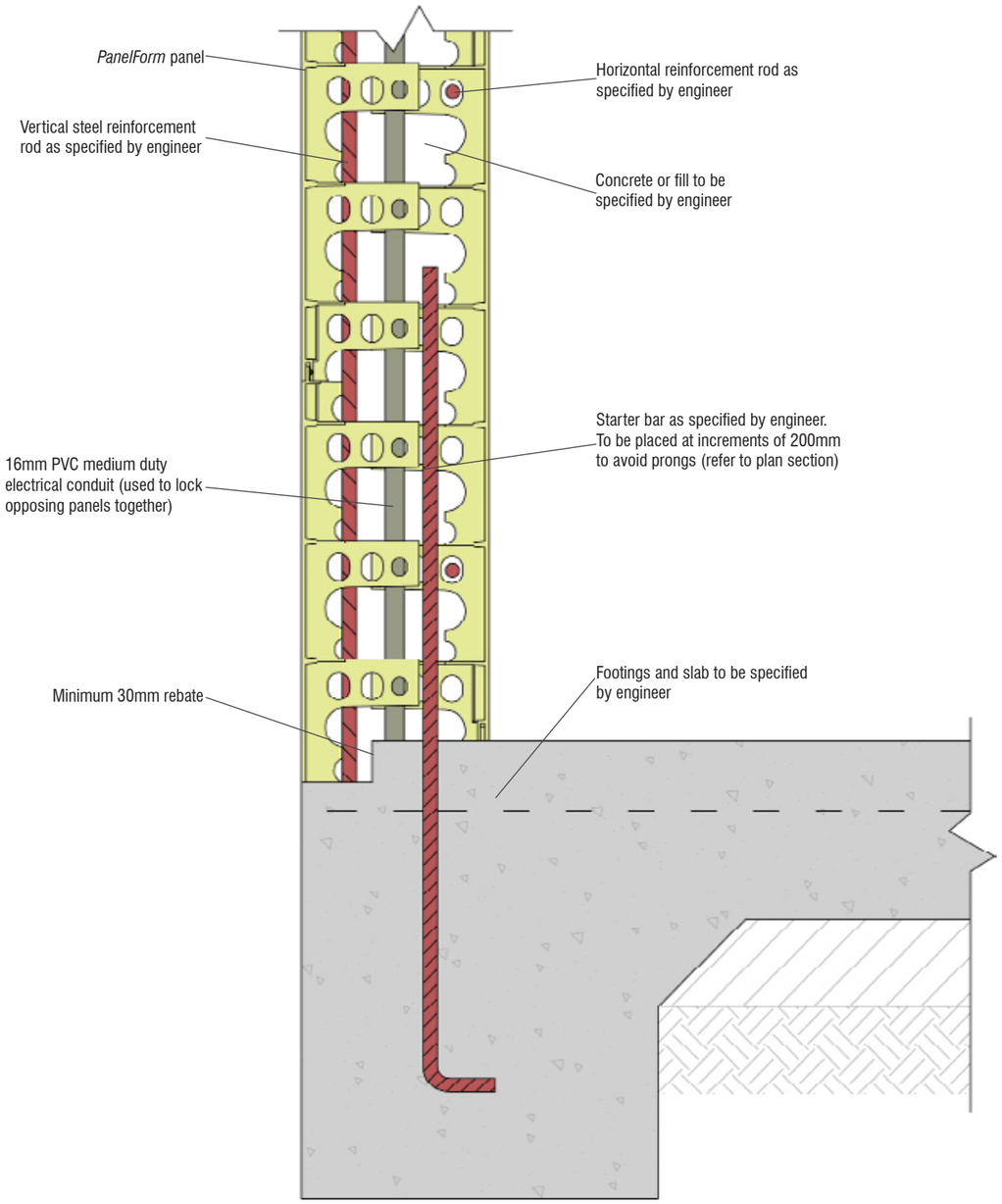
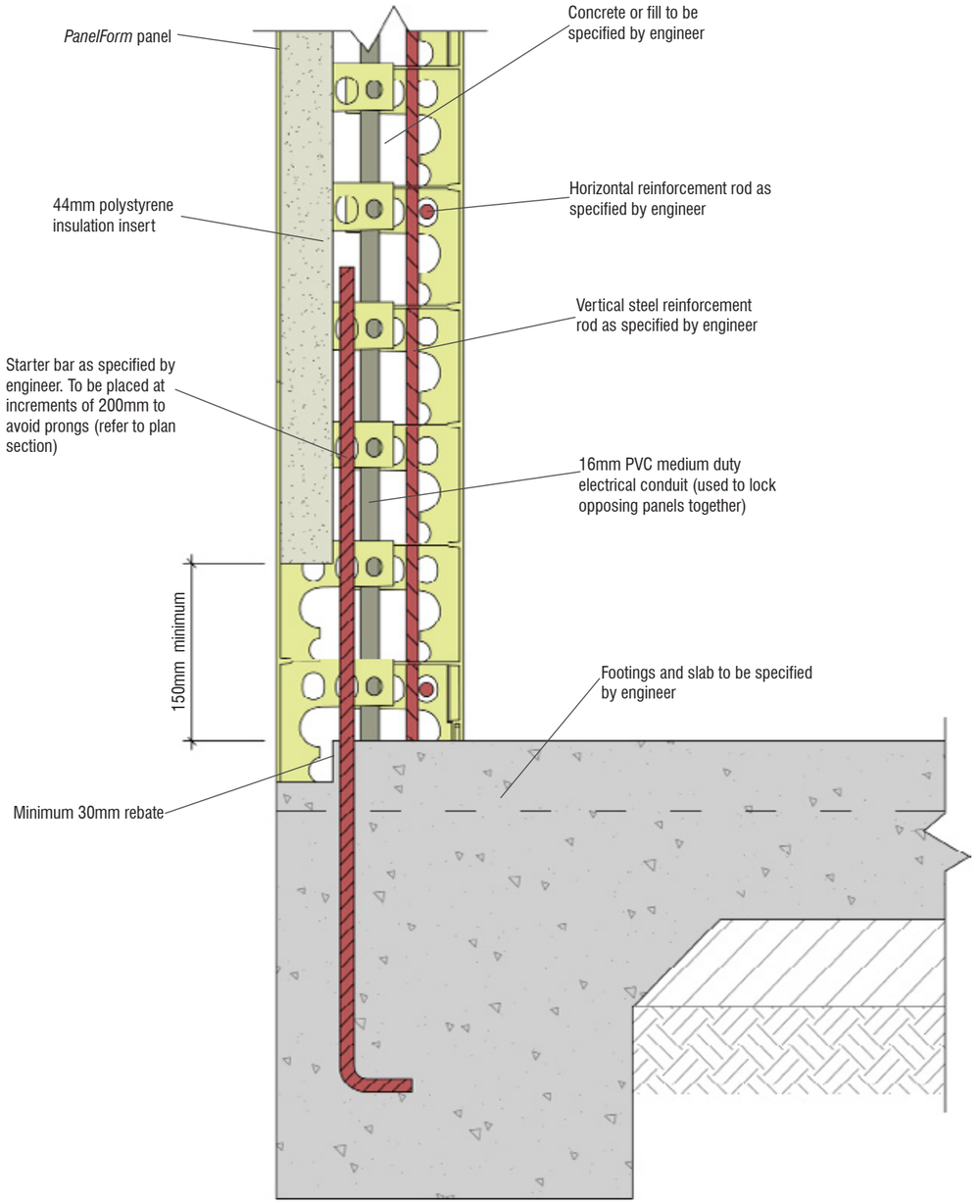
Typical Finished Wall
Cross Section



