THE USE OF PRECAST CONCRETE FLOORS WITH THE POROTHERM BUILDING SYSTEM

JULY 2015

Wienerberger

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CONTENTS

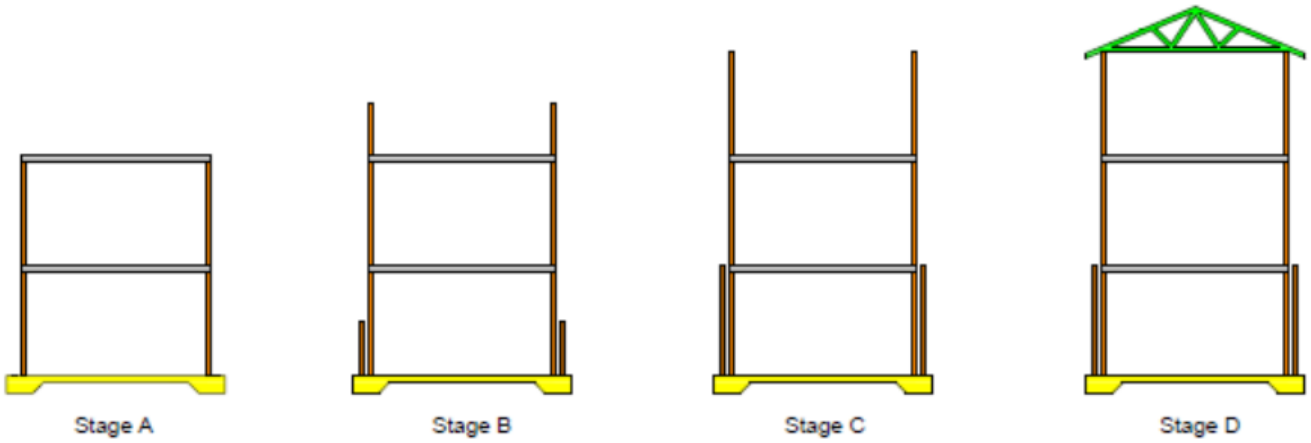
1. Executive Summary

The Porotherm System is suitable for the use with precast concrete floor planks. This document sets out some of the key considerations for the efficient and safe use of the Porotherm System in the construction of low rise masonry projects when utilising pre-cast concrete floor planks. Guidance is provided for consideration during the erection of precast floors.

2. Background and Introduction

The Porotherm System has been used in Europe for more than 30 years and represents 85% of block sales. The Porotherm System has been available in the UK since 2008.

The strength of the Porotherm System makes it suitable for the construction of masonry structures with wide span pre-cast concrete floors. With due care and consideration Porotherm construction can be progressed up to two stories ahead of the external skin of cavity walls. The pre-requisite requirement is that the structure is stable in this condition. This is usually achieved by utilising the internal structure as either load bearing masonry and/or to provide lateral stability. Specific design checks are required to assess this temporary condition.



Stage A to D outlined above indicates programme principles to ensure Porotherm is never more than two lifts in advance of the brick outer leaf.

Introduced in to the UK industry in 2008 the Porotherm System is not as embedded in the UK Industry's Codes of Practices and guidance documents as concrete blocks. Hence Wienerberger commissioned Lucideon to develop a Technical Report and Design Guidance for Porotherm to complement the existing Codes of Practice.

For example:
The Precast Flooring Federation notes that where the inner skin is of 140mm thin joint masonry then construction and placement of pre-cast floors may proceed up to two storeys ahead of external skin subject to certain parameters, and further recognises 100mm thick thin joint masonry systems and refers to their use within their Code of Practice – Clause 4.6.

> *"4.6 Installation of precast concrete floors onto masonry*
> *The following good practice applies to all types of masonry used in the construction of cavity walls:*
> *100 mm thick thin-joint masonry systems are available. However, their use is subject to strict stability checks by the Engineer with input from the block manufacturer.*
> *Barring of precast floor elements should not be permitted with 100 mm thick thin-joint masonry systems."*

This document provides guidance and the appropriate "input from the block manufacturer".

3. Design of Porotherm Masonry

For low rise residential buildings Porotherm Masonry (100, 140 & 190 blocks) can be considered for use with The Building Regulations 2010 Approved Document A as;

- The blocks conform to clauses 2C20 which states “a. clay brick or blocks to BS EN 771-1”
- The compressive strengths of the masonry units conform to 2C21, which intern refers to Diagram 9 and tables 6 & 7. These references determine the required block strength at different locations in the building.

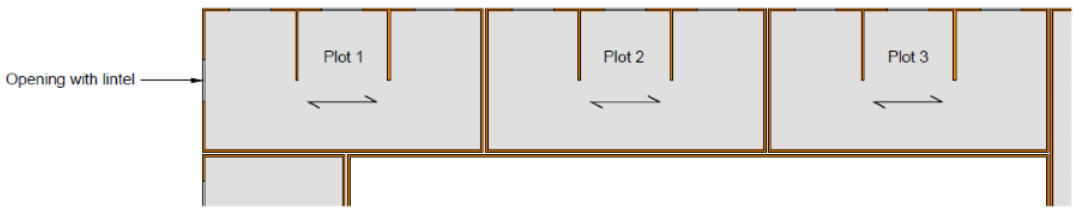
Approved Document A allows the selection of masonry units (size and strength) depending on the location in the building provided specified criteria are satisfied.

In general terms Porotherm masonry is categorised as ‘Group 2’ with in table 6 & 7 of Approved Document A and is deemed to be suitable for ‘Conditions A & B’ in 3 storey residential construction. Experience shows that in many cases Porotherm is also suitable for the ground floor inner skin of the cavity walls to 3 storey buildings, but as this is outside the scope of Approved Document A ‘Condition C’ formal design checks for use in this location are required.

Beyond the scope of Approved Document A Porotherm masonry can be conventionally designed using the masonry codes Eurocode 6 (BS EN 1996-2:2006) and its National Annex.

Parameters for the use Porotherm masonry have been determined by Lucideon and are included in their publication “Technical Report for the Design guidance for the Use of Porotherm Blocks in the UK – Special Publication 148 (2015)”

Appendix A summarises the principal parameters for engineering design with Porotherm.



The Contractor/Developer should note that where PC planks bear over lintels the requisite time for curing of mortar is allowed when agreeing floor placement programme with the Pre-cast Floor supplier. The diagram above demonstrates this condition.

There are occasions where the PC installer will request the top course of some or all internal non load bearing walls to be left down until after installation, any such requirements should be clarified prior to site commencement.

Wind Posts

Note: Wind posts are only fully functional once fully installed and fixed at head and foot, and should not be considered as providing lateral restraint in the temporary condition.

4. Preliminary Planning

Consideration of the construction process should commence when preliminary planning drawings are available, the focus should be on establishing the principles of design and the mitigation of risk.

Investment of time in planning, and communication between the Developer/Contractor, the appointed design team and preferred pre cast concrete floor plank supplier is essential.

The primary considerations being;

- Does the wall and precast floor arrangements complement each other to allow wall thicknesses to be minimized?
- Can the erection of the precast floor and the continued construction of the internal skin of Porotherm masonry precede the external skin?
- Does the wall layout provide a stable structure in the temporary condition?
- What additional measures which can to be taken to minimize temporary works? Consider converting some non-structural partition walls to provide lateral stability to omit the need for temporary propping?

The level of information provided by pre-planning drawings is usually adequate for this process to commence.

Effect of wall width on design Parameters
Preliminary design calculations will usually determine the thickness of principle walls which will then determine the extent of lateral support required.

Inner leaf is 190mm
It is likely little additional restraint will be required to restrained walls, but attention should still be given to slender piers and openings.

Inner leaf 140mm
Intermediate lateral restraints would typically be considered where unrestrained lengths significantly exceed 6m, again attention should still be given to slender piers and openings.

Inner leaf 100mm
Unrestrained lengths should typically not exceed 4m (subject to Structural Engineers advice), good practice is to utilise party wall to party wall spanning wherever practicable, and again frequency and dimensions of small piers/large openings should further be recognised.

Internal Walls to support abutting Pre-cast planks
190mm Porotherm may be considered for walls where pre-cast planks abut - providing appropriate bearing.

Steelwork
Where steelwork occurs it should be appropriately restrained in accordance with the guidance set out in the PFF Code of Practice.

Temporary Support
Where there are no convenient partition walls which can be utilised, or additional bracing to smaller piers is necessary then temporary support can be considered for these areas both during construction of the wall, and provide stability during placement of Precast flooring units. Appendix B provides a designed temporary support which can be utilised in many situations, together with advice in respect of frequency of temporary supports.

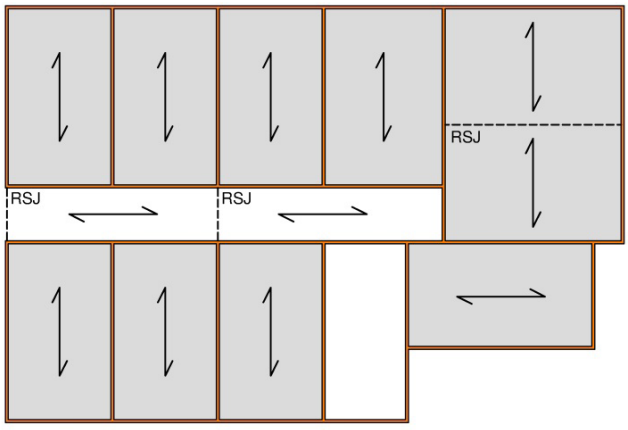
NB. Where temporary supports are utilised Pre-cast floors must be fully installed and grouted before temporary supports are removed.

4.1 Typical Footprints

Whilst every project is unique in its design the following indicate some of the key principles which can be considered are set out below.

Experience demonstrates the benefit of incorporating buttress walls to create stability and therefore minimizing temporary works and requirements for wind posts.

