Build Specification

revised 2010-11-05
draft #9

Site Address-
Zero
Sydenham Road
Cotham
Bristol
BS6 5SH

Correspondance address-
Si Parker
Flat 1
Sydenham Place
Sydenham Road
Bristol
BS6 5SB

si@caffeinate.org.uk
http://www.toblerhome.co.uk

Site Summary

Conversion of workshop into residential dwelling. Addition of basement and all utilities.

Main Aspects

- Change of building use to a residential dwelling.
- Planning permission application number 06/05007/F granted 24/01/2007.
- Self-build.
- Structural Engineering overseen by David Veale of Casley Rudland Structural Engineers.
- Basement constructed in sections to aid stabilisation of existing structure.

Change Log

Changes since previous version titled "2009-07-01 - draft #8"

- correction: "50mm limecrete slab" corrected to "150mm concrete slab"; U-value calcs updated accordingly. Page 8
- Flat Roof (Patio) - changed to use block and beam; EPDM with 55mm slab; Flat Roof (Patio) Heat Calculation updated accordingly. Page 17
- correction: Stonework mortar will be NHL3.5 lime mixed 1:3 with sharp sand as specified by Ty-Mawr Lime. - corrected to "Standard OPC mortar with sharp sand to be used". Page 18
- Front door section added. Page 21

General Details

Basement

The basement is constructed in 900mm retaining wall sections as shown in Illustration 5, page 9. The panels are shown in Illustration 6 and the bending schedule in Illustration 8.

Structural calculations are in Appendix 1.

Material	Area (%/100)	Thickness (m)	R-Value per m	Element R-Value
Celcon Standard Blocks	0.98	0.075	6.67	0.49
FoamGlas Perinsul	0.02	0.070	23.81	0.03
FoamGlas T4	1	0.080	23.81	1.9
Structural Concrete	1	0.150	0.61	0.09
Celcon Hi-Ten	1	0.100	5.26	0.53
				3.05
			U-value	**0.33**

Table 1: Basement Heat Calculation

Information on Foamglas can be found at - http://www.foamglas.co.uk/building.htm

The technical approval for this family of products can be found in Appendix 3.

Foamglas blocks will be joined with the manufacturer's recommended P56 two part adhesive.

Foamglas joint with PC56 will provide the Radon barrier. See Appendix 4 for the manufacturer's statement.

80mm of Foamglas will be comprised of two layers of 40mm T4 Foamglas. The joints will be staggered with at least 50mm overlap. This detail is not required for Radon protection as PC56 adhesive is being used.

The structural engineering specification requires a load bearing strength of 100kN/m^2. Foamglas T4 has a working compressive strength of 400kN/m^2.

Foamglas will be used to surround the reinforced concrete parts of the retaining walls. This is shown in Illustration 2 , Illustration 1 and Illustration 3. A course of Foamglas Perinsul is used as the first course of the external 75mm block wall. This ensures the Foamglas jacket is continuous and therefore provides a DPC and bonding surface for the Foamglas T4 which wraps around the heel of the retaining wall.

Where Foamglas T4 is used vertically it will have a thickness of 80mm (2 layers of 40mm).

T4 is available in 600x450 blocks. To obtain the U-values in Table 1 and Table 2 either two or three layers are used. This arrangement allows for staggered joints as shown in Illustration 4. Staggered joints are not a requirement for this design in any aspect of the tanking; DPM; radon barrier or insulation.

The Foamglas could be joined with the same PC56 adhesive to the backing block to ease construction but this is not a requirement.

The Foamglas edges should not coincide with the block edges as this will interfere with the forming boards used during the concrete pour.

The staggered joints arrangement does not need to exactly match Illustration 4. The reinforcing steel joining adjacent retaining wall panels extends by 300mm. Blocks should be arranged in an material efficient manor which protrudes enough to provide staggered joints but ideally not further then the 300mm.

A 100mm hole from the street through all sections of the retaining wall at a depth of 300mm is permitted on each panel.

SUITABILITY OF BASE

FOAMGLAS® Floorboard insulation is applied direct to the ground or crushed hardcore, an even surface should be created using 10/20mm of dry sand levelling bed, alternatively a sand/cement mixture can be used, or sand/cement slurry.
Where irregularities of less than 10mm occur a dry sand levelling bed should be used.
For irregularities of 10-50mm apply a stabilised sand bed, comprising 100kg per m³ of dry clean sand (approx 1:18 cement sand ratio), mixed dry and then wetted with a fine spray.

Illustration 1: Extract from Foamglas manufacturer's recommendations for "Floor board under concrete slab (E20)"