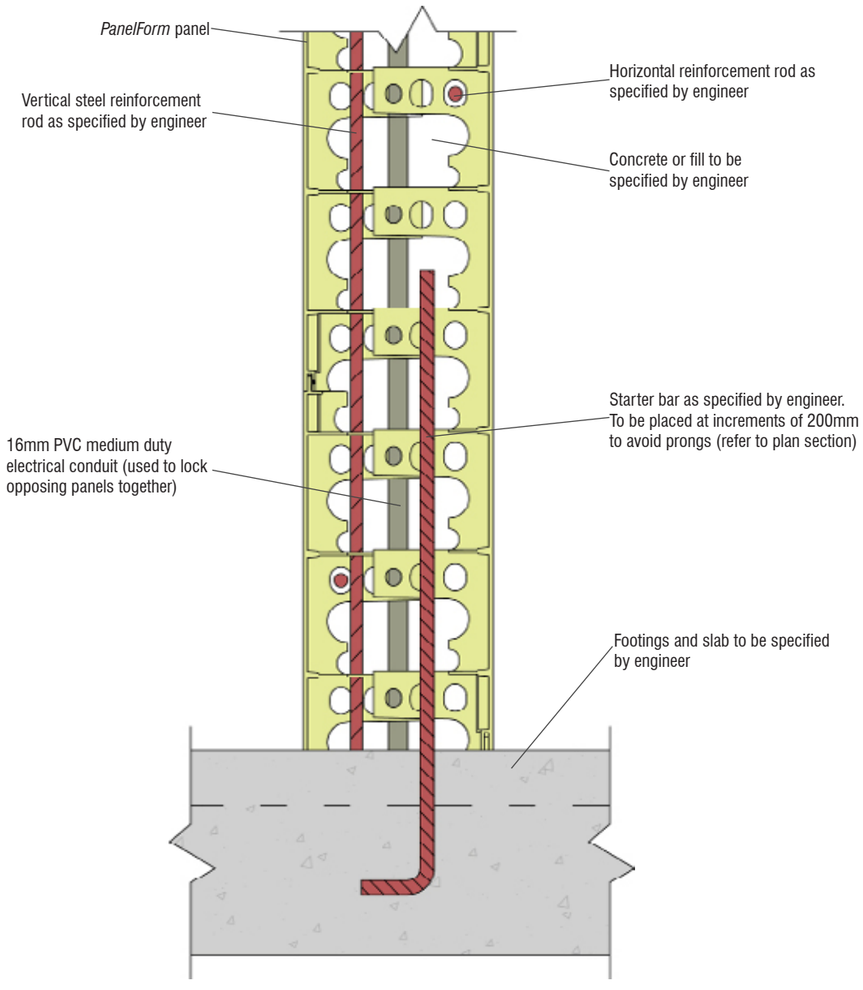
Wall Connection To Slab With Rebate
Elevation Section



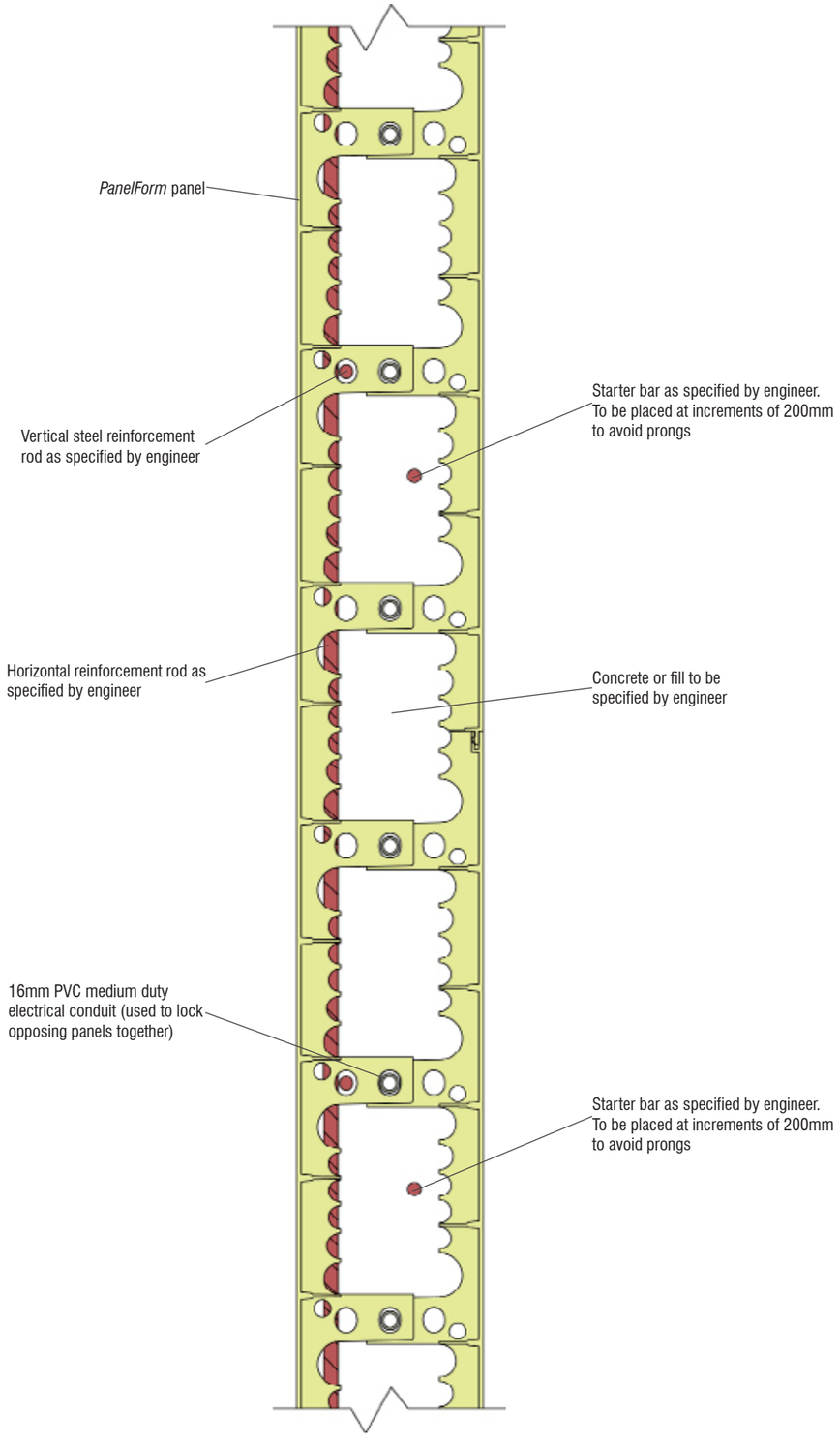
Insulated Connection To Slab With Rebate
Elevation Section