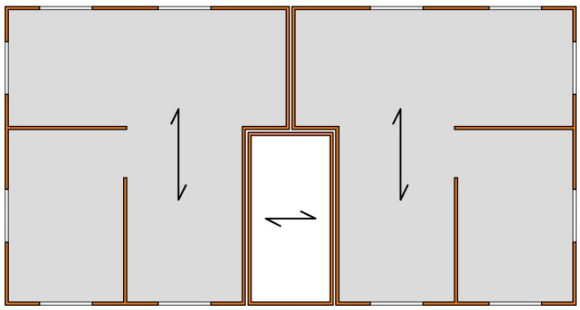
Care Home



Extract from Care Home footprint with numerous bedrooms circa 6m x 3.5m creating a cellular like structure.

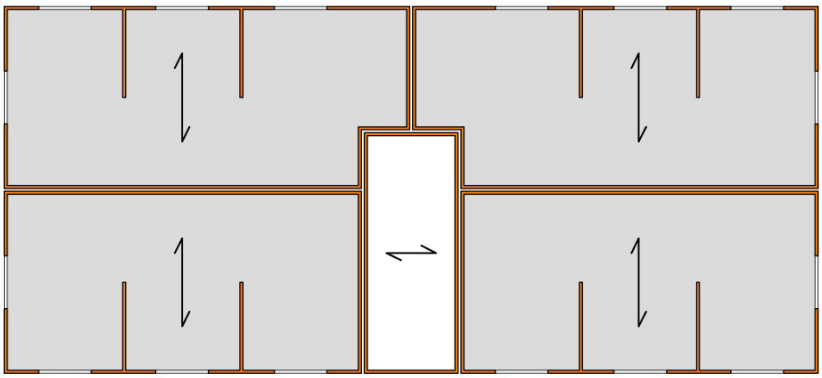
Large spans over communal spaces potentially split by steelwork will require further consideration.

Apartments – 2 per Floor



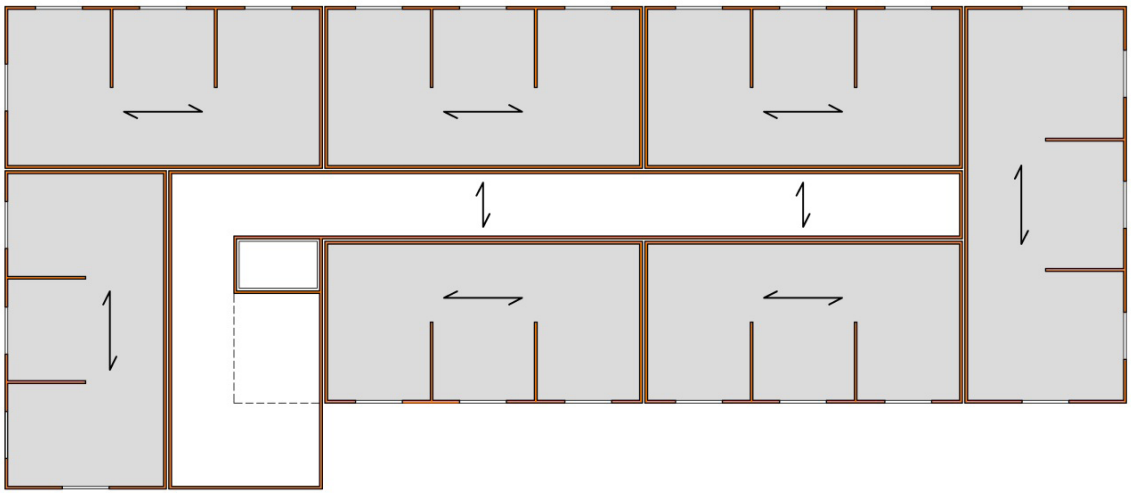
Porotherm partitions provide lateral support to the front and gable walls, the long rear wall to the open plan living area may require temporary propping, sacrificial buttress walls or other considerations.

Apartments – 4 per Floor



The party walls create a backbone stability with the walls to the central room in each apartment providing lateral stability to the inner skin, and in particular the piers between openings.

Apartments – Large footprint (extract)



The party wall structure within the footprint provides basic stability when combined with lift shafts and stair cores. By providing masonry partitions within each apartment lateral stability to the external wall is improved and also minimises or removes the requirement for wind-posts.

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4.2. Lateral Stability

For load bearing masonry buildings the building's lateral stability to resist wind loads on the building's roof and walls is provided by the roof bracing and floor plates transferring lateral loads to the bracing walls. Where larger rooms or slender masonry elements are required wind posts may be necessary.

In the construction stage the roof bracing and floor plates may not have been placed or completed and therefore interim stability must be considered to reflect the construction stages.

One of the constraints in the placing of pre-cast concrete planks is the ability of a wall to accept an imposed load without compressive failure or failure through buckling

Engineering guidance indicates resistance to this can be provided in a number of ways
Vertical lateral restraint - provided by intermediate walls and returns. (typically not an issue for a load bearing wall design)

Photograph showing internal masonry walls providing bracing and support to piers between large window openings.

In this instance these walls do not act as full load bearing structures, but only as lateral restraints. Pre-cast planks generally spanning from party wall to party wall.

4.3. Coursing

Coursing should be designed so that top bearing course is constructed with full height blocks, as noted in Section 4.6 of the Pre Cast Flooring Federation Code of Practice.

If there is no alternative to using a cut block, the minimum height of that block should be 190mm.
For added stability on the top course it is advised that adhesive should be applied to the vertical joint on all blocks which abut at corners and returns. Prior to placement of precast concrete floors the age and strength of any levelling course or traditional mortar used at lintel bearings should be considered. For this reason levelling courses should be at the base of the walls only.

4.4. External Skin

Whilst the Porotherm Walling System provides the opportunity to remove the external skin from the critical path it does not mean that the external skin cannot be constructed, and it is better considered as removing the need to back up the inner skin every 1500mm, hence providing more flexibility.

5. Erection of Precast Concrete Floor Planks

Industry guidance is provided by the Precast Flooring Federation in their published document titled " Precast flooring Federation Code of Practice for: THE SAFE INSTALLATION OF PRECAST CONCRETE FLOORING AND ASSOCIATED COMPONENTS" (PFF Code of Practice).

While the PFF Code of Practice should be considered in full section 4.6 specifically relates to the installation of precast concrete onto masonry. For ease of reference a partial extract is included below.

4.6 Installation of precast concrete floors onto masonry

The following good practice applies to all types of masonry used in construction of cavity walls:

- In all installations where traditional mortar is used and where the inner leaf of the cavity is less than 190 mm thick, it is recommended that the outer leaf is constructed to within 225 mm of the bearing height of the inner leaf. This is so that maximum stability can be achieved during the construction phase (Figure 4.1).

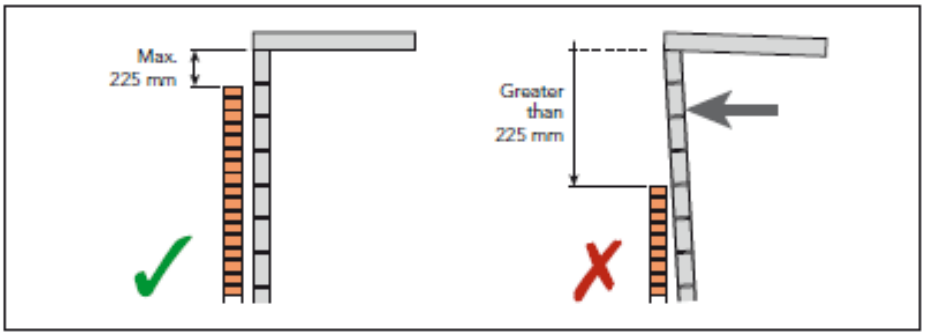


Figure 4.1 Relative height of inner and outer masonry leaves

- The guidance notes covered in Figures 4.2 to 4.5 regarding lintels and steelwork should also be observed.
- Where the inner leaf is constructed from a minimum 140 mm thick, thin-joint masonry systems: *Thin-joint masonry includes Aircrete and Porotherm systems
- The strength of the blockwork and the overall temporary stability must be checked by the Engineer who is responsible for the overall project.
- A maximum of 2 storeys is constructed at any one time before the outer leaf is installed, with a maximum of 4 storeys overall.
- The height of the blockwork is no greater than 2.7 m for each storey.
- Generally, unrestrained walls should be limited to a maximum length of 6 m.
- Consideration should be given and approval sought from the Engineer to confirm that due consideration has been given to the more onerous forces during the construction phase whilst positioning heavy precast components.
- The top bearing course should be constructed with full blocks and not cut or coursing blocks unless the flooring system is specified using coursing blocks as part of the system. Guidance should be sought from the supplier of the masonry on the availability of and use of coursing blocks.
- Inner non-loadbearing walls should be left at least one course down to assist with the positioning of the flooring system in the construction phase.
- With all mortars and thin joint adhesives/proprietary mortars, sufficient curing time as per manufacturing instructions must be allowed so that the supporting structure achieves sufficient strength. Care should be taken, especially in inclement weather conditions, in the use of retarded and lime mortar. Reference should be made to the manufacturer's data sheet on the mortar product.

- Pressed steel lintels must be installed in accordance with the lintel manufacturer's recommendations. They should be bedded onto a full block and the blockwork should be set out to avoid vertical joints lining up in adjacent courses (Figure 4.2).
- 100 mm thick thin-joint masonry systems are available. However, their use is subject to strict stability checks by the Engineer with input from the block manufacturer.
- Barring of precast floor elements should not be permitted with 100 mm thick thin-joint masonry systems.

For typical construction, from the PFF Code of Practice the following conclusions are drawn:140 thick Porotherm walls are considered to be adequate and the outer skin can be up to 2 storeys behind the inner skin.

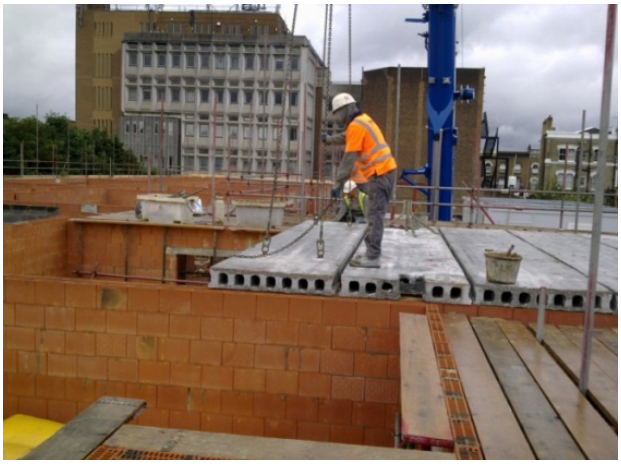
The height of 140 Porotherm blockwork can be up to 2.7m and the length of wall be up to 6m.
100 thick Porotherm walls require the outer skin of the wall to be constructed within 225 of the inner wall to support the precast walls unless the project has been specifically designed to provide the appropriate stability in the temporary condition.