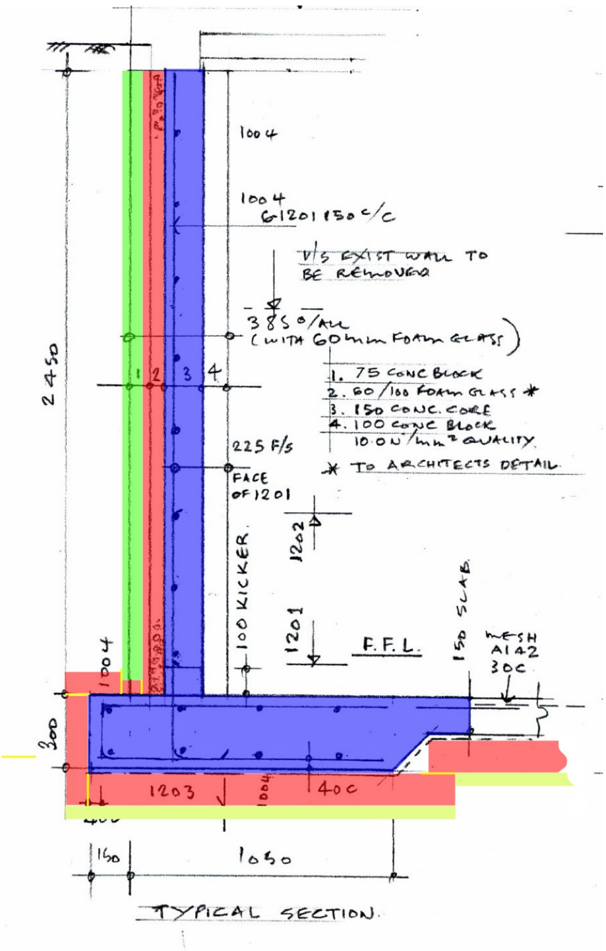


Illustration 2: Relationship between structural elements and Foamglas

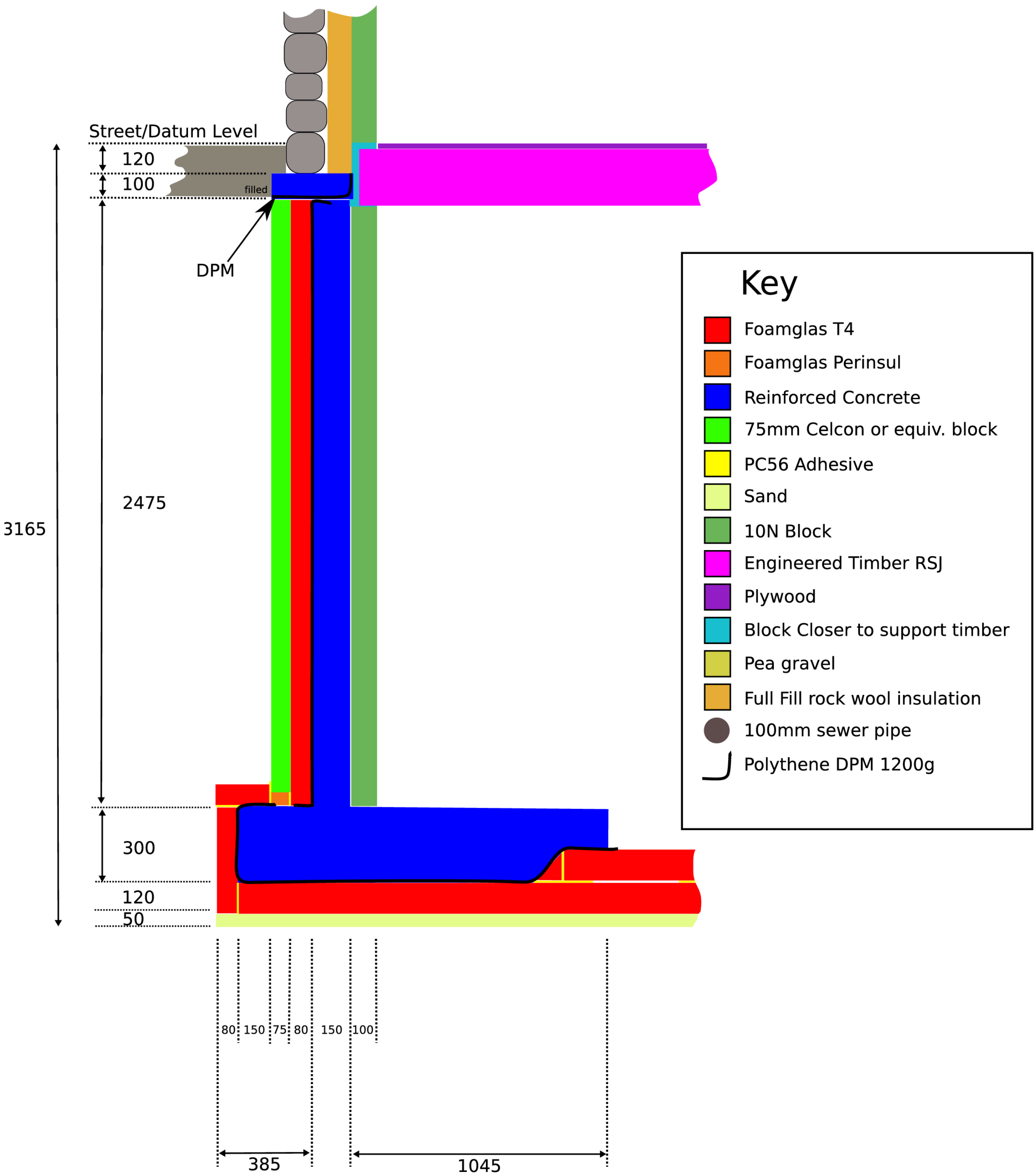


Illustration 3: Retaining wall detail

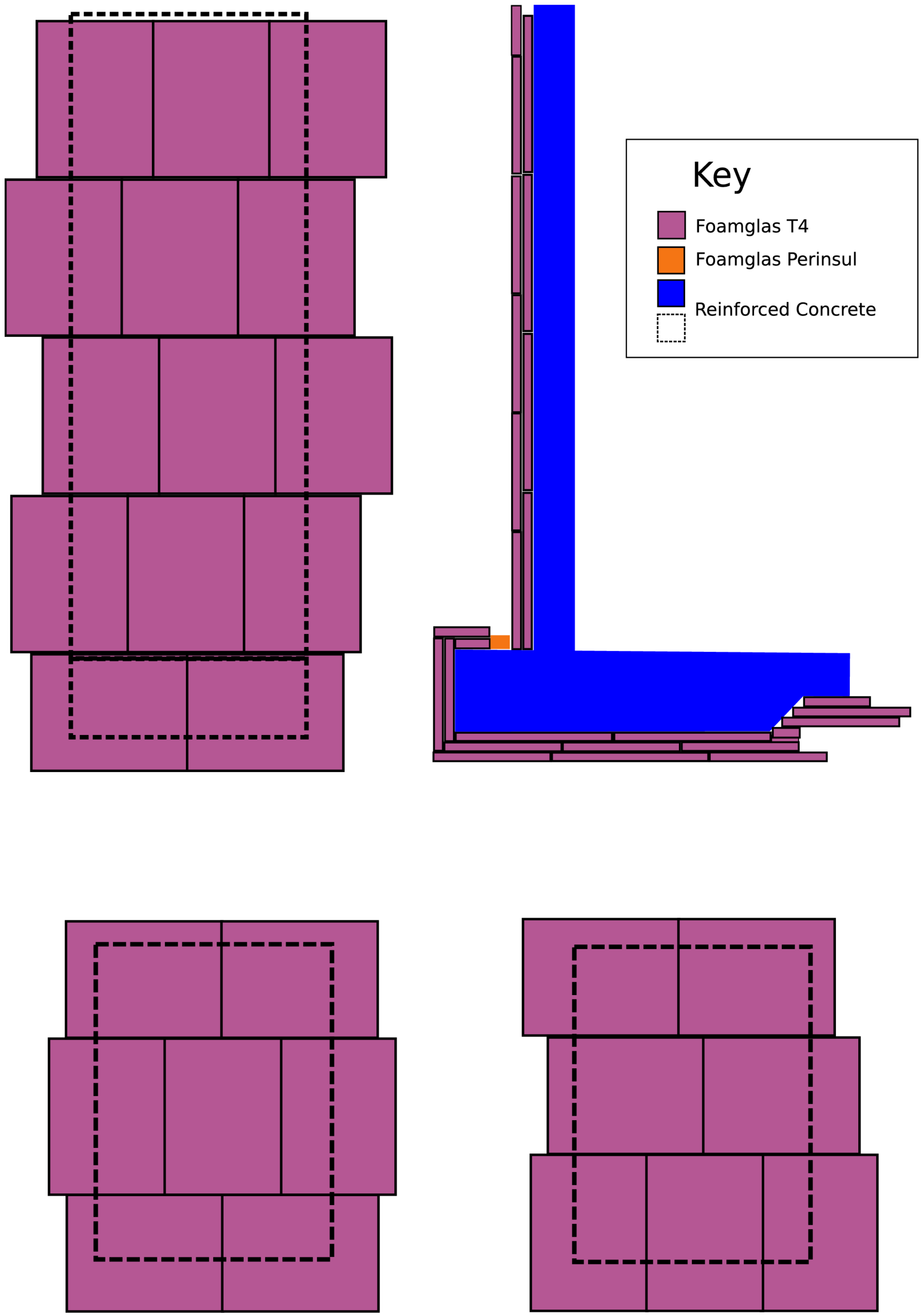


Illustration 4: Typical Retaining Wall Panel - Foamglas details. Top Left: Elevation on panel; Top Right: Section; Bottom: Two example layers

Ground Floor Slab

On the plans, see figure D3 (Basement Floor Plan). The existing slab within the walled boundary of the building is labelled 'filled'. This will be replaced with a 150mm concrete slab on a Foamglas backing. The resulting slab will be at the same position and level.

Foamglas blocks will be jointed with the manufacturer's recommended PC56 adhesive. The foamglas will provide the DPM; insulation and stability for the 100mm slab.

Material	Area (%/100)	Thickness (m)	R-Value per m	Element R-Value
Building Itself P/A =0.9	1	1	0.95	0.95
FoamGlas (cellular glass insulation)	1	0.120	23.81	2.86
Concrete	1	0.3	0.61	0.18
				3.99
			U-value	**0.25**

Table 2: Ground Floor Replacement Slab Heat Calculation

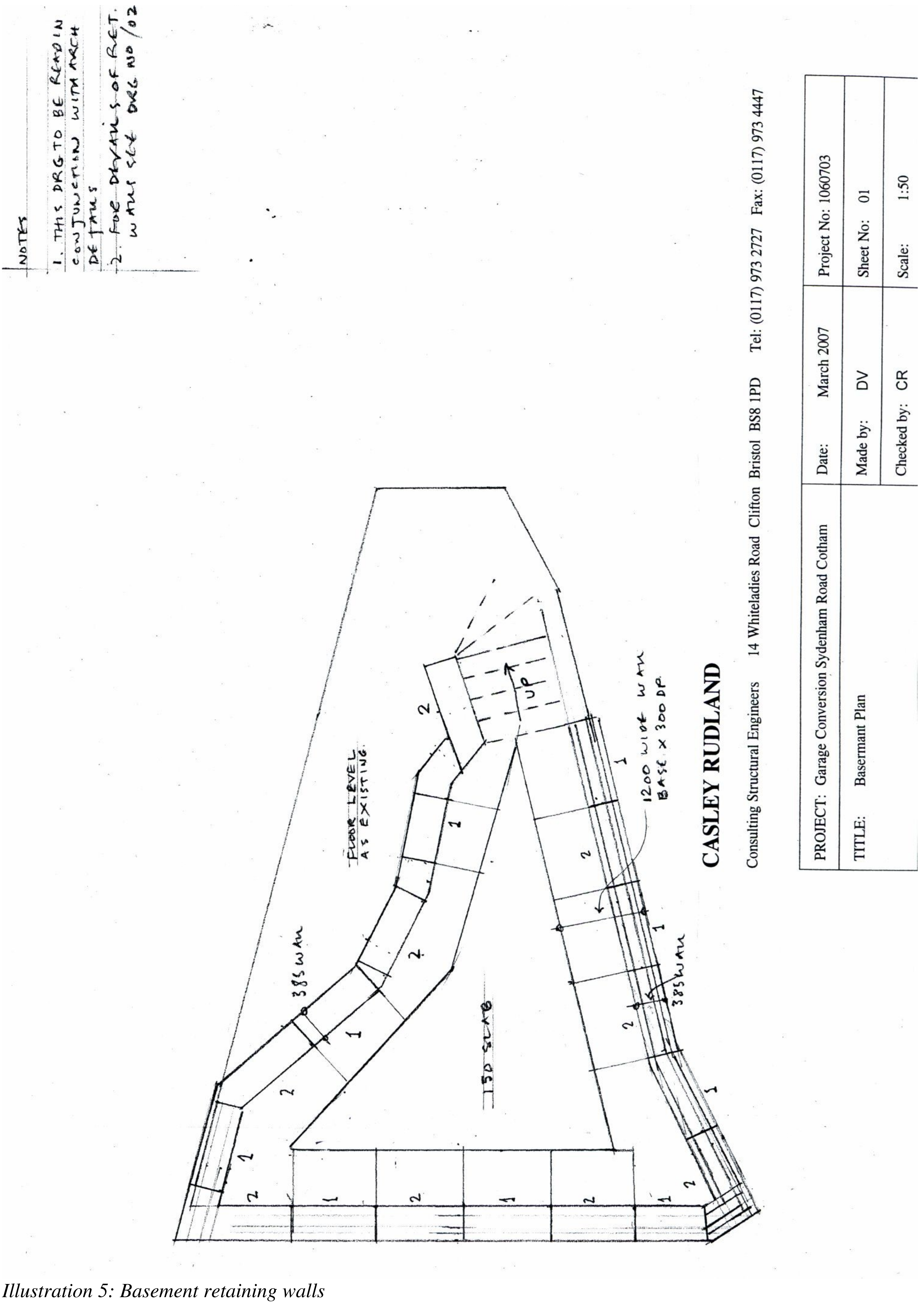
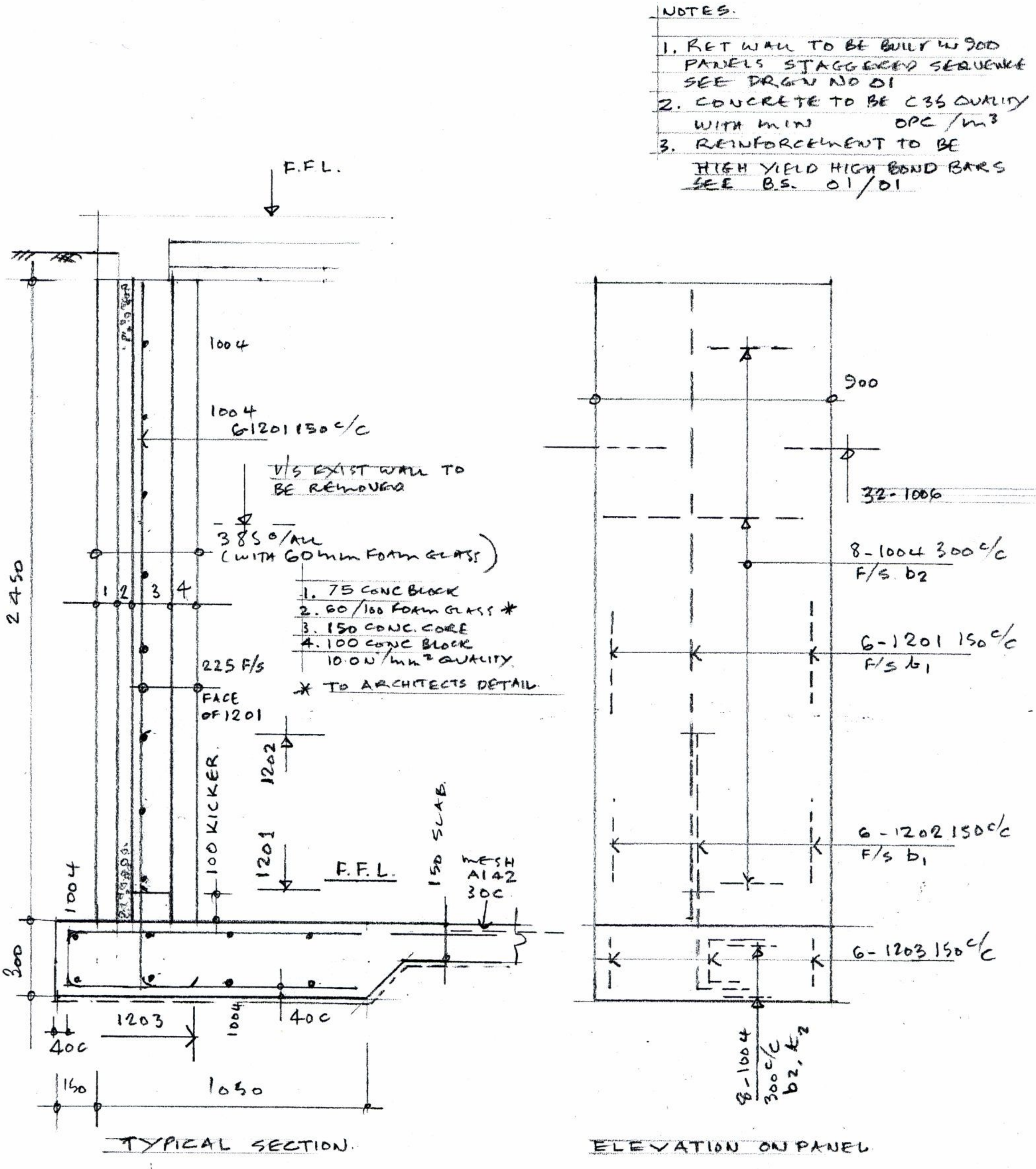