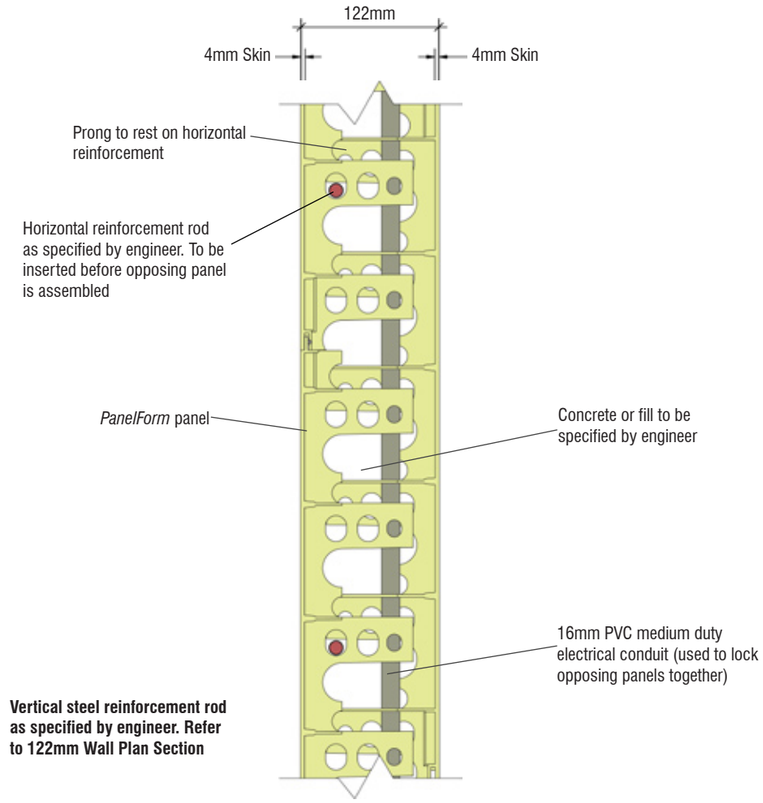
Wall Connection To Existing Slab
Elevation Section