Notwithstanding the comments above all projects should be reviewed by suitably qualified person for the installation of the precast floor to reflect the current construction stage.

5.1. Placement of Precast Concrete Floor Planks to Porotherm

Final positioning of Pre-cast units to Porotherm should be undertaken by the use of craneage and lifting eyes, with the exception of specific conditions outlined in Clauses 5.1.2 and 5.1.3 below. Some Pre-cast Floor suppliers prefer to lift floor planks close to final position by use of "choked chains" utilising lifting eyes only for final placement.

Planks being located close to final position using choke chains.



Final positioning utilising lifting eyes.

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Section 11 of the Precast Flooring Federation Code of Practice sets out limited general guidance which should be followed as a general principle, and specifically notes “Components should be positioned as near as possible to their final position to minimise barring; however the, use of pinch or crowbars to move components is common to all types of floor unit and all categories of contract. The bar is used to move individual units into their final position, and to tighten up a floor after laying.”

The guidance for placement of pre-cast planks onto Porotherm is more prescriptive, and specific in respect of the structure to which the precast planks are being installed.

5.1.1
Where precast units span from one skin of a fully constructed cavity wall (usually a party wall) to a single skin condition i.e. planks being placed before the external skin is constructed NO barring is permitted.

5.1.2
Where pre-cast planks span between two fully constructed cavity walls – typically corridor situations – and providing a minimum of two 1200mm wide planks have been placed using lifting eyes to create a suitable platform from which to work, precast planks of :

- maximum overall length 2200mm
- maximum width 1200mm,
- maximum weight 800kg

may be moved a maximum of 100mm in the direction of the supporting walls by barring from an adjacent plank providing the barring us undertaken with two operatives moving the unit simultaneously and evenly at each bearing end of the unit.

NB. It is noted that where 100mm thick PC units are proposed that these will not generally accept sockets for lifting pins, and notches may be incorporated to allow final positioning with the use of choked chains, and their subsequent removal.

- **Under no circumstances** should movement of unit perpendicular to bearing walls be undertaken.
- **Under no circumstances** should barring be undertaken by utilising the supporting walls.

5.1.3
Where precast planks span between a fully constructed party wall and a fully constructed external cavity wall (fully cured and external skin is built within 225mm of the bearing), planks should be positioned using craneage and lifting eyes. Minor adjustment in “tightening the floor” may be undertaken – maximum movement 50mm.

- **Under no circumstances** should movement of unit perpendicular to bearing walls be undertaken.
- **Under no circumstances** should barring be undertaken by utilising the supporting walls.

There are occasions where it is not appropriate to place pre-cast planks in a single skin condition, and these must be recognised.

On this project the external skin was constructed before planks placed in recognition of frequent large openings with very small piers between, and bracing provided in recognition of the small dimensions of those small piers.

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5.2. Temporary Support to Lintels

Consideration must be afforded to lintels over openings of 900mm or above, in accordance with normal guide lines. A structural engineer will advise if propping is required to any other areas.
Where narrow sections of walls (less than 900mm) or piers occur these should be given special consideration as these can be weak points during the construction phase. The Contractor/Developer and design team may need to consider additional temporary supports, or sacrificial buttress walls during the process of planning and design.

5.3. Precast Concrete Plank Erection - Commencement Check Lists

Pre-commencement meetings to communicate all the aforementioned to all parties are advisable. Relevant trades e.g. bricklayers, pre-cast plank supplier and scaffolder should be made aware of the proposed build order.

5.4 Scaffolding

An independent scaffold should be erected to the perimeter in advance of Porotherm, in accordance with the relevant regulations. The requirements for safe access set out in the Precast Flooring Federation Code of Practice Section 13 should be noted. It is preferable not to raise scaffold above the floor to be installed on the elevation of the building from which pre-cast planks are to be installed, removing the need to “lift over”.

5.5 Weather Conditions

Appropriate Codes of Practice should be followed.

6. Training and Site Supervision

Porotherm Walling System training for operatives, site supervision and design teams is available by prior arrangement with Wienerberger or Porotherm System Distributors

7. Summary

- Every project is unique and must be considered on its merits
- Consider build preferences at design stage, and design to accommodate.
- Involve relevant parties at an early stage – PC Plank supplier, Structural Engineer, Architect, Contracts Manager etc.
- Consider the direction of plank span
- Plan and manage stability in a temporary condition – consider maximising masonry internal walls where these can benefit lateral stability.
- Consider where loads are applied over lintels and there is a small element of sand/cement mortar.
- Interface between trades and detailed construction programme should be communicated to all parties. Making the programme specific in relation to the order of works, and not just time periods is beneficial.
- The order with pre-cast plank supplier should be specific in respect of use of lifting eyes for final placement of place planks. Some pre-cast suppliers opt to lift planks close to area of final installation by the use of choke chains, photographs on page 14 indicate. Orders should clearly state that barring of planks should be in accordance with Clauses 5.1.1, 5.1.2 and 5.1.3 of this document.
- Coursing should be designed to finish with a full block directly below planks, apply bed joint mortar to vertical joint of corner blocks to this top course.
- Denote any internal non-load bearing walls which pre-cast supplier has requested to be left one course low.
- The plank manufacturer may prepare a specific installation order - this should be followed.
- Brief the construction team as to the principles utilised in the design, and the sequence of work proposed.
- Steel work which carries/interfaces with pre-cast plank installation should be correctly restrained in accordance with the Pre-cast Flooring Federation Code of Practice.
- Some pre-cast suppliers may require the top surface of the Porotherm to be sealed using Porotherm adhesive and a DPC prior to installation of planks, this should be clarified during the early discussions.
- Planks should be grouted before work proceeds above
- Consider loading out constraints – take advice re safe loading, avoid point loads.
- Appropriate supervision should be provided.

ABOVE ALL – WHILST PROGRAMME IS IMPORTANT – SAFETY IS PARAMOUNT

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Appendix A

Principal Parameters for Engineering Design with Porotherm							
Block Type	**Porotherm Blocks**						
	PTH 100		PTH 140		PTH 190		SP148
Dimensions *w x h x l* mm	100 x 224 x 300		100 x 224 x 300		100 x 224 x 300		SP148
Typical Block Strength (N/mm^2)	10		10		10		SP148
Characteristic Compressive Strength of Masonry (N/mm^2)	6.5		5		4.5		SP148
Flexural Strength (N/mm^2)*	Parallel	Normal	Parallel	Normal	Parallel	Normal	
	0.8	0.3	0.55	0.2	0.5	0.15	SP148
Shear Strength*	f_{vko}	A	f_{vko}	A	f_{vko}	A	
	0.20	0.20	0.15	0.2	0.15	0.20	SP148
Gross Density kg/m^3	950		850		850		SP148
Laid Weight kg/m^2	96.4		120.9		164.4		Calculated from dry density and Zeroplus/ Ecoparge usage rates.
Laid Weight/m^2 – Ecoparge to one face kg/m^2	97.85		122.5		165.9		
Group (to EN 1996-1-1)	2		2		2		SP148
Mean Mortar Strength N/mm^2 Compression Zeroplus	13.3						Ceram Test Report
Mean Mortar Strength N/mm^2 Flexure ZeroPlus	2.6						
Mortar Class for Lateral Load Design ZeroPlus	M12		M12		M12		SP148
Mortar Adhesion Zeroplus**N/mm^2	0.3						By reference to fixed value in Annex C BSEN-2-2010
Mortar Method of Test Zeroplus** To BSEN 1015-11	MC						Ceram
Mortar for base course Sand/Cement – Minimum Class (unless otherwise specified by Structural Engineer)	M4		M4		M4		

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Ancon Wall Ties	Cavity Width	Type at 900mm x450mm	Tie Wire Diameter mm	Use	
Ext. Cavity Wall					**Source**
CCB3 -100	≤ 100	3	3.3	Porotherm to Brick	SP 148/Ancon Building Products
CCB3 -125	100 ≤ 125	3	3.3		SP 148/Ancon Building Products
CCB4 - 150	125 ≤ 150	4	3.3		SP 148/Ancon Building Products
CCB JJ- 260	100	3	N/A	Porotherm to Porotherm	Ancon Building Products
CCBJJ- 285	125	3	N/A		Ancon Building Products
CCB JJ- 310	150	3	N/A		Ancon Building Products
CCB JJ -335	175	3	N/A		Ancon Building Products
CCB JJ- 360	200	3	N/A		Ancon Building Products
Party Wall	Cavity Width	Type	Tie Wire Diameter mm		
CCBA - 75	75	A	3.3	Porotherm to Porotherm	SP 148/Ancon Building Products
CCBA - 100	100	A	3.3		SP 148/Ancon Building Products

Notes:
SP148 refers to:
Lucideon (Ceram) Technical Report and Design Guidance for the Use of Porotherm Blocks in the UK Special Publication SP148

*With Zero-Plus Mortar
**Inputs required for Danish Institute of Technology EC6 Design software. EC6design.com

Appendix B

STRUCTURAL NOTES

RECOMMENDED TEMPORARY SUPPORT FOR 100MM POROTHERM BLOCKWALLS DURING CONSTRUCTION.