Illustration 5: Basement retaining walls



CASLEY RUDLAND

Consulting Structural Engineers 14 Whiteladies Road Clifton Bristol BS8 1PD Tel: (0117) 973 2727 Fax: (0117) 973 4447

PROJECT: Garage Conversion Sydenham Road Cotham	Date: March 2007	Project No: 1060703
TITLE: Retaining Wall Details	Made by: DV	Sheet No: 02
	Checked by: CR	Scale: 1:20

Illustration 6: Retaining wall sections

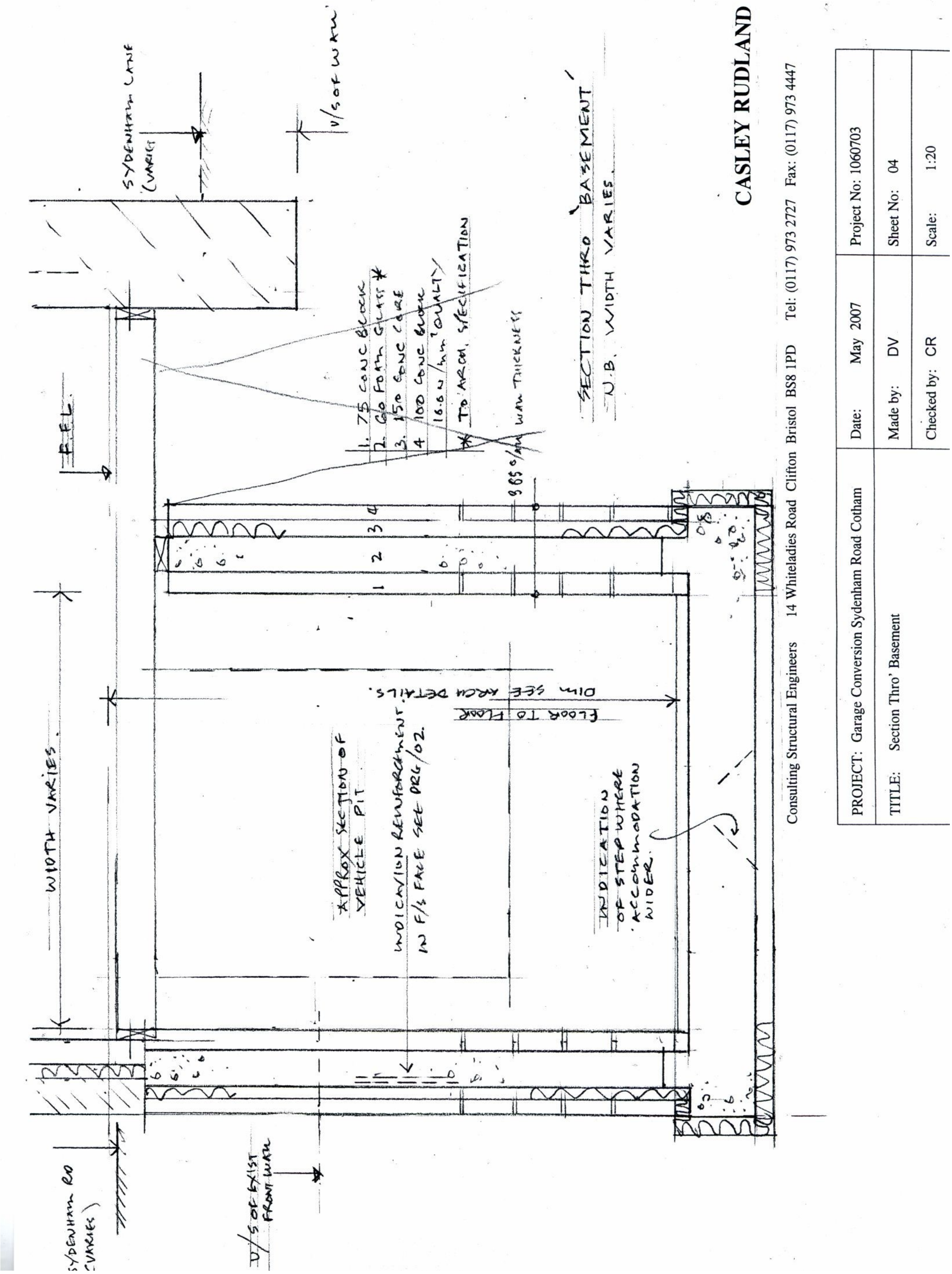


Illustration 7: Cross section through basement

CASLEY RUDLAND

Consulting Structural Engineers 32-34 Hotwell Road Hotwells Bristol Tel: (0117) 929 8598 Fax: (0117) 921 5285

BENDING SCHEDULE

PROJECT: GARAGE CONVERSION SYDENHAM ROAD COTHAM.	Date: MARCH 2007	Project No: 10600320
	Made by: DV	
	Checked by: DC.	Sheet No.: 01

Location	Mark	Type Size	No. Off	No. in each	Total No.	Length mm	Shape Code	A mm	B mm	C mm	D mm	E.R. mm
RET. WALL	01	T12	21	6	126	2300	00					
900WIDE	02	T12		6	126	1750	11	950				
PANELS	03	T12		6	126	1900	21	1150	240			
	04	T10		16	336	800	00					
	06	T10		32	672	600	00					

All bending shapes are in accordance with BS8666

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Illustration 8: Retaining Walls Bending Schedule