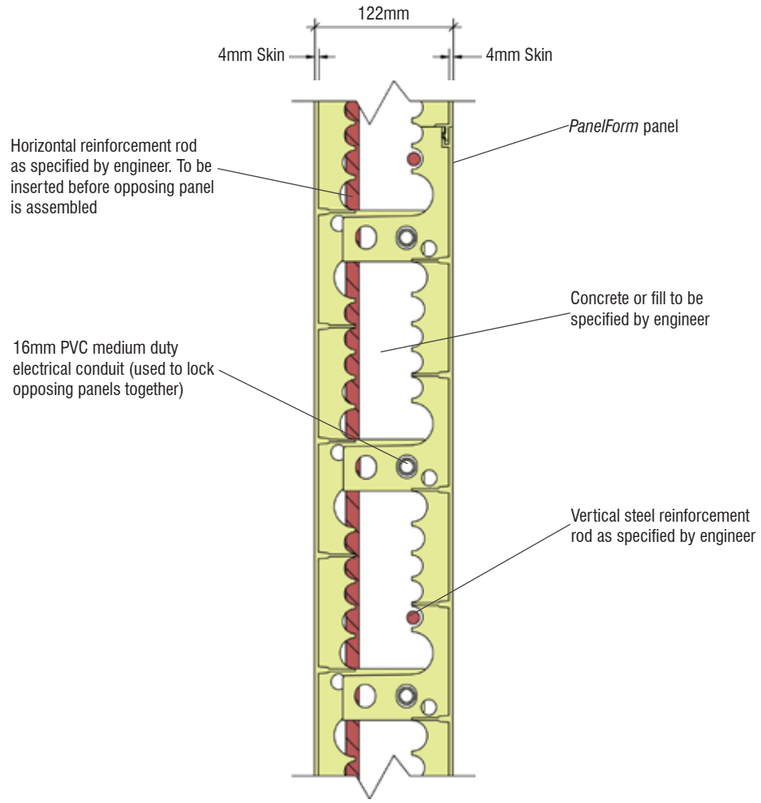
Wall Connection To Slab
Plan Section



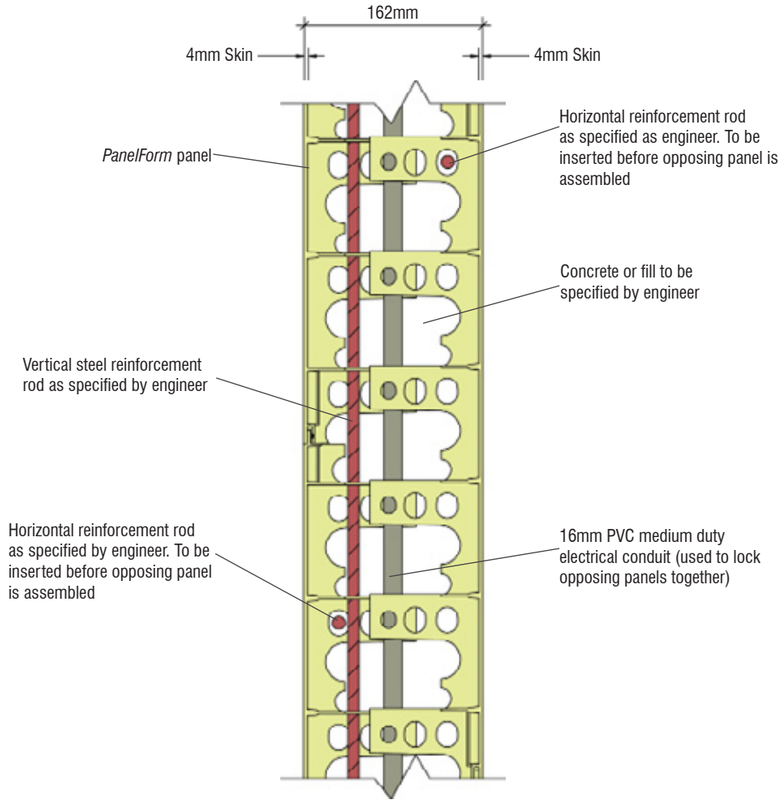
122mm Wall
Elevation Section



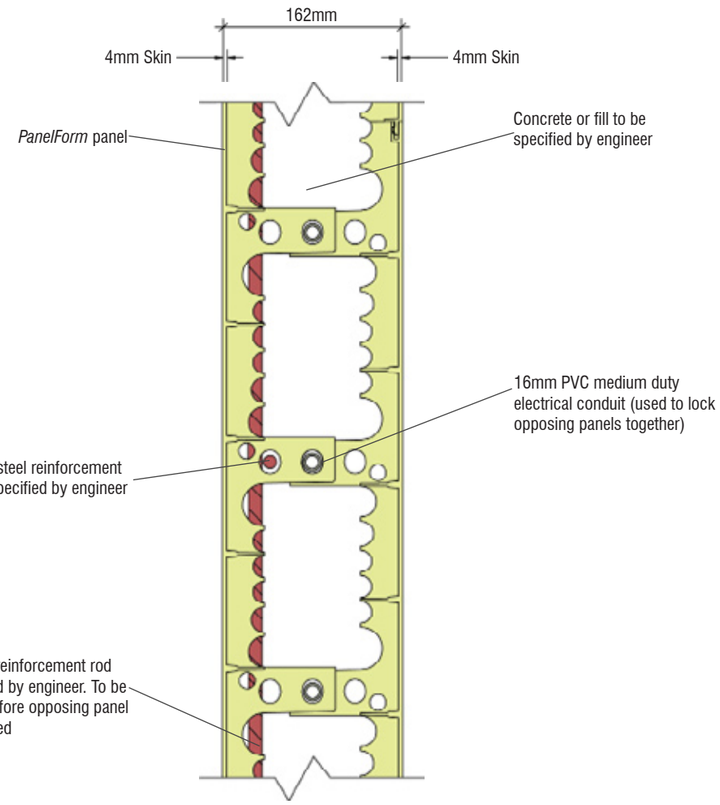
122mm Wall
Plan Section



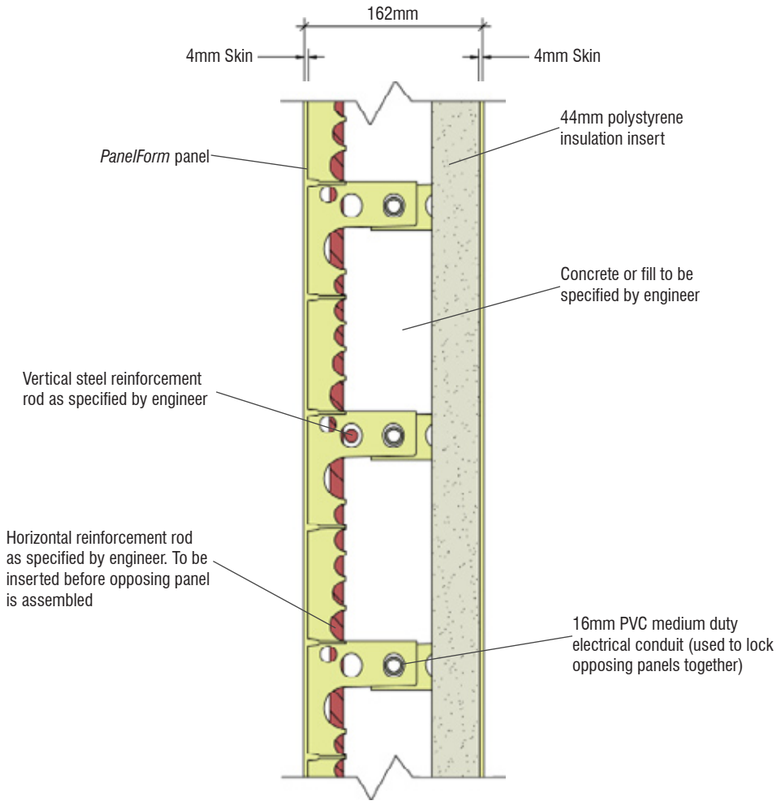