PREPARED FOR WIENERBERGER LTD
BY YES ENGINEERING GROUP LTD
JULY 15

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Appendix B
Typical Temporary Support Details

Contents

1. Introduction

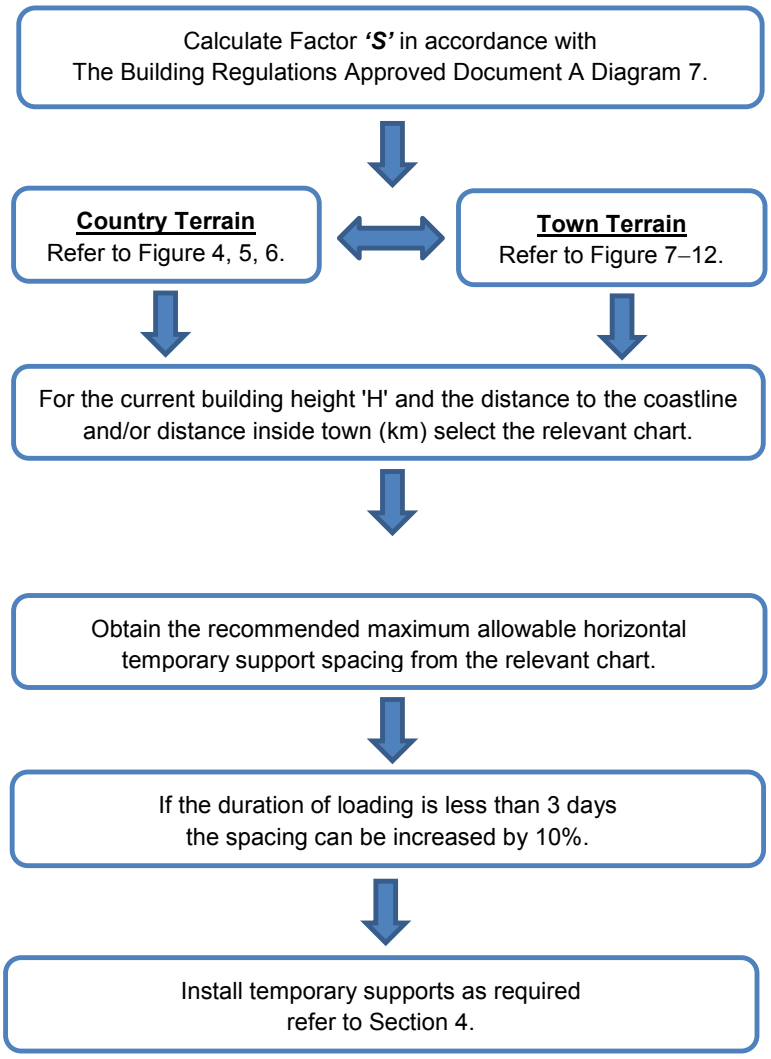
Wienerberger have instructed YES Engineering to provide advice for the propping of their 100mm Porotherm masonry during construction. The following structural notes consider the temporary case of single skin wall construction that may be found in low rise development of up to 3 storeys. This case allows the inner support wall to proceed ahead of the construction of the outer skin. Indicative details are provided for the site manufacture of suitable props.
These structural notes are aimed at construction professionals that are competent with the interpretation of the Building Regulations 2010: Approved Document A (2004 edition incorporating 2004, 2010 and 2013 amendments). In particular these structural notes reference to the 'S' factor used in the procedure to determine the maximum height of the buildings (refer to clause 2C16). We note that all projects vary and care should be taken to ensure the findings of these design notes are correct and applicable to a specific project.

2. Temporary Supports

Often it is desirable to progress the inner skin ahead of the outer skin and to install floors with the outer skin following 1 or 2 levels behind. Temporary supports may be necessary in these situations especially if there are few internal bracing walls or they are to be built later. Section 4 provides an example of a site made temporary props and these notes provides guidance on how to assess temporary support spacing requirements.

The spacing of temporary supports is linked to the geometry of the wall and the wind pressure. The effect of typical precast floor load is not typically significant as the precast floor often provides restraint to the top of the wall thereby increasing wall stability. The remainder of these notes provide a simplified approach that can be assessed by site managers/construction professionals that are not necessarily structural engineers. This approach uses the 'S' factor determined from Approved Document A to assess support spacing requirements.

It is noted that the 'S' factor can be obtained from the project's Structural Engineer as it relates to the 'basic wind velocity' used in BS EN 1991-1-4:2005 section 4.2 (see figure NA.1) and the 'basic wind speed' used in BS 6399-2:1197 (see figure 6). The procedure to determine the temporary support spacing is illustrated in the flowchart below:



Note:

a. The design is based on the following assumptions:

- All walls are 'fixed' at their base. This requires all DPM's to be '[high bond'.
- Wall ends are supported.
- The walls do not have significant openings.
- The net pressure coefficient is 1.5.
- Duration of load; less than 3 months but greater than 3 days.
- The building floor is adequate to support the prop loads.

b. Shielding, funnelling, wind direction, seasonal factors have not been considered for this assessment. These could vary the required spacing.

c. Assumed construction sequence:

- Erect frames, align & plumb and fix to floor.
- Construct wall and progressively install restraint ties and screw to propping support frames.
- At this stage it assumes that the brickwork outer skin has not yet been constructed and the
- 100 thick Porotherm block wall is up to a maximum of 2.7m high.

d. Notwithstanding the above design assumptions, The Contractor shall review weather forecasts and the recommendation in BCSA Publication No. 39/50 'Guide to Steel erection in windy conditions' and proceed with care and with due consideration of expected weather conditions and take precautions as necessary to ensure the stability of the construction.

e. If in doubt seek the advice of a structural engineer.