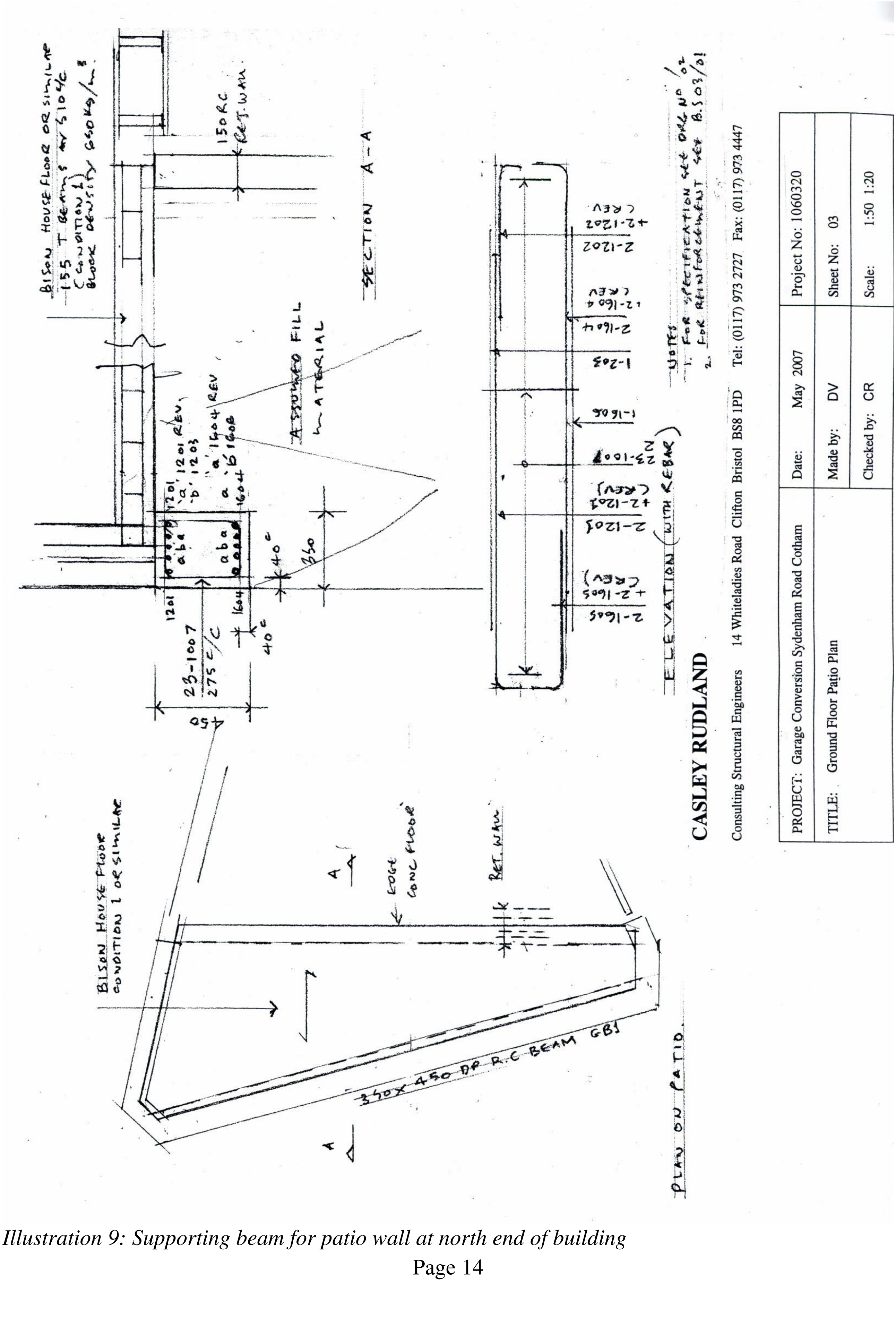


Illustration 9: Supporting beam for patio wall at north end of building

CASLEY RUDLAND

Consulting Structural Engineers 32-34 Hotwell Road Hotwells Bristol Tel: (0117) 929 8598 Fax: (0117) 921 5285

BENDING SCHEDULE

PROJECT: GARAGE ROOF CONVERSION SYDENHAM ROAD COTHAM.	Date: MAY/2007	Project No: 10,60320
	Made by: DW	
	Checked by:	Sheet No.: 03/01

Location	Mark	Type Size	No. Off	No. in each	Total No.	Length mm	Shape Code	A mm	B mm	C mm	D mm	E.R. mm
GROUND FLR	01	T12	1	4	4	6200	12	200				
BEAM	02	T12		4	4	2000	12	200				
350X450 DP	03	T12		1	1	4750	00					
GB1	04	T16		4	4	6200	12	200				
	05	T16		4	4	2000	12	200				
	06	T16		1	1	4750	00					

All bending shapes are in accordance with BS8666

G:\masters\forms\bending

Illustration 10: Bending schedule for concrete beam at north end of building

Flat Roof (Patio)

On the plans, see figure D1 (First Floor Plan). This area is marked 'Patio'. This is above the ground floor rooms.

Constructed from block and beam with EPDM (synthetic rubber) seal and 55mm concrete slab.

Material	**Area (%/100)**	**Thickness (m)**	**R-Value per m**	**Element R-Value**
Concrete	0.14	0.16	0.61	0.01
Celcon Standard Blocks	0.86	0.1	6.67	0.57
Internal Surface Resistance	1	1	0.1	0.1
External Surface Resistance	1	1	0.04	0.04
Isonat (hemp isulation)	1	0.2	25.64	5.13
Plaster Board	1	0.1	6.25	0.63
				6.48
			U-value	0.15

Table 3: Flat Roof (Patio) Heat Calculation

Block and beam design and calculations are by CBS (Precast) Ltd. and are in appendix 5.

The EPDM roofing system is manufactured by Firestone. It will be laid directly on the block and beam and covered with a 55mm slab. The supplier has confirmed this as a standard method. BBA certificate is available at this address-

http://www.rubberepdm.com/technical+help

Drainage from the patio will be via a 55mm deep channel drain. The downpipe goes through the patio deck. The seal around this is as per the EPDM supplier's recommended details.

Notes on Illustration 11: Gable end of building onto patio -

- Step onto patio – 245mm
- EPDM rises 100mm all round patio apart from under slate threshold onto patio.
- DPC wrapped around block and beam is the same on all sides of patio
- Slate perimeter isn't required by EPDM manufacturer
- EPDM is only tucked into block wall enclosing patio, i.e. doesn't span depth of wall as DPC does this.

- Nogin to secure floor deck into UC not shown

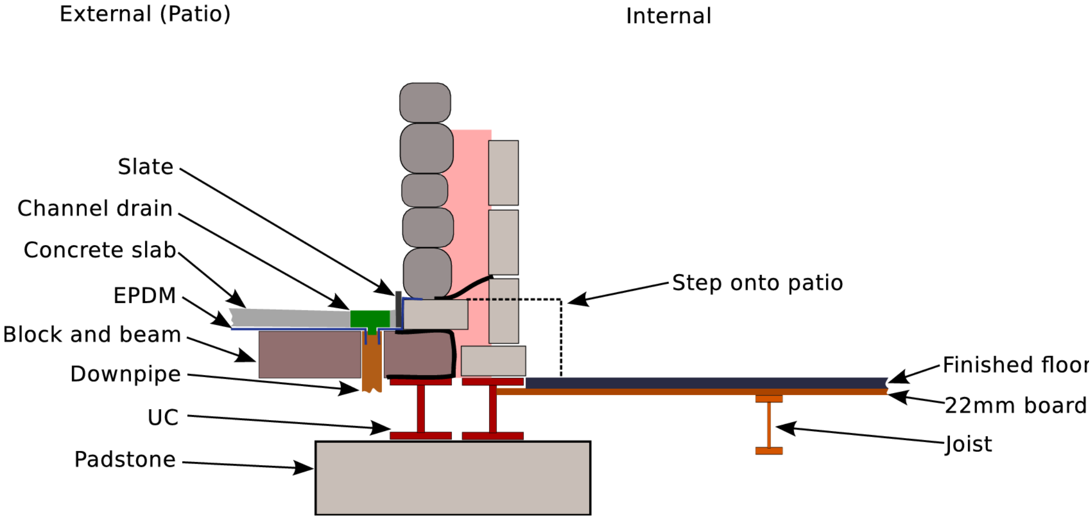


Illustration 11: Gable end of building onto patio

New Cavity Wall

All new walls will be built with 160mm cut stone outer leaf; 100mm standard block inner leaf and 'Rockwool Cavity' full-fill insulation. This is designed to fit against uneven surfaces in a full-fill cavities. The manufacturer's statement is as follows-

> *The full-fill cavity wall insulation is to be 100/120* mm thick Rockwool Cavity, manufactured by Rockwool Limited, Pencoed, Bridgend, CF35 6NY, installed as work proceeds in accordance with the recommendations of British Board of Agrément Certificate no. 94/3079.*
> ** See Heat Calculations for each section.*

It is proposed that a stonework backing block isn't used.

Standard OPC mortar with sharp sand to be used.

Blockwork mortar will be a standard mix.

Below ground mortar will be as specified by the project's structural engineer.

Material	Area (%/100)	Thickness (m)	R-Value per m	Element R-Value
Stonework	0.87	0.15	1.19	0.16
Rockwool Cavity	0.87	0.100	27.03	2.35
Celcon Hi-Seven	0.87	0.100	5.26	0.46
Wall ties	1	0.035	0	0
Windows and Door	0.13		0.83	0.11
				3.2
			U-value	**0.33**

Table 4: New Walls Heat Calculation

Existing Wall

One original wall is kept. The top 1/3 is constructed from brick, the bottom from 8” stone.

This wall will be made into a cavity wall. The bottom thick stone section will be full-fill 'Rockwool Cavity' as above. The brick section will be partial filled.