162mm Wall
Elevation Section



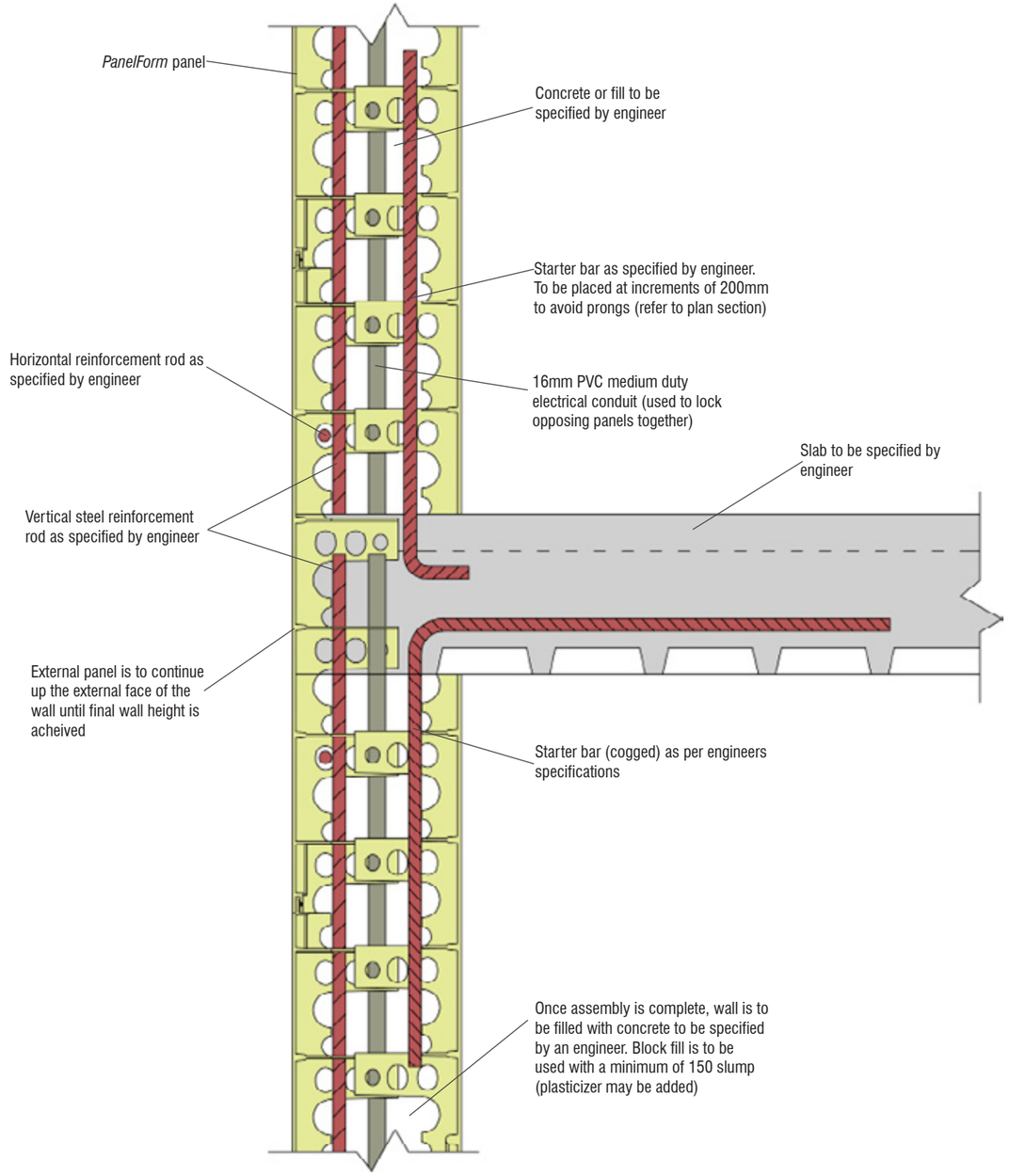
162mm Wall
Plan Section



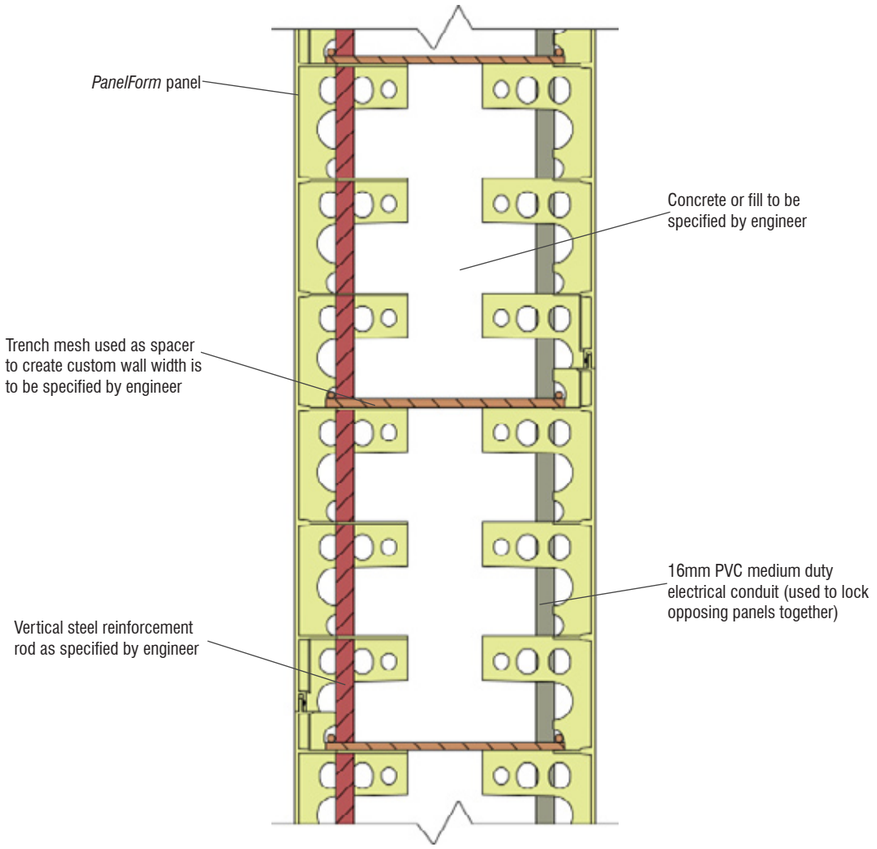
162mm Insulated Wall
Plan Section



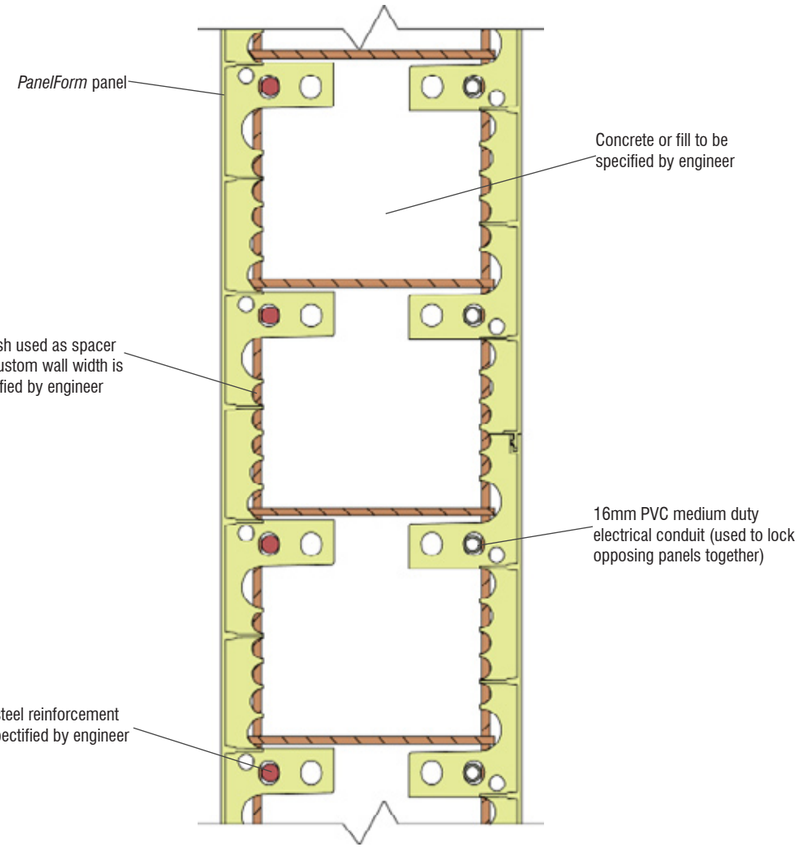
Slab To Wall Connection
Elevation Section