2.1 County Terrain Prop Spacing Chart

Figure 4: Country terrain with distance to coastline less than 2km

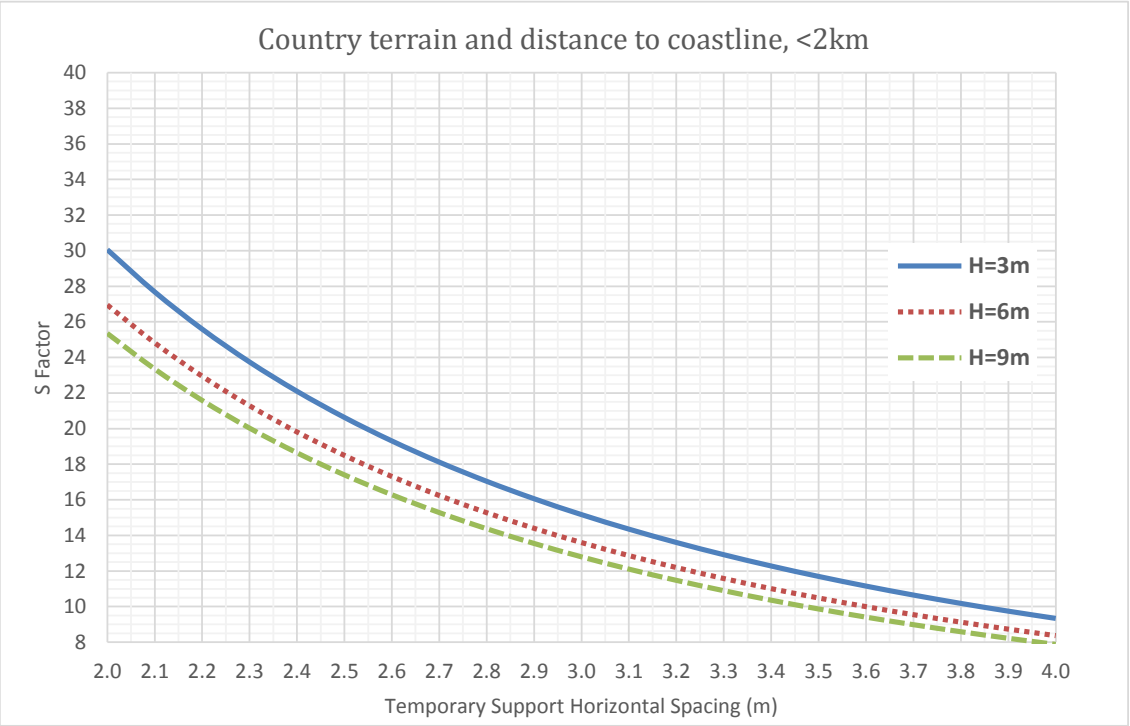


Figure 5: Country terrain with distance to coastline 2–20km

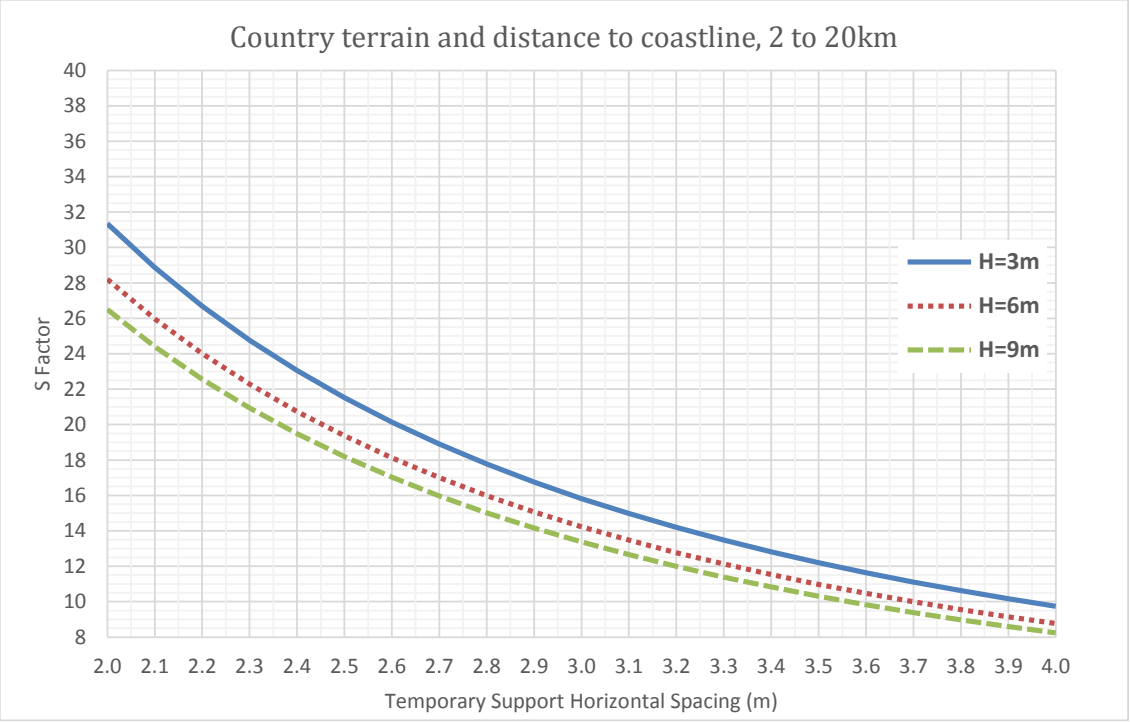
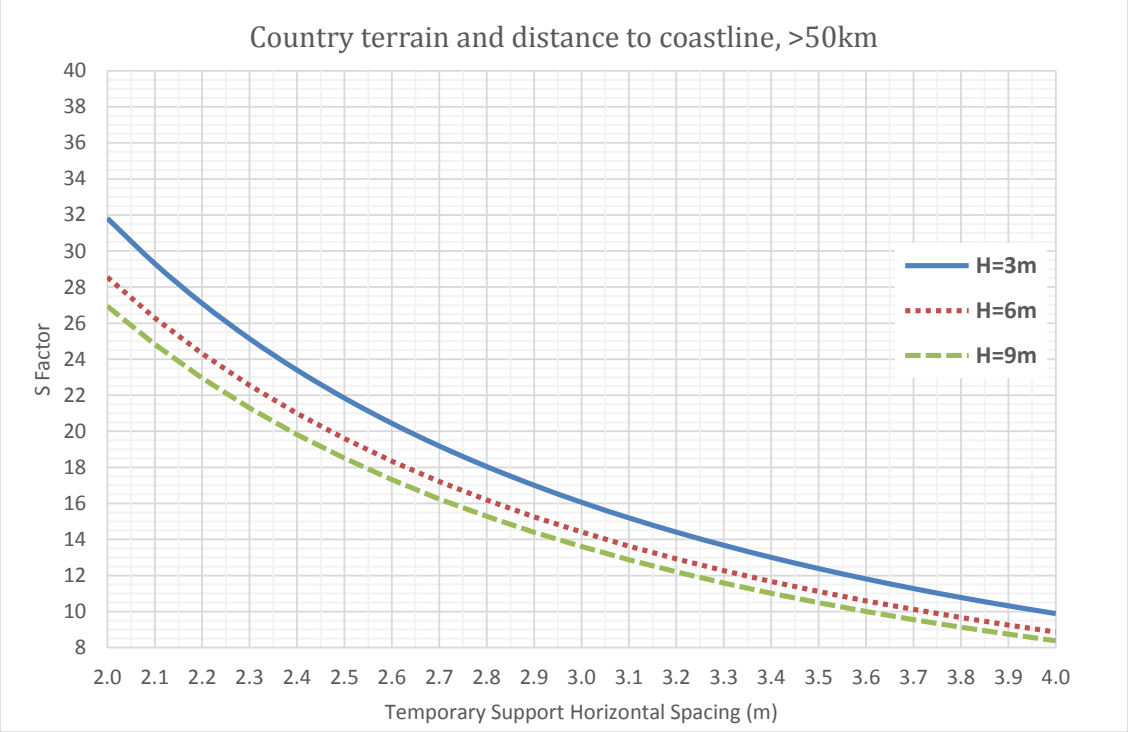


Figure 6: Country terrain with distance to coastline greater than 50km



2.2 Town Terrain Prop Spacing Chart – Less than 1km

Figure 7: Town terrain with distance to, coastline <2km & inside town terrain <1km.

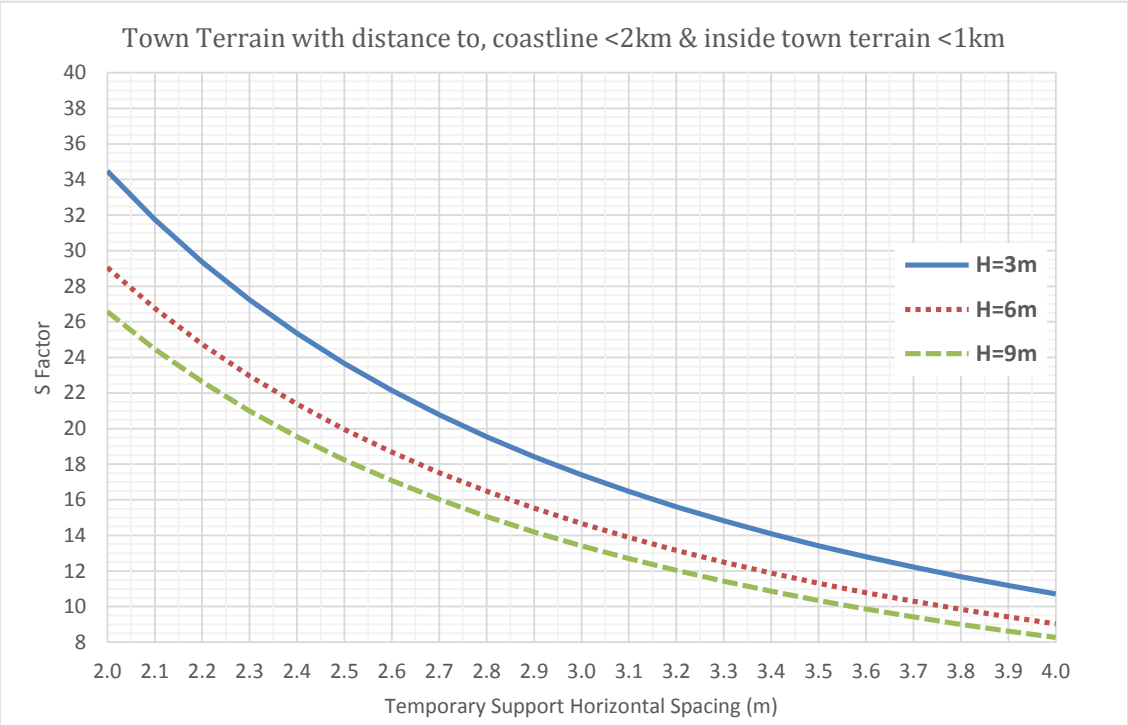


Figure 8: Town terrain with distance to, coastline 2–20km & inside town terrain <1km.

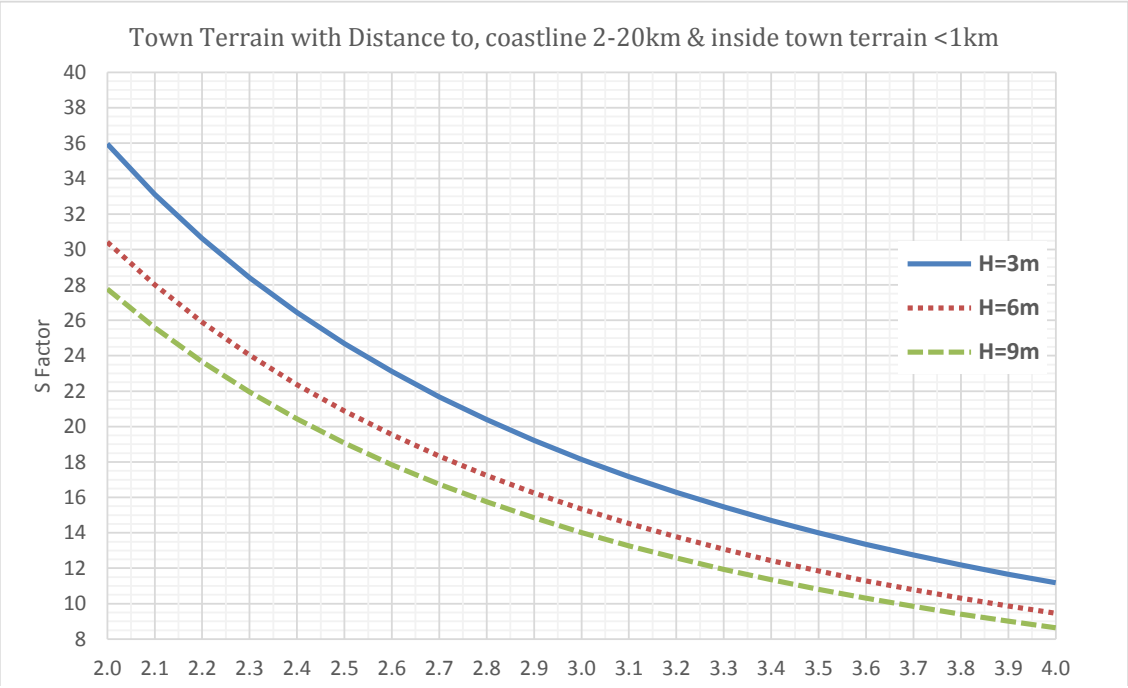
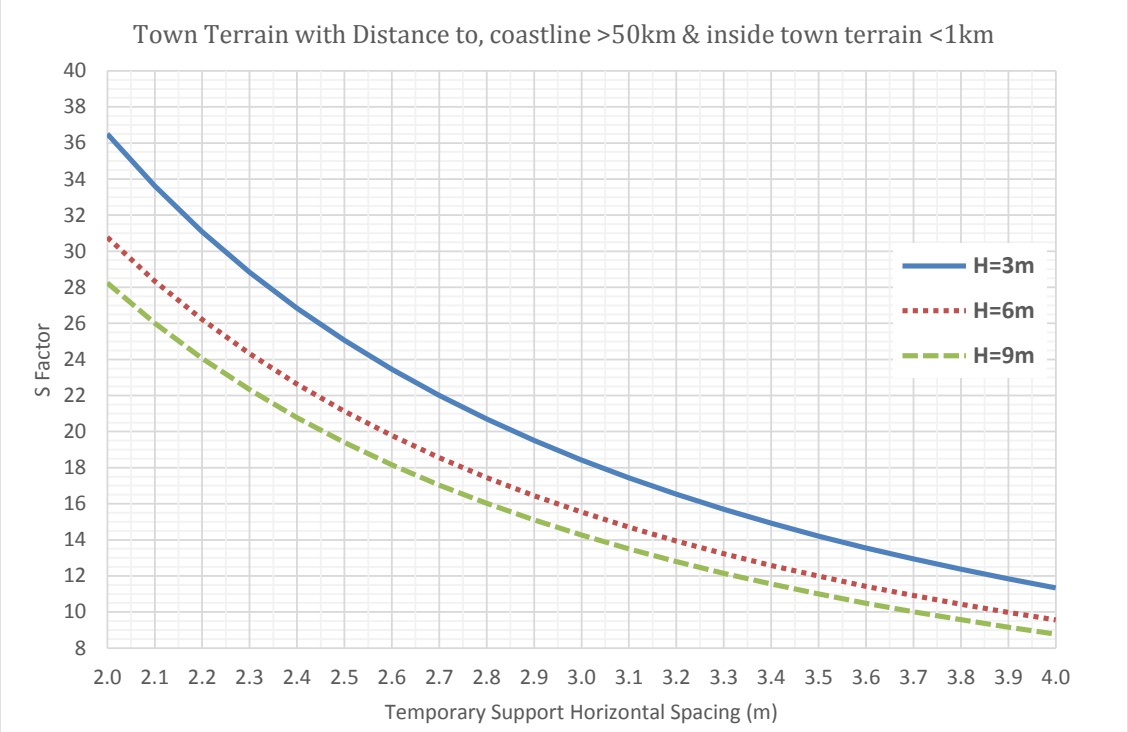


Figure 9: Town terrain with distance to, coastline >50km & inside town terrain <1km.