	Area (%/100)	Thickness (m)	R-Value per m	Element R-Value
Stonework	0.62	0.200	1.19	0.15
Rockwool Cavity (stone section)	0.62	0.100	26.32	1.63
Bricks	0.31	0.440	1.19	0.16
Rockwool Cavity (brick section)	0.31	0.100	43.48	1.35
Celcon Hi-Seven	0.93	0.100	5.26	0.49
Wall ties	0	0.000	0	0
Windows	0.07		0.83	0.06
				3.84
			U-value	**0.26**

Table 5: Existing Wall Heat Calculation

Patio Wall (RSJ Supported)

A pair of 203x133x30KG universal beams will support this new cavity wall. Structural calculations are in Appendix 1.

The beams will be separated by insulation.

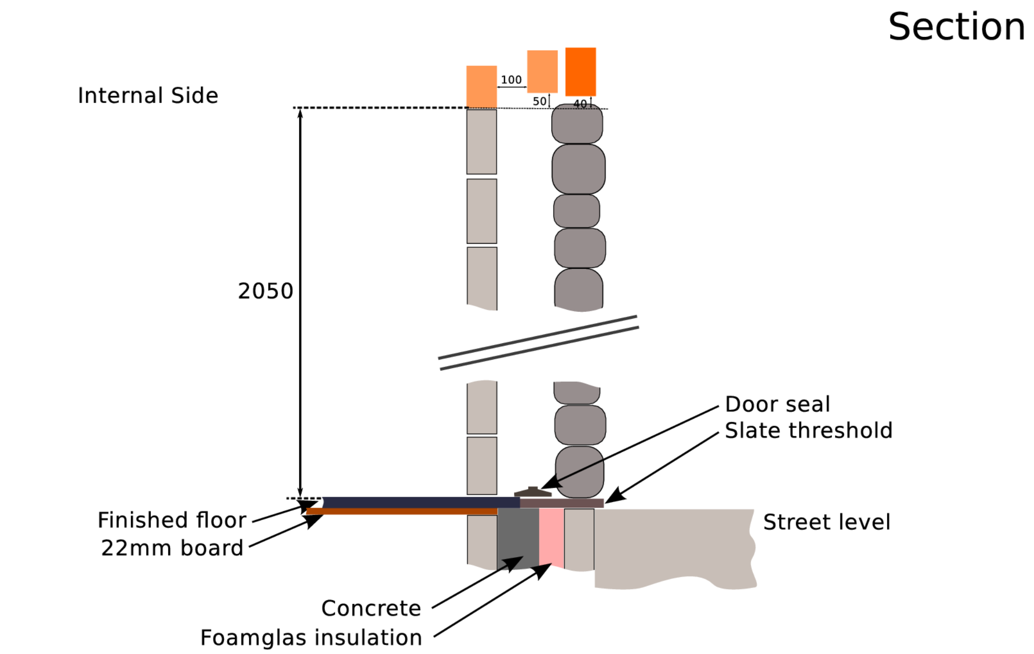
	Area (%/100)	Thickness (m)	R-Value per m	Element R-Value
Stonework	0.73	0.160	1.19	0.05
Rockwool Cavity	0.73	0.120	26.32	2.31
Celcon Hi-Seven	0.73	0.100	5.26	0.39
Wall ties	0	0.000	0	0
Door	0.27		0.83	0.22
				3.07
			U-value	**0.33**

Table 6: Patio Wall Heat Calculations

Front Door

The door will be 898mm wide. The opening is 1300mm wide and incorporates a side light.

Sydenham road slopes and the property is directly facing onto the public highway. The threshold will be a 35mm slate, the left side will be 15mm above street level ; the right side will be 90mm above street level. See Illustration 12.



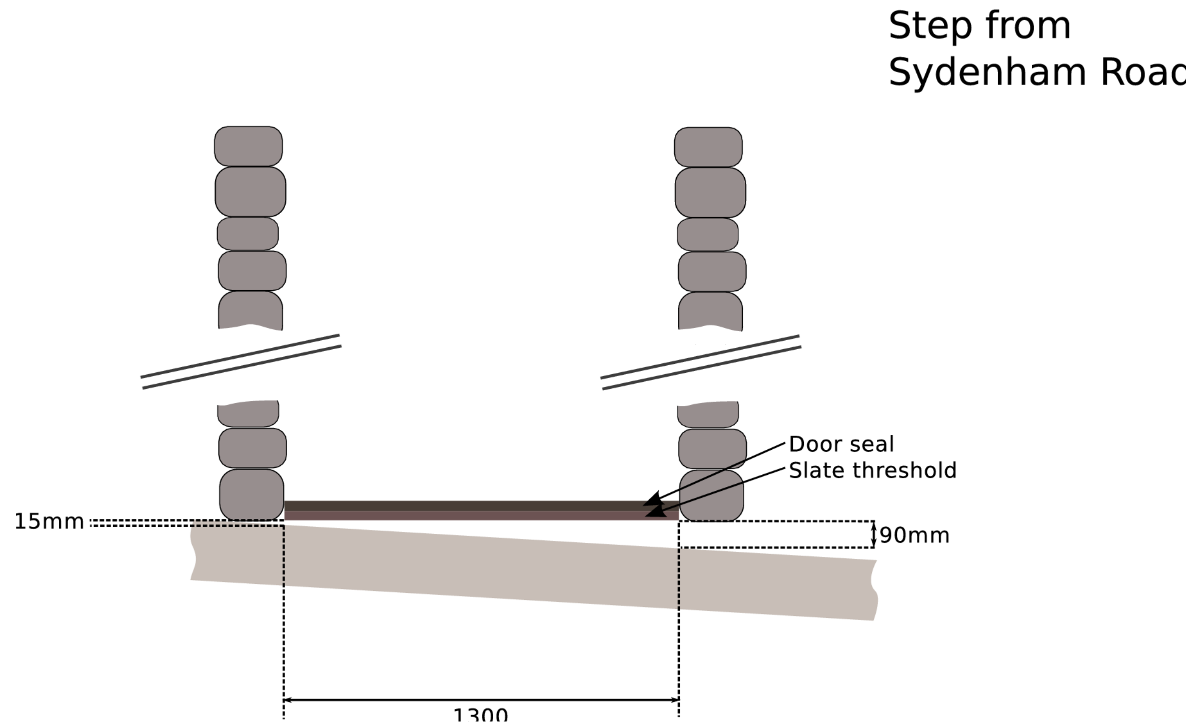


Illustration 12: Front door

Roof

This 'Roof' section is incorrect and incomplete!

The existing roof will be left in place. It is constructed with a non-breathing felt and slate tiles. 50mm air gap will be left between the Triso-super 10 insulation and the felt.

Material	Area (%/100)	Thickness (m)	R-Value per m	Element R-Value
Timber Studs	0.14	0.110	7.69	0.12
Rockwool	0.86	0.048	27.03	1.11
Plaster Board	1	0.013	6.25	0.08
Triso-super-10	0.86	0.012		4.51
				5.82
			U-value	**0.17**

Table 7: Roof Heat Calculations

The joist depth is 110mm. The proposed primary insulation material is Triso-Super 10 (http://www.actis-isolation.com). The remaining 48mm of space will be filled with Rockwool as a supplementary insulation.

Joists

This section is incorrect and incomplete!

Illustration 13 shows the proposed joist layout. The orange joists are the wooden i-beams as described below. The left blue joist is the pair of RSJs detailed in the “Patio Wall (RSJ Supported)” section. The other two blue joists are solid wood joists as part of the roof structure.