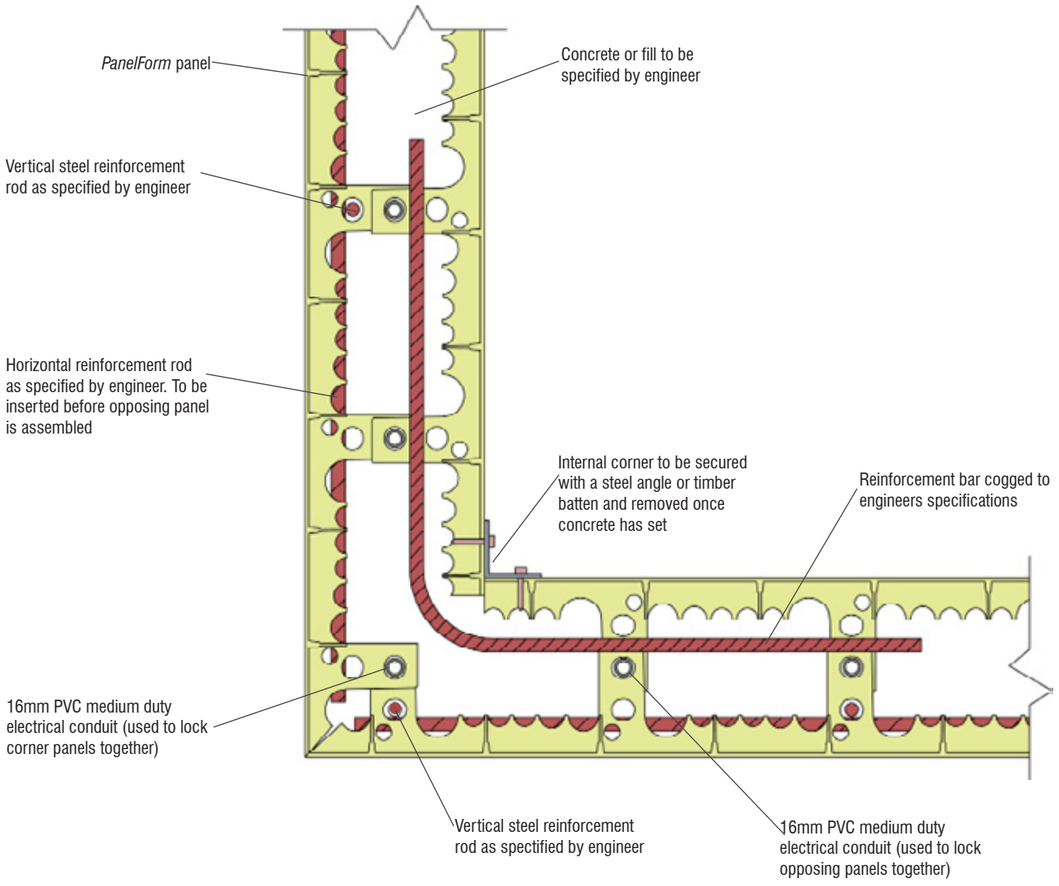
Custom Width Wall
Elevation Section



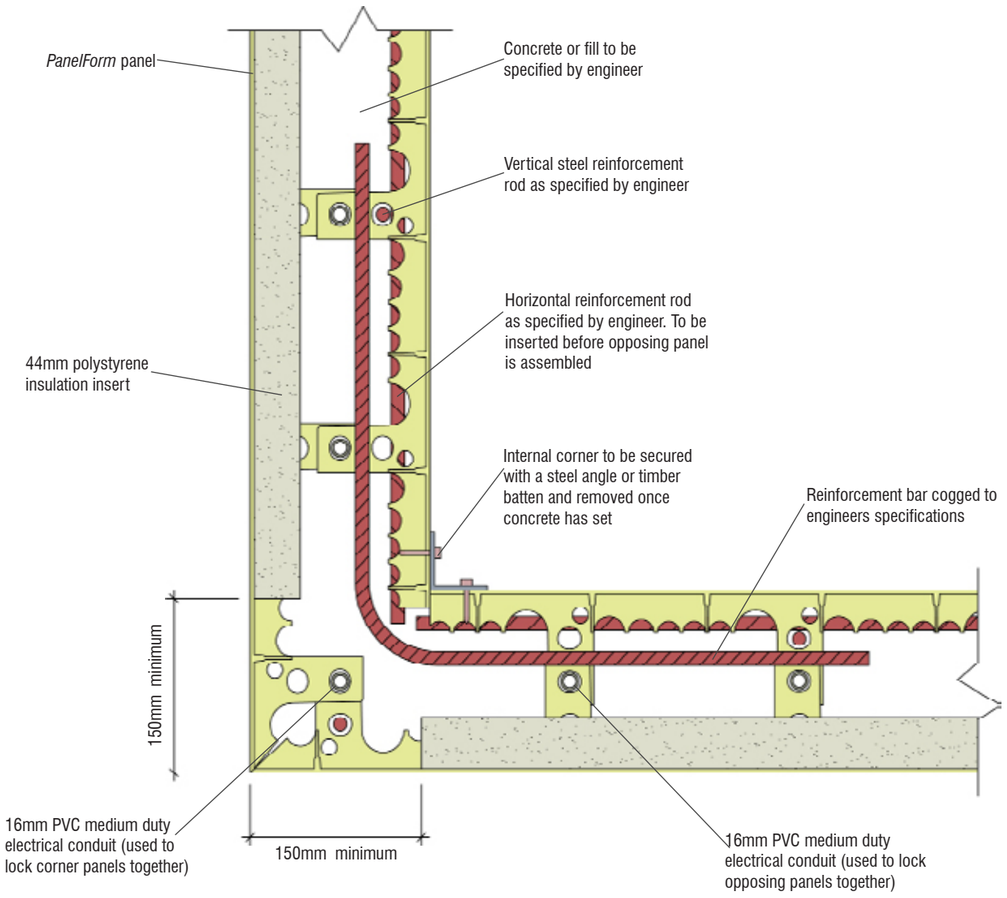
Custom Width Wall
Plan Section



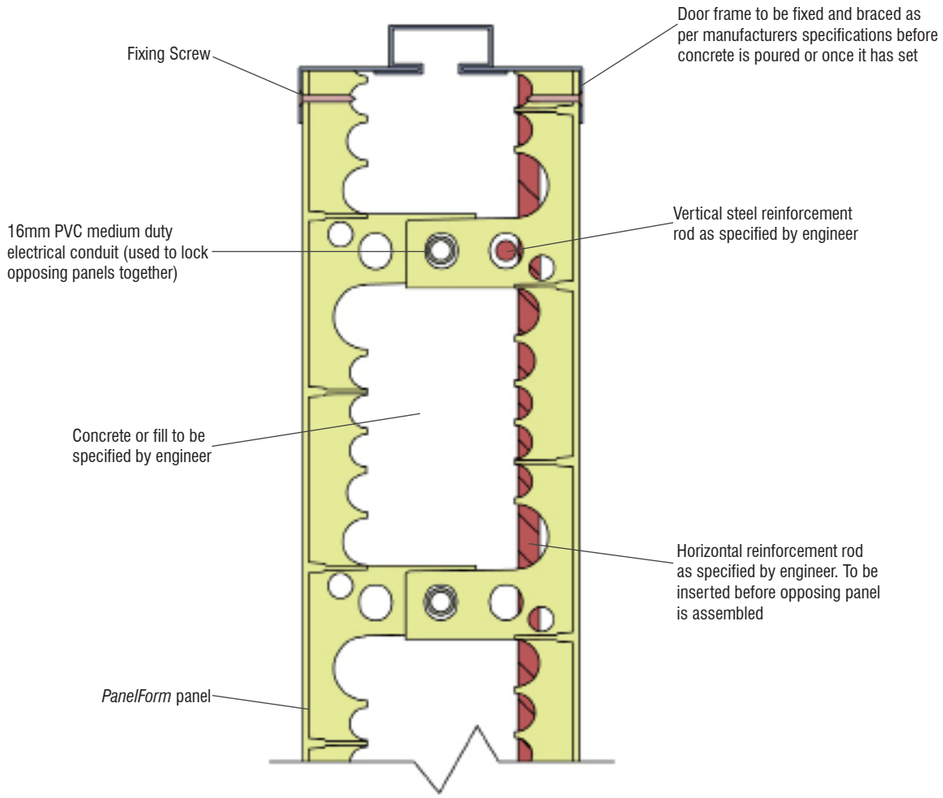
Corner
Plan Section