2.3 Town Terrain Spacing Chart – Greater than 20km

Figure 10: Town terrain with distance to, coastline <2km & inside town terrain >20km.

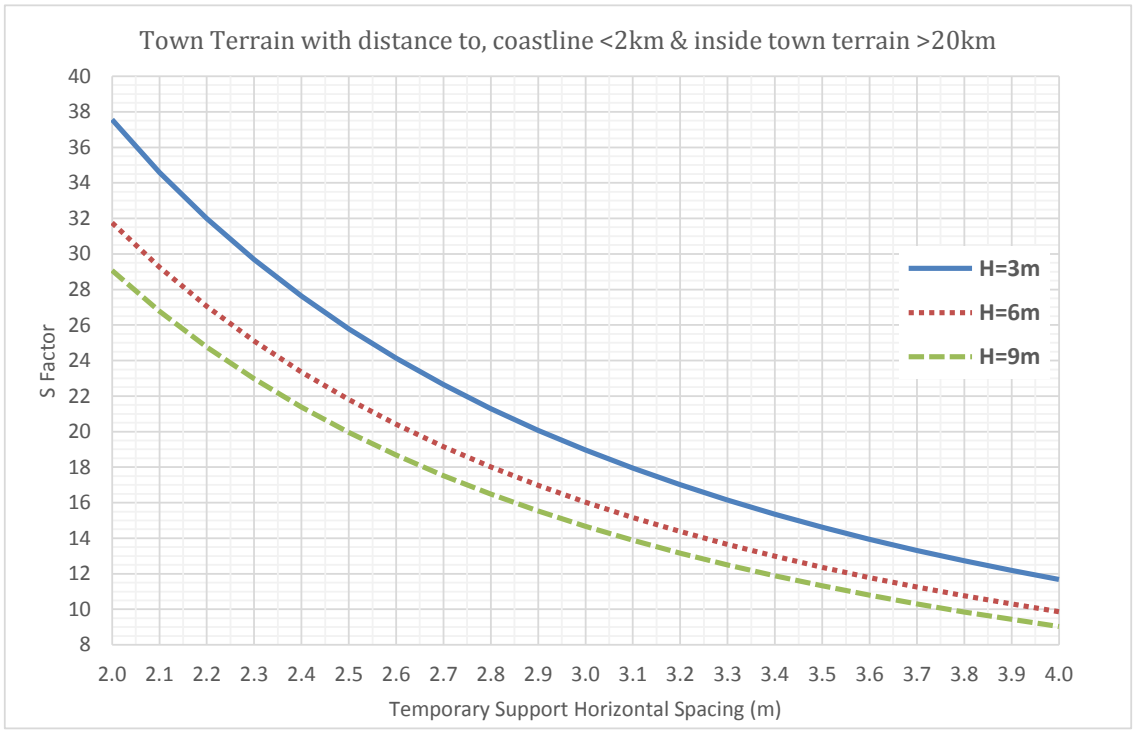


Figure 11: Town terrain with distance to, coastline 2–20km & inside town terrain >20km.

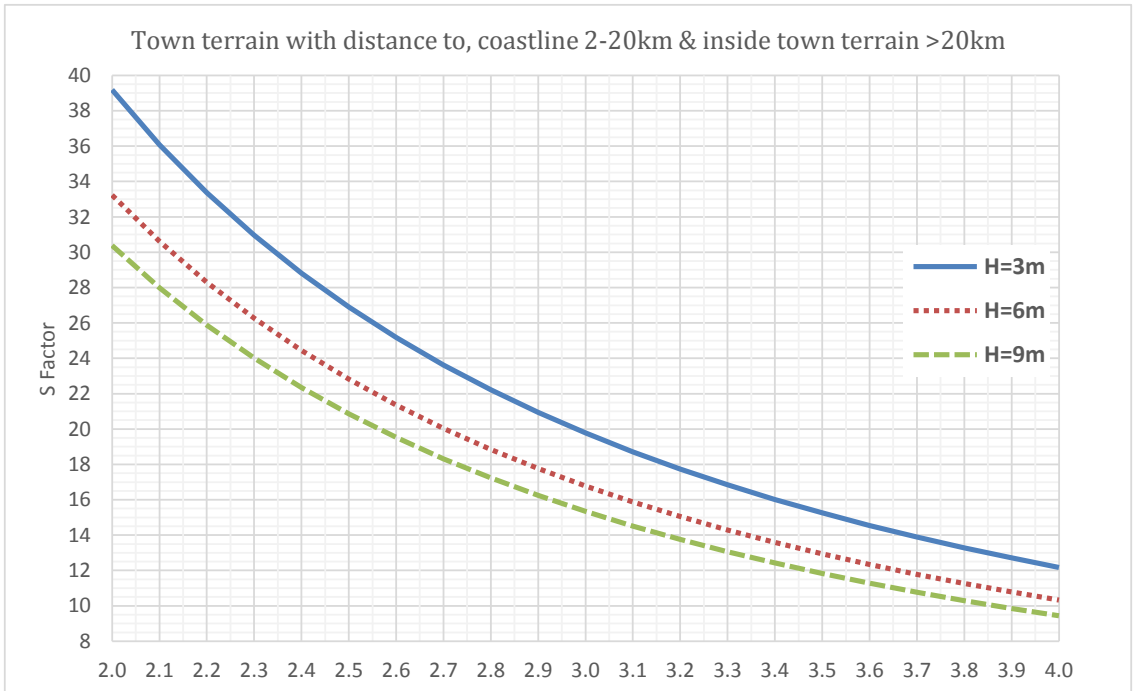
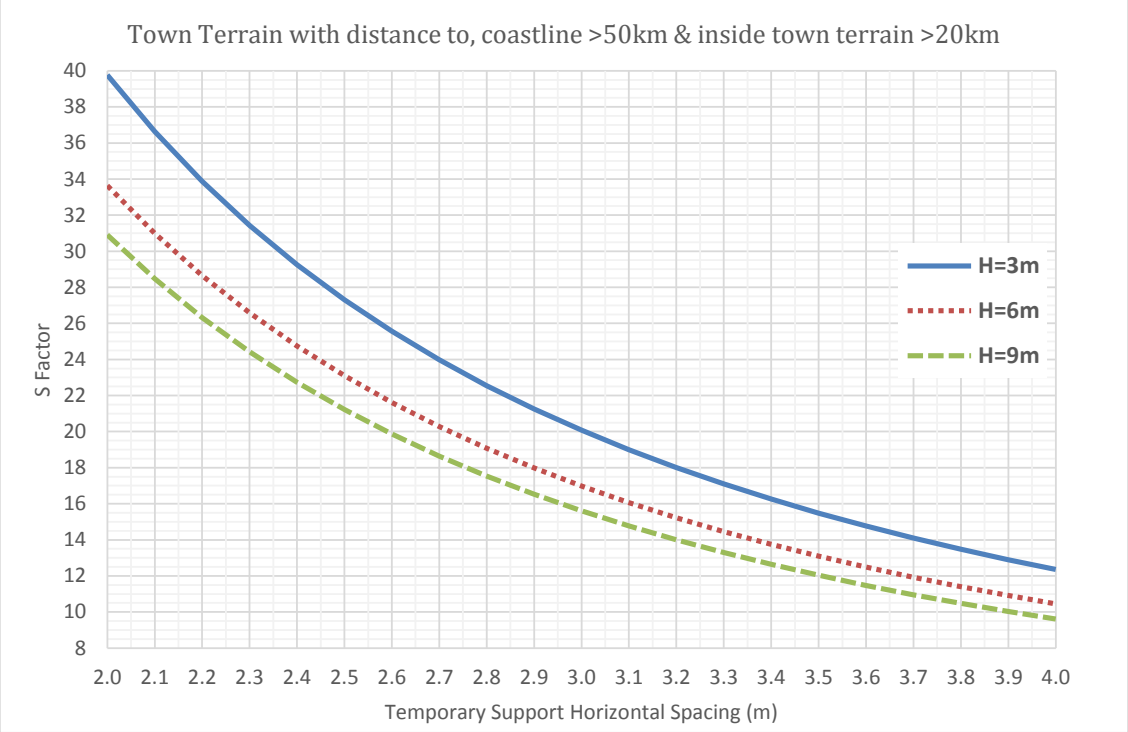


Figure 12: Town terrain with distance to, coastline >50km & inside town terrain >20km.



3. Worked Example

Example: Determination of Temporary Support Spacing

This worked example explains the procedure of determination of recommended temporary support spacing for a 100mm thick Porotherm Blockwall under wind loading.