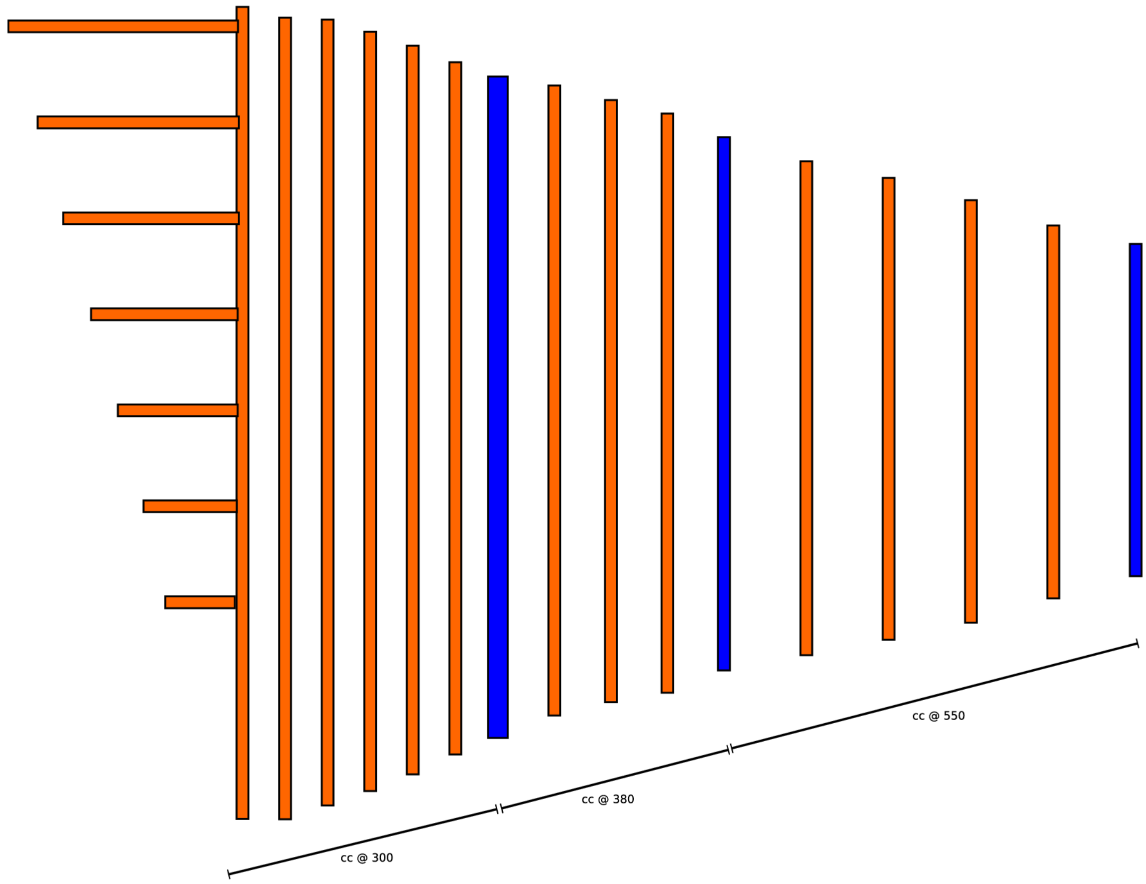


Illustration 13: Joist Layout

Working with the span table from James Jones and Sons.
http://www.jji-joists.co.uk/index.php?id=span

- JJI-220D-24 seems most suitable for me as it fits within the expected depth of the RSJ supporting the north end wall.
- Could use wider spacing and deeper joists but it will be simpler if I use the same depth everywhere.
- Will use the "Dead Load up to 0.75kN/m^2" spec. 220D allows max. 5375 span so fits the wide end. Will need 300 spacing for this span.
- As the building is triangular, the spacing will vary. The building will be in three zones divided by the three fixed beams. These three fixed beams are (i) RSJs under north wall (ii) north wooden arch (ii) south wooden arch. Joists in each zone will have the same spacing. The spacing will be determined by the longest joist in the section. Chosen spacing is determined by adding joists to fit between the fixed beams until the spacing is below min. required spacing as stated on the JJI tables.
  - zone (i) – max. joist span = 5370 ; min. spacing = 300 ; chosen spacing = 300
  - zone (ii) – max. joist span = 4380 ; min. spacing = 480 ; chosen spacing = 380
  - zone (iii) – max. joist span = 3530 ; min. spacing = 600 ; chosen spacing = 560

- North of zone (i) are 7 perpendicular joints. Verbal confirmation of this design has been given by the manufacturer. Written confirmation to follow. If this is a problem, the wall separating the bedroom and office could become load bearing OR custom angled hangers OR build joist ends into the blockwork.

Drainage Details

Central Conduit

In the centre of the building is an approx. 900x180 services conduit. All pipes and cables between floors will be routed through this conduit. The surrounding construction will be block masonry with sound proofing insulation.

Alternative placement of the services conduit has been considered as the current central positioning prevents the ground and basement floors being used a fully open plan areas. The joist layouts between the ground and first floor do not require a load baring wall so other aspects of the building do allow for open plan areas.

Main Stack

The main stack will be in the central conduit with an 'Air Admittance Valve' at the top. All drainage above the basement level will be connected to this stack.

At the base of the stack will be a Shallow Inspection Chamber (see Illustration 15) which takes the waste from the stack plus bathroom and storage room which are both at the basement level. The inspection chamber will be covered with a double seal screw down cover.

The route taken in relation to adjacent retaining wall panels by the soil pipe that exits the building is shown in Illustration 14. It will be 110mm underground rated soil pipe 3.1m long. This pipe is bedded on pea gravel in a conduit under the retaining wall panels. A cross section of a retaining wall panel can be seen in Illustration 3 on page 6. An end view including the soil pipe conduit can be seen in Illustration 16 on page 27.

The conduit is cut into the rock and the sides are standard density 75mm celcon blocks. The top is covered with roofing slate as very little strength is required. The top supports one layer of the foamglas on to which the concrete is poured.

The inspection chamber is housed in an enclosure made from the same 75mm celcon blocks and it joins the drainage conduit. See Illustration 17 page 28. The inspection chamber is on the dry side of the DPM where as the drainage conduit is entirely on the wet side.

Between the two courses of blocks making up the sides of this enclosure is a 1200 gauge DPM which extends under the concrete base of the enclosure. This DPM extends out to be lapped between the top two layers of foamglas.

This soil pipe's conduit is below the DPM provided by the foamglas. The seal between dry and wet will be made where the soil pipe leaves the inspection-chamber/central conduit. This will ensure it is accessible in the event of a leak. There is a 300x300 manhole cover to facilitate this. Neoprene will be used used to make the seal between the pipe and block.

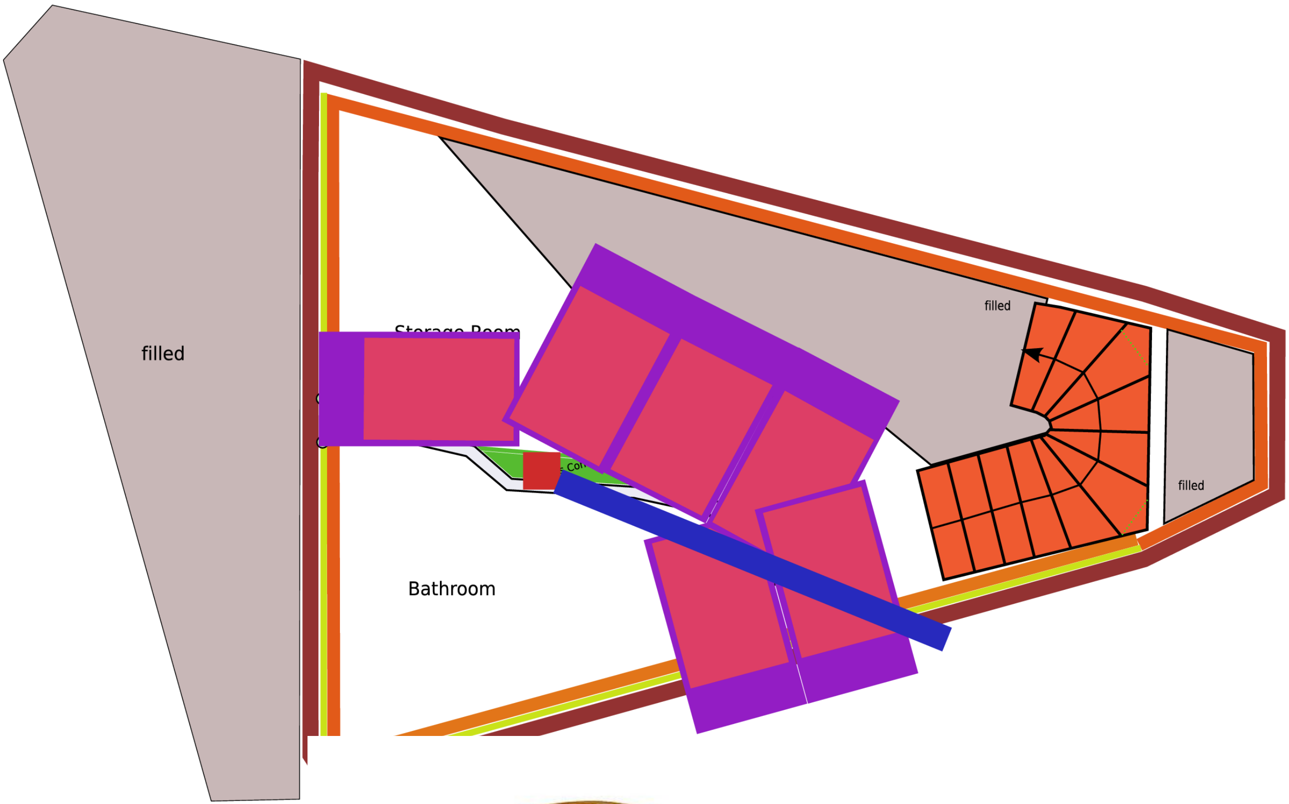


Illustration 14: Position … blue. The inspection chamber is marked as a red squa … .

Illustration 15: The type of shallow inspection chamber to be used.