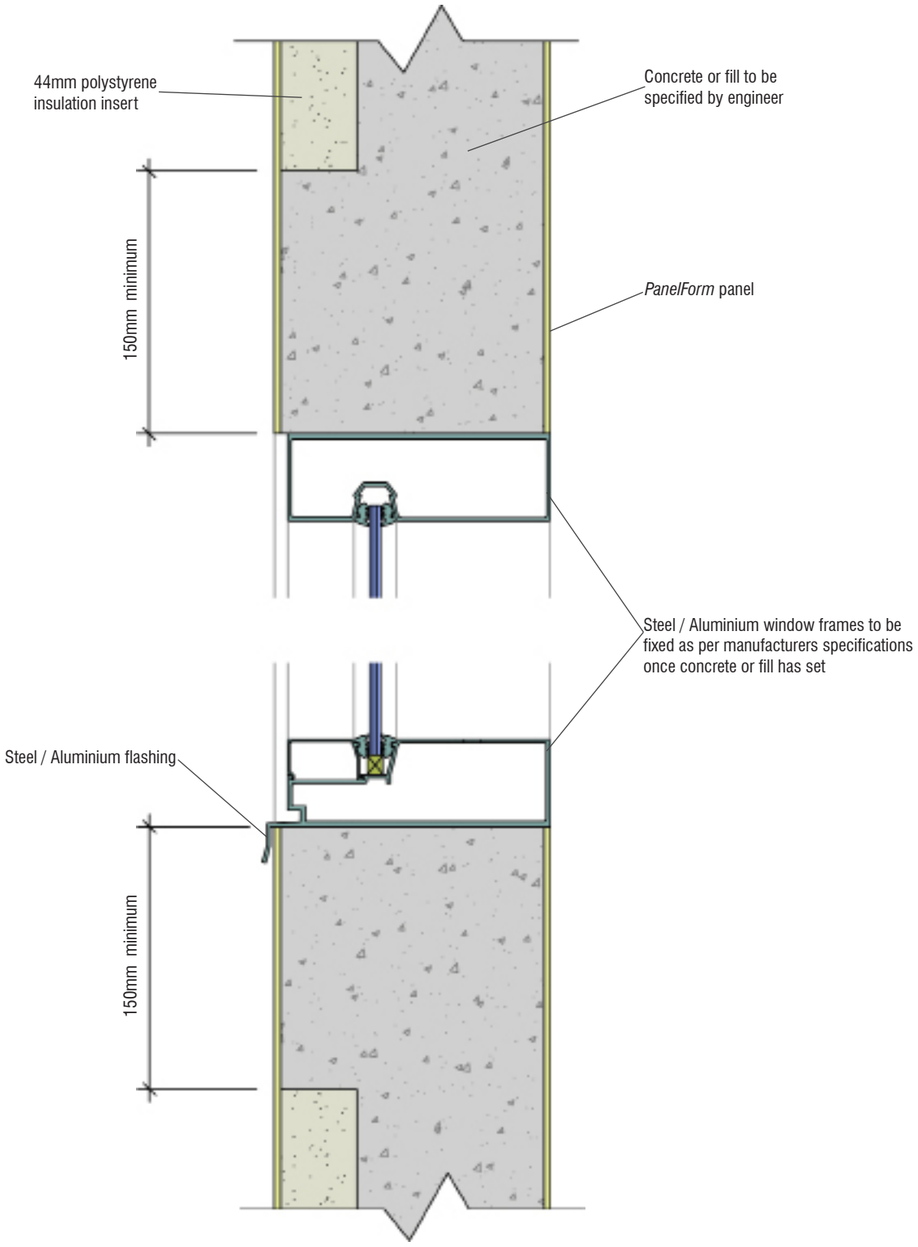
Insulated Corner
Plan Section



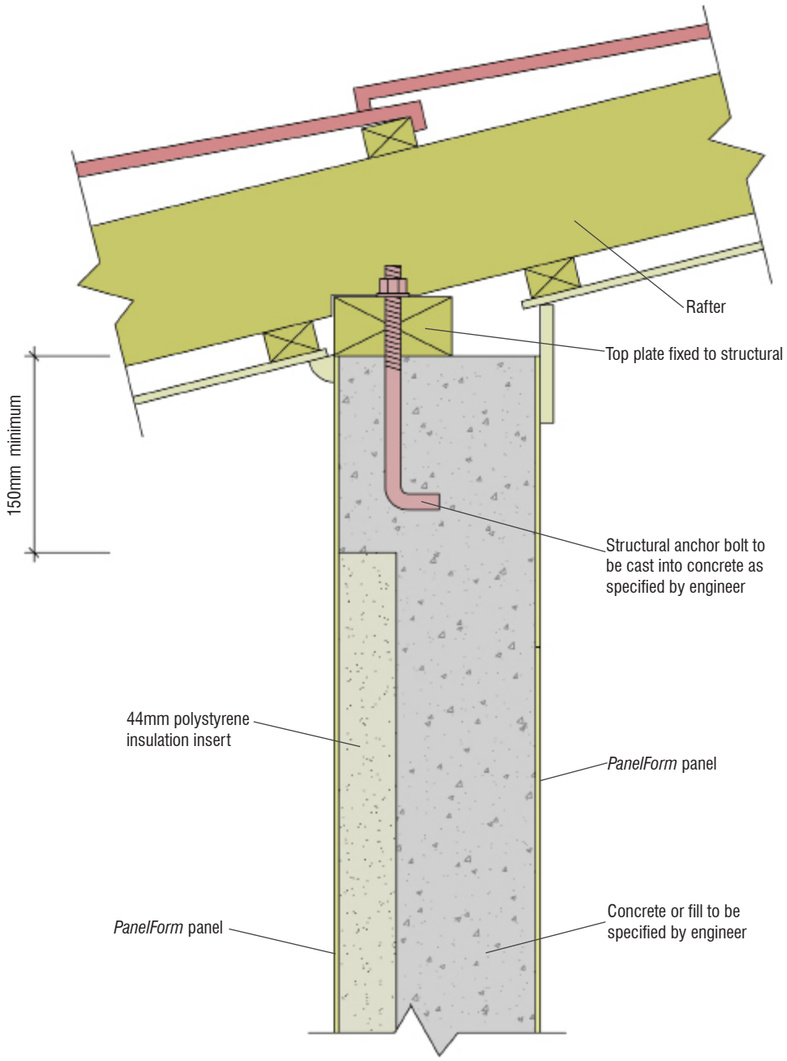
Typical Ezy-Jamb / Door Frame Connection
Plan Section



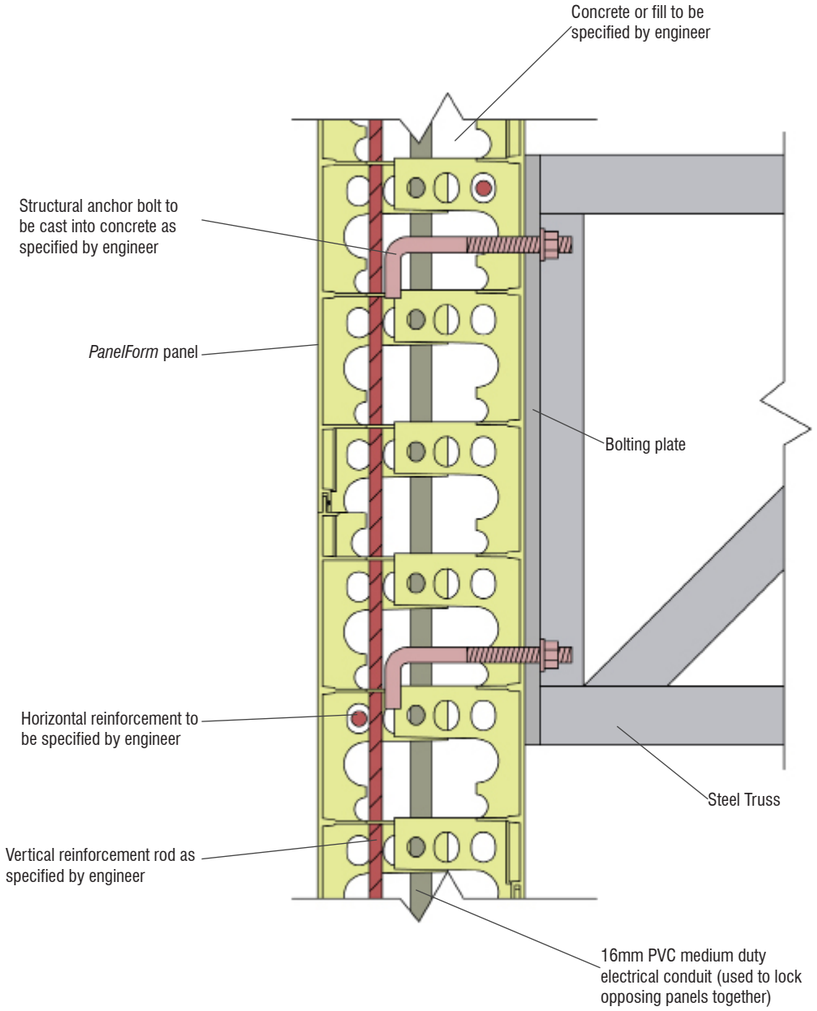
Typical Window Connection
Elevation Section