Design Parameters:

- Site location – London
- Site altitude – 50m
- Duration of load <3 Days
- No significant topography
- Distance to coastline >50km
- Town terrain – Distance to inside terrain <1km
- Current height of building – 6m above ground level

Wall parameters:

- 100mm Porotherm block outer skin to follow once precast floor is installed.
- 2nd floor, where top of wall = 6m
- Internal non bracing walls.

1. Calculate Factor ***S*** in accordance with The Building Regulations Approved Document A page 21 diagram 7:

$$S = V \times O \times A$$

   a. Figure 1, Diagram 6 on page 19 for Factor ***V***:

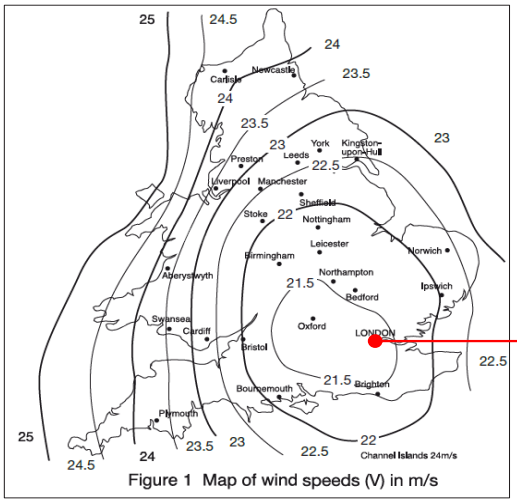


Figure 1 Map of wind speeds (V) in m/s

V = 21.5

   b. Table a and b, Diagram 7 for Factor ***O*** & ***A***:

      Nominally flat terrain, Factor ***O*** = 1.0

      Site Altitude, Factor ***A*** = 1.05

   c. Factor ***S***:

      ∴ ***S*** = 21.5 x 1.0 x 1.05 = 22.6

2. Recommended Temporary Support Spacing:

   a. Town terrain with distance to, coastline >50km & inside town terrain <1km.

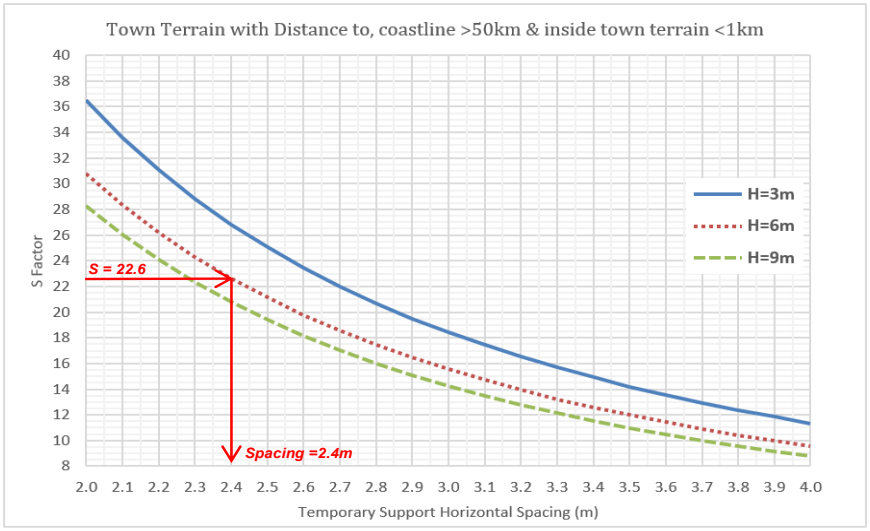
      ∴ Select Town terrain chart - Figure 9.

   b. Obtain spacing from chart

      For ***S*** = 22.6 (calculated from 1.c. above) and H = 6m.

      ∴ Recommended Spacing = 2.4m for this 100 thick Porotherm Blockwall.

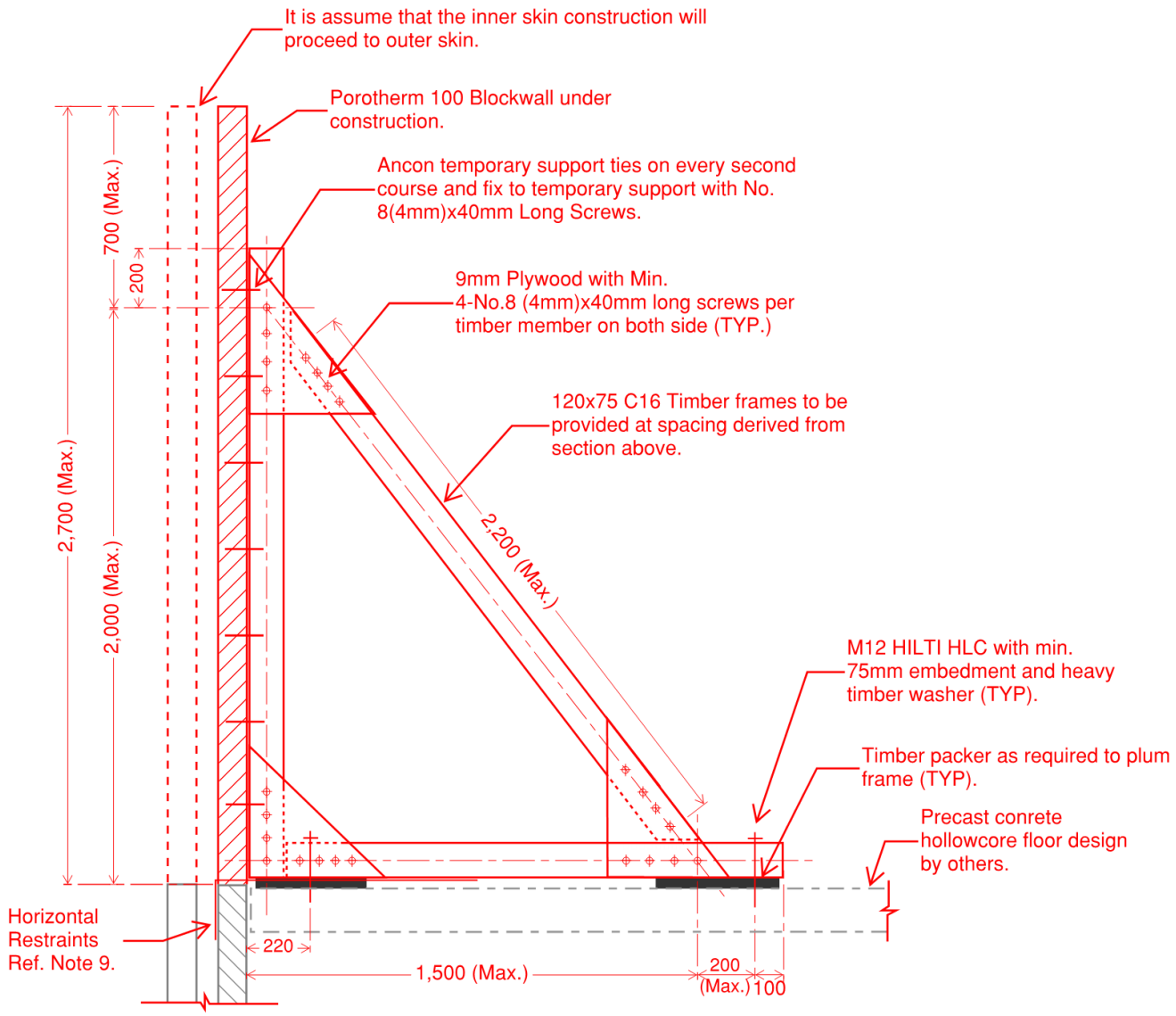
Figure 9: Town terrain with Distance to, coastline >50km & inside town terrain <1km.



3. Since the duration of load less than 3 days the above obtain spacing can be increased.

   ∴ Recommended spacing = 1.10 x 2.4m = *2.60m centres.*

4. Temporary Prop Sketch



1 / - ELEVATION - TEMPORARY SUPPORT

SCALE: N.T.S.

NOTES:

1) This drawing considers the interim stability and temporary support and provides recommendations for propping the wall during the construction phase under wind loading and the installation of a precast floor on to the wall.

2) At this stage it assumes that the brickwork outer skin has not yet been constructed and the 100 thick Porotherm blockwalls is up to a maximum of 2.7m high.

3) The Project Engineer & Contractor should assess the suitability of the detail for the specific project requirements.

4) The temporary support spacing to be derived from figures 4-12.

5) Not withstanding the design assumptions the Contractor shall review weather forecasts and the recommendation in BCSA Publication No. 39/50 ' Guide to steel erection in windy conditions' to proceed with care and with due consideration of expected weather conditions and take precautions as necessary to ensure the stability of the wall.

6) All timber work shall comply with Building Regulations Approved Document A and BS5268.

7) All solid timber shall be Grade C16 U.N.O.

8) All plywood shall be Grade C-C.

9) Building horizontal restraints to be designed by others and as required by the Building Regulations. Restraints to be installed prior to proceeding with construction on the next level.

10) This temporary support is intended to be used in England Only.

DISCLAIMER:

1) This drawing shall be read in conjunction with all relevant project documentation.

2) All dimensions shall be checked on site prior to commencement of work.

INSTALLATION PROCEDURE:

a) Prior to constructing the wall, install frame on line of wall and plumb using 100x100mm solid packers and install fixings to floor.

b) Install secondary brace to props as required.