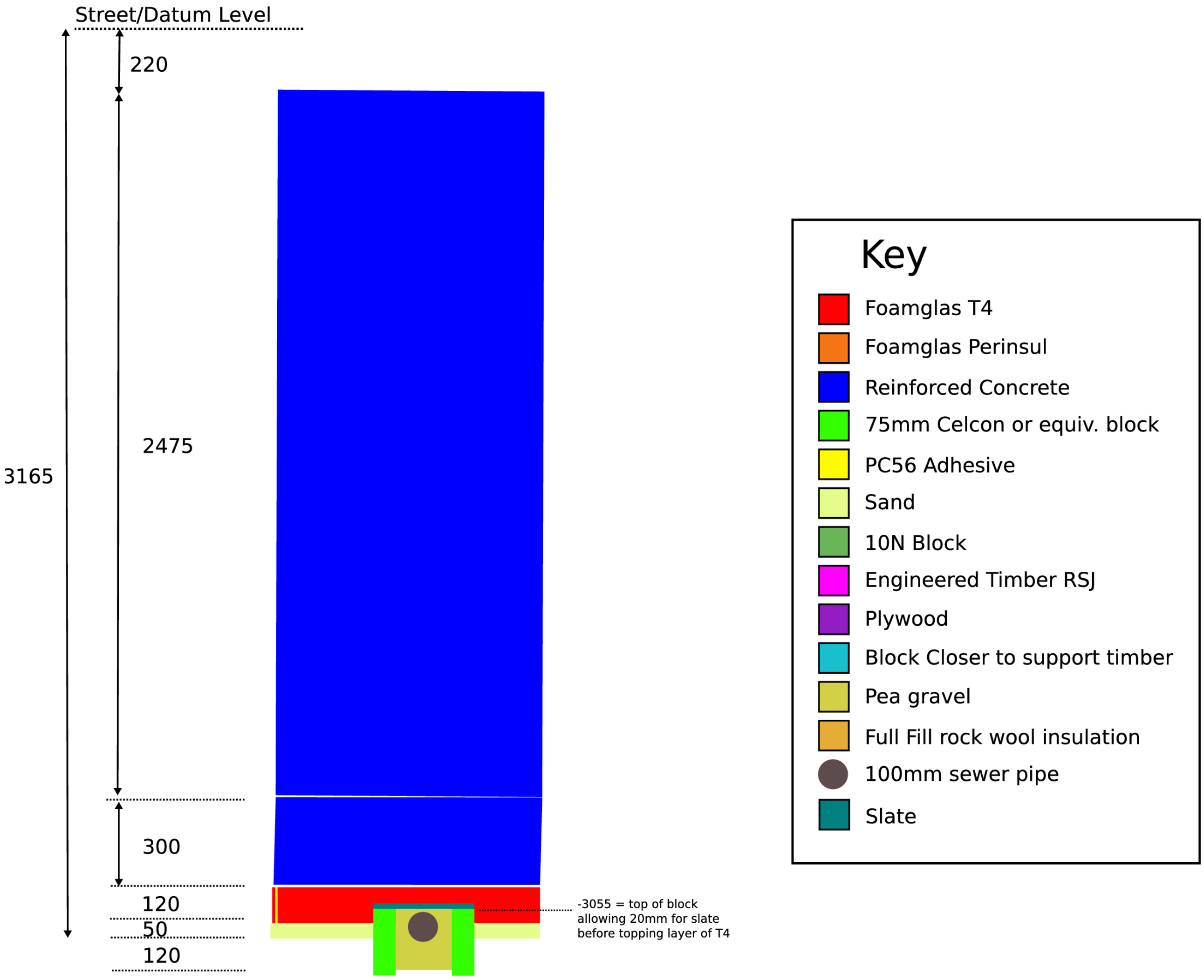


Illustration 16: Drainage channel under retaining wall panel.

Inspection Chamber Detail

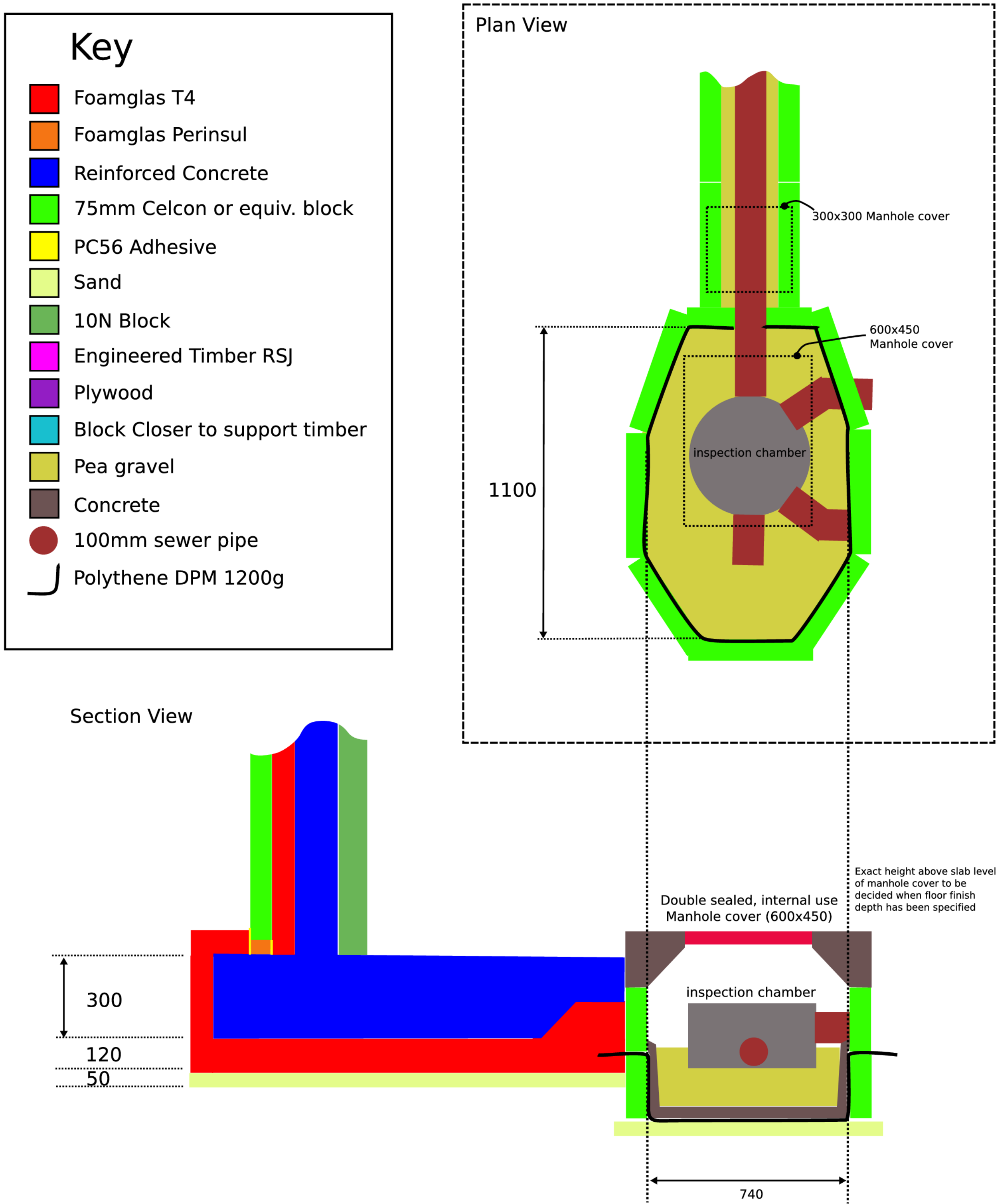


Illustration 17: The soil pipe and inspection chamber are housed a blockwork channel and enclosure respectively. These are shown in section and plan. The section shows the relationship with the retaining wall.

Basement Drainage

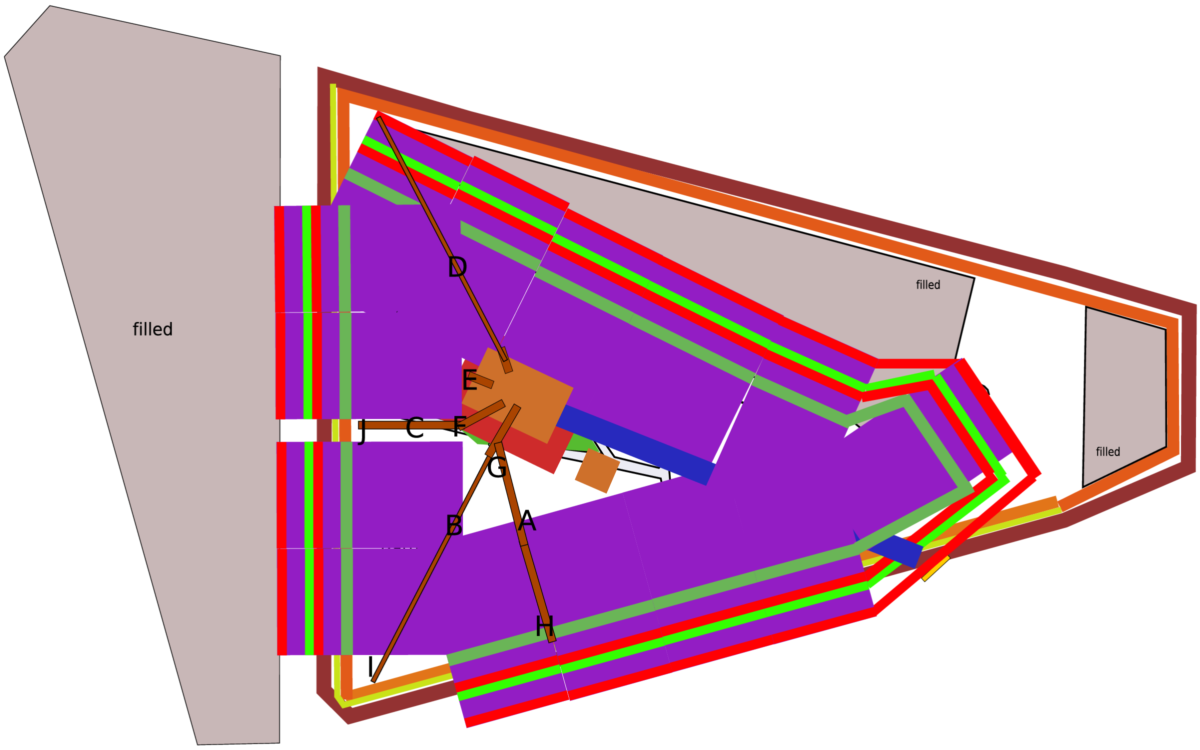


Illustration 18: Basement drainage showing the retaining wall panels

Pipe Label	Key Feature
A	110mm pipe ; approx 1750mm; fall of 40mm
B	50mm pipe ; approx 2400mm; fall of 100mm
C	110mm pipe ; approx 1200mm ; fall of 20mm
D	50mm pipe to storage room; for washing machine ; approx 2200mm; fall of 100mm
E	110mm stack see 'Main Stack' section above
F	Adjustable bend, approx. 40 degrees
G	45 degree
H	Position of washbasin; 110mm-32mm adapter; 87.5 degree long radius bend
I	Shower trap
J	Position of WC; 87.5 degree long radius bend