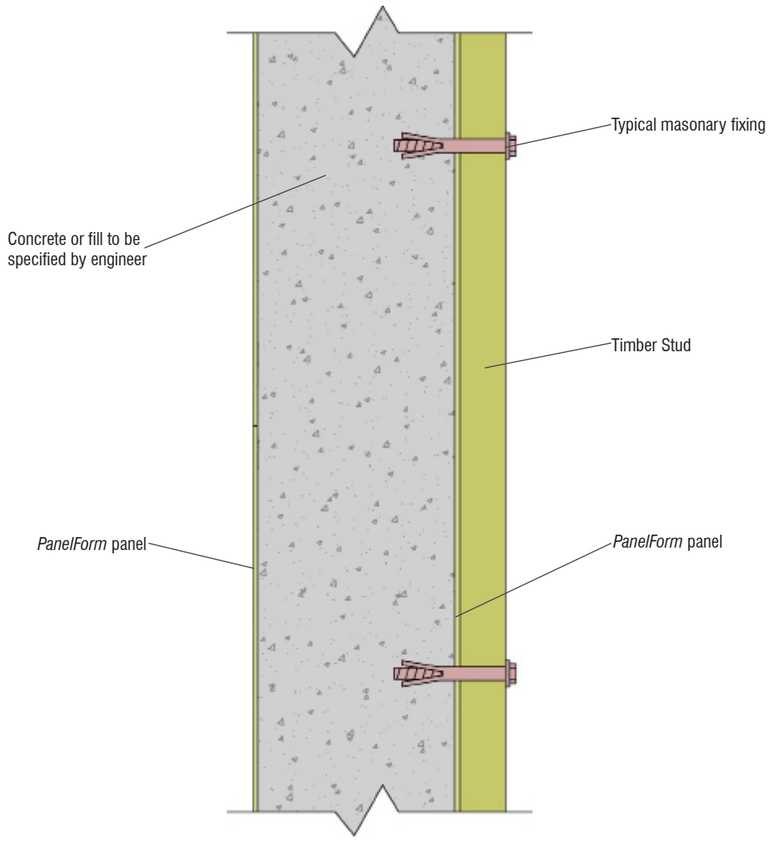
Typical Roof Connection
Elevation Section



Typical Truss Connection
Elevation Section



Typical Stud Connection
Elevation Section



Legal Notice

This Technical Manual is intended only to serve as general guidelines for use of PanelForm products and not as a complete treatment of how such products may or should be used. This publication is current only for its date of publication and any person in possession of a copy should check for updates.

PanelForm requires that a person considering to use a PanelForm product first obtain and give primary regard to professional engineering or architectural advice based on particular site conditions, the particular use to be made of the product within a structure, and check for compliance with applicable local laws and codes of practice.

Use of a PanelForm product using different materials or methods than those now recommended, or recommended by professional engineering or architectural advice, may result in product failure under critical conditions.

Any known health risks of our products and how to handle them safely are stated on packaging and/or the documentation accompanying them.

Law requires contractors perform their own risk assessments before undertaking work.

PanelForm AU Pty Ltd is a supplier only; PanelForm AU Pty Ltd does not employ people qualified as accredited or principal certifiers. PanelForm is therefore unable to provide Construction Compliance Certificates or Statements of Compliance.

To acquire skills to become an accredited PanelForm installer, contact PanelForm AU Pty Ltd.

To check for latest developments of the PanelForm system, please access the website at www.panelform.com.

PanelForm

About PanelForm

PanelForm is a simple modular permanent formwork system used to create solid structures. The 1200x600mm high impact polystyrene panels easily clip together and are then held in place through the insertion of reinforcement bars or plastic conduits into guide holes within the cavity. Once the system is locked together, concrete is poured into the cavity, vibrated and allowed to set which then completes the process. PanelForm becomes the permanent face of the structure which is water and termite proof. PanelForm is a strong and revolutionary permanent formwork system which has the ability to reduce costs and construction time in today's highly competitive DIY and building industries.

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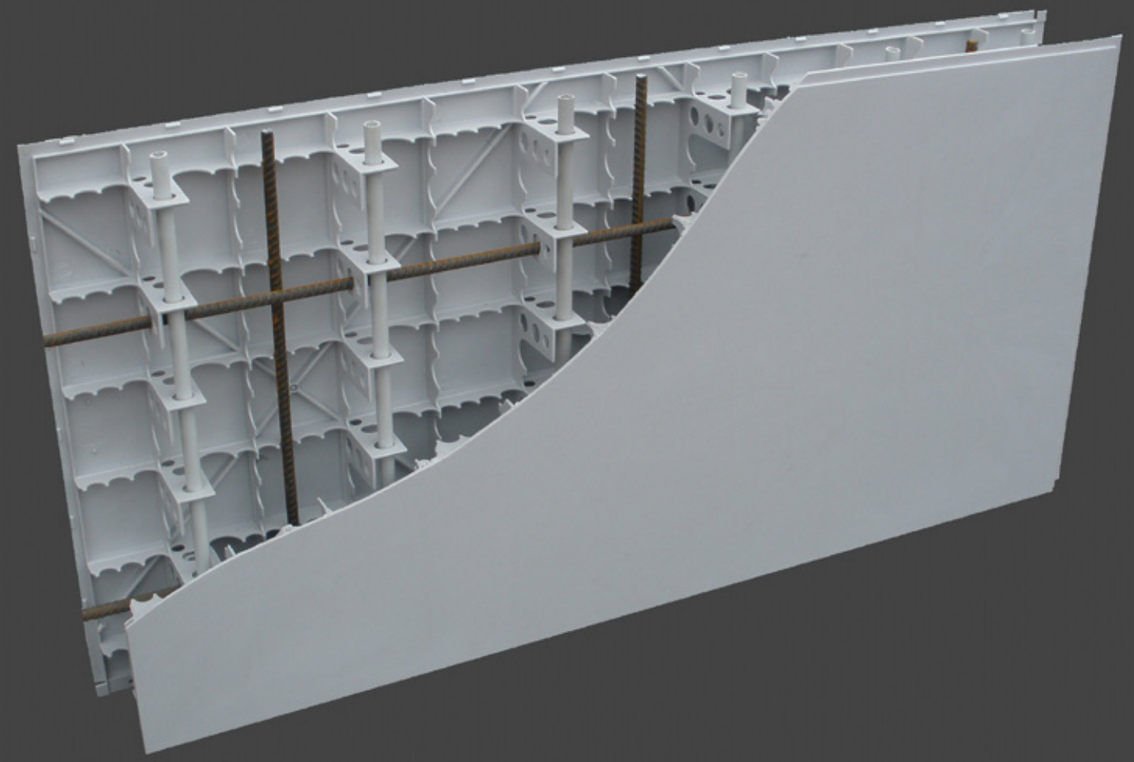

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