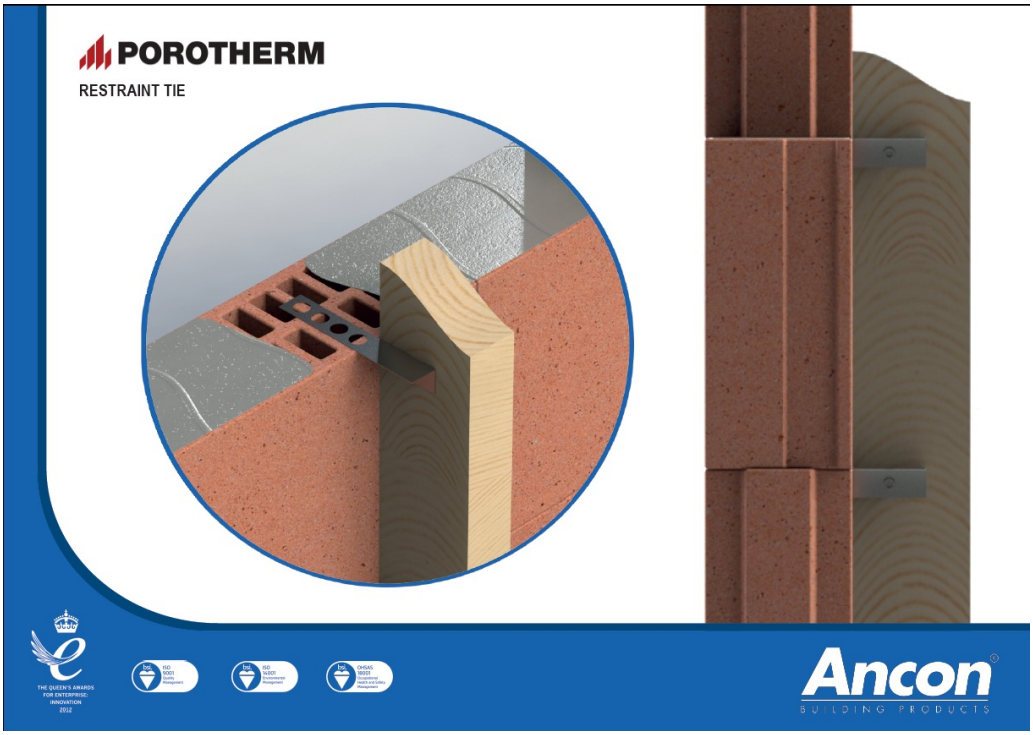
c) Build wall to the frame and insert wall ties progressively and screw fix to the temporary support.

d) Remove temporary support frame once the floor or roof above is in place with horizontal restraints installed. Consideration must also be given to the requirement for the external leaf to be constructed prior to the removal of temporary support.

Client: Wienerberger	Project: POROTHERM BLOCKWALL – INTERIM STABILITY AND TEMPORARY SUPPORTS	
Title: 100 POROTHERM BLOCKWALL TEMP. SUPPORT FROM PRECAST HOLLOWCORE FLOOR – ELEVATION	Discipline: STRUCTURAL	
	Drawing No.: 1400801-SK-01	Rev.: -

Appendix C
ANCON RESTRAINT TIE

The tie for connecting Porotherm to temporary braces utilises the same embedded profile as the wall ties designed for use with Porotherm, tensile performance has been tested. Compression performance in this is not relevant in this situation as this is taken directly by the brace.



Appendix D

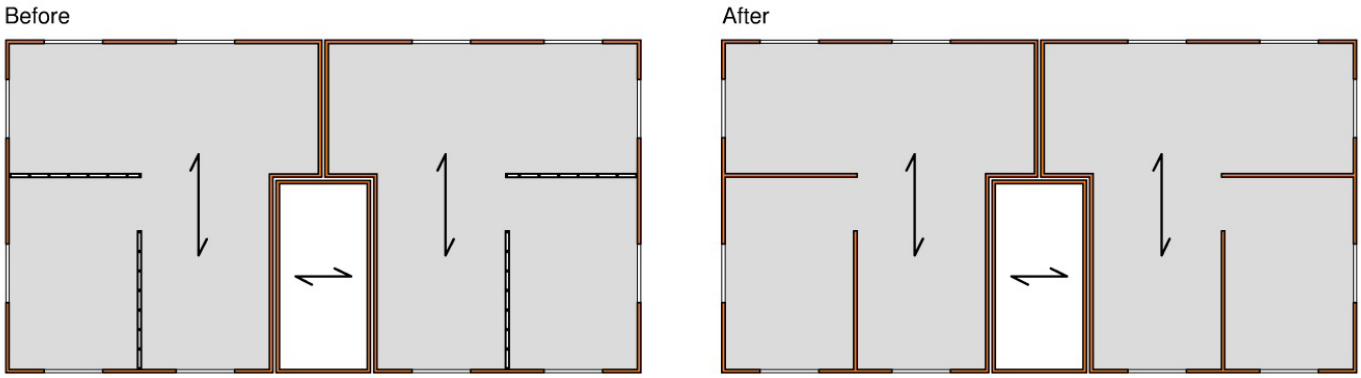
Where there is a desire to change a pre-designed structure there is generally no reason why Porotherm cannot be utilised as a replacement for aggregate or aircrete blockwork subject to the necessary checks by the design team.

However the external skin will need to be constructed prior to placement of pre-cast planks in accordance with the requirements of the Precast Flooring Federation Code of Practice, unless design amendments to create the necessary temporary stability are made.

Opportunity to amend design to provide appropriate stability in the “temporary condition”

Where there is scope to consider some variance in design the examples below indicate the type of variation which can be considered.

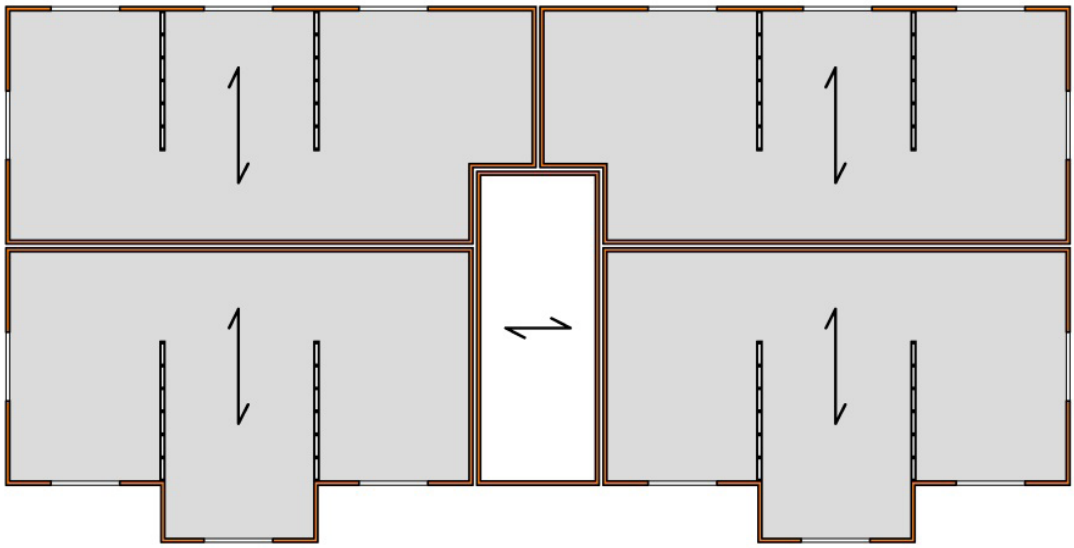
Apartments – 2 per Floor



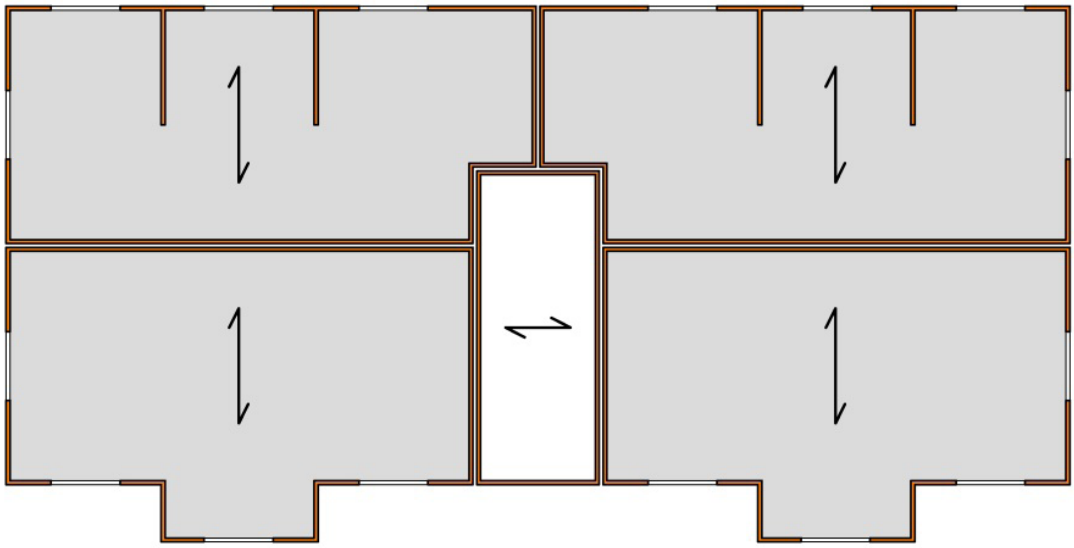
Pre – designed, with a desire to switch to Porotherm the stud partitions could be switched to Porotherm, providing lateral support to the front and gable walls. The long rear wall to the open plan living area may however require propping, sacrificial buttress walls or other consideration.

Apartments – 4 per Floor

Before



After



Typical layout for small residential blocks. The party walls to either side of communal space and between apartments provide a backbone to the structure. The partitions to the rear apartments being amended from stud to masonry to provide lateral to the rear wall. The design team may consider the stagger to the front elevation provides adequate support, or opt to again change stud to Porotherm.

Acknowledgements

This guidance document has been developed by Wienerberger for the Porotherm Walling System who gratefully acknowledge the input and assistance provided by:

Yes Engineering - Structural Engineering Design and Co-Authors

Ancon Building Products - Temporary Restraint Tie Development.

Precast Flooring Federation - Guidance and support, and permission to incorporate extracts from the PFF Code of Practice.

Pre-Cast Flooring Federation Technical Committee advice.
Mon 15/06/2015 17:02

Keith,

The PFF Technical Committee agreed with the document that you submitted and as such has formal approval. However, there was recognition that the subject of barring would remain a contentious issue between product suppliers, site managers and installation teams as invariably there would remain a need to bar slabs in some situations even though lifters had been supplied.

One method of addressing this issue is for the PFF members to write in their method statements that barring is to be in accordance with the PFF Code of Practice and Manufactures Product Installation Guides. However, where there is no alternative to barring this is to be agreed with the installation team and the site managers.

Regards,
John

Dr. John Cotton
Engineering Manager