Table 8: Key details from basement drainage diagram

- All pipes in the basement are set in concrete. David Veale the structural engineer has suggested these are wrapped in neoprene or similarly compressible material to protect during the concrete pour. The pipe manufacturer does not mandate the use of this wrapping as can be seen on this page- http://content.wavin.com/__C1256AF4003281D0.nsf/0/3251F5E1F46ABD7BC125709B006AE586?OpenDocument#section1
- The manufacturer recommends filling the pipe with water to act as ballast during the pour.
- The only movement join is between the inspection chamber and it's out pipe
- Label A in Illustration 18: Basement drainage showing the retaining wall panels is for a 110mm pipe which services a wash basin. This is intentionally oversized to allow the WC to be in two possible positions. This pipe is placed between two retaining wall concrete reinforcing cages.

Appendix 1 – Structural Engineering Calculations

CASLEY RUDLAND

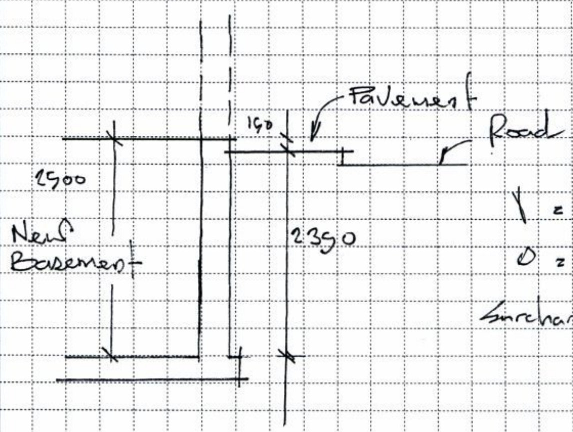
Consulting Structural Engineers 14 Whiteladies Road Clifton Bristol BS8 1PD Tel: (0117) 9732727 Fax: (0117) 9734447

CALCULATIONS

PROJECT: Conversion of Garage Sydenham Rd	Date: 03/07	Project No: 1060320
	Made by: BS	
	Checked by: RJ	Sheet No: 1

ITEM	ELEMENT	OUTPUT

Proposed New Basement Wall



$\gamma = 18 kN/m^2$

$\phi = 30°$

Surcharge = 10 kN/m²

Earth / Backfill :-

$q_2 = K_2 \gamma h = 0.33 \times 18 \times 2.35 = 13.959 kN/m^2$

$F = 13.959 \times 2.35 \times 0.5 = 16.40 kN/m$

$l_a = 2.35/3 = 0.783 m \times$ " = 12.85 kNm

×1.4 = 17.985 kNm

Surcharge :-

$q_s = 10 kN/m^2 \therefore h_e = 10/18 = 0.555$

$q_s = K_2 \gamma h_e = 0.33 \times 18 \times$ " = 3.3 kN/m²

$F_s = q_s h_1 = 3.3 \times 2.35 = 7.755 kN/m$

$l_a = 2.35/2 = 1.175 \times$ " = 9.112 kNm

×1.6 = 14.579 kNm

Σ 1.4 + 1.6 BM's = 17.985 + 14.579 = **32.564 kNm**

P03/2

CASLEY RUDLAND

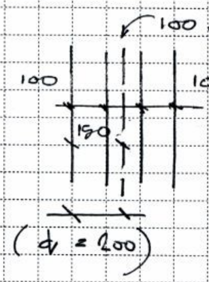
Consulting Structural Engineers 14 Whiteladies Road Clifton Bristol BS8 1PD Tel: (0117) 9732727 Fax: (0117) 9734447

CALCULATIONS

PROJECT:	Date: 03/07	Project No:
Sydenham Rd	Made by: BS	1060320
	Checked by: PV	Sheet No: 2

ITEM	ELEMENT	OUTPUT

Stem Design



100 con core (150)

Σ 300 c/c (350 c/c)

Block fW (10N in iii) = 8.2N/mm²

γ_m = 1.8

R = 1.3

$M_{rc} = Rbd^2 = 1.3 \times 1000 \times 190^2 / 10^6 =$ 29.25 kNm < 32.964 kNm

∴ Increase wall thk to say 350

∴ d = 200

$M_{rc} = 1.3 \times 1000 \times 0.2^2 =$ 52 kNm > 32.964 kNm

∴ adequate

$A_s = \frac{M_a \gamma_{ms}}{f_y l_a} = \frac{32.964 \times 10^6 \times 1.15}{460 \times 0.85 \times 200} =$ 479 mm²

T10 @ 150 c/c = 523 mm² > 479 mm²

CASLEY RUDLAND

Consulting Structural Engineers 14 Whiteladies Road Clifton Bristol BS8 1PD Tel: (0117) 9732727 Fax: (0117) 9734447

CALCULATIONS

PROJECT: Sydenham Rd	Date: 03/07	Project No: 1060320
	Made by: BS	
	Checked by:	Sheet No: 3

ITEM	ELEMENT		OUTPUT	
			Gk kN/m²	Qk
	Roof loading :-			
	Gk = 0.9 / cos 30°	=	1.40	—
	Qk = 0.75 ((60 − 30) / 30)	=	—	0.25
	1st Floor & Grd Floor	=	0.50	1.50
	Partitions	=	—	0.50
				2.00
	Existing Walls (≥ 300 thk o/a)			
	Gk = 22 × 0.3	=	6.6	—

P03/2

CASLEY RUDLAND

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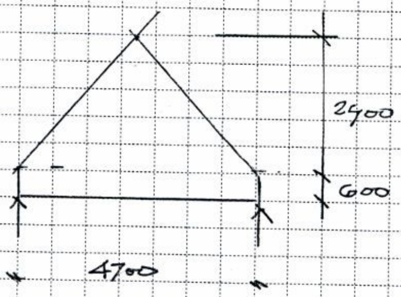
CALCULATIONS

PROJECT: Sydenham Rd	Date: 03/07	Project No: 1060320
	Made by: BD	
	Checked by: W	Sheet No: 4

ITEM	ELEMENT	OUTPUT

Twin Beams @ 1st floor



Wall Gk = 6.6/2 = 3.3 per beam

Gk UDL	= 3.3 × 0.6 + 0.3 (sw)	=	2.28	–
Gk △	= W = 4.7 × 2.5 × 3.3/2	=	19.39kN	–
Qk Floor	= 2.0 × 0.2	=	–	0.40
Gk "	= 0.5 × 0.2	=	0.10	–
	UDL Σ	=	2.38	0.4
			× 1.4	× 1.6

Σ = 4.0kN/m

△ × 1.4 = 27.145kN

BM UDL = 4.7² × 4.0 /8 = 11.045

" △ = 27.145 × 4.7/6 = 21.264

Σ = 32.309kNm

Use 203 × 133 × 30kg UB (2 No)

Mb = 39kNm for Le = 5.0m > 32.309kNm

Reactions = 4.0 × 4.7 × 0.5 × 2 = } 46kN
27.145 × " × 2 = } (twin Beams)

P03/2

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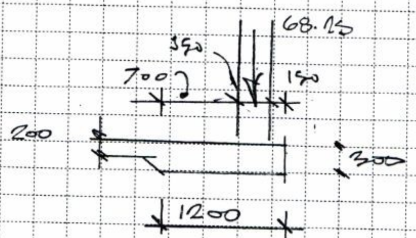
CALCULATIONS

PROJECT: Sydenham Rd	Date: 03/06	Project No: 10600320
	Made by: BD	
	Checked by: W	Sheet No: 2

ITEM	ELEMENT		OUTPUT	
	Loading to external walls			
	Av span of floors & Roof say 4.5 m		Gk (kN/m)	Qk
	Gk 1st = 0.5 x 4.5 / 2	=	1.125	—
	Qk " = 2.0 "	=	—	4.50
	Gk grd & Qk as 1st	=	1.125	4.50
	Roof Gk = 1.4 x 4.5 / 2	=	3.15	—
	" Qk = 0.25 "	=	—	0.56
	Wall Gk = 6.6 x 3.9 (Av ht)	=	25.75	—
			31.15	9.56
			Σ = 40.71 kN/m	
	Twin Beams 46 kN / (1.5 + 2.3 x 2)	=	7.54 "	
			Σ = 48.25 "	
	Retaining wall stem :- see sht 2			
	(22 x 0.2 + 24 x 0.15) x 2.5	=	20.00	
			68.25 "	
	Stem GWB = 12.85 + 9.112 (see sht 1)	=	22 kN/m	



P03/2

CASLEY RUDLAND

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CALCULATIONS

PROJECT: Sydenham Rd	Date: 03/06	Project No: 1060320
	Made by: BD	
	Checked by: NJ	Sheet No: 6

ITEM	ELEMENT	OUTPUT
	Base s/w = 1.2 x 0.3 x 24 =	8.64
		68.25
		76.89 kN/m
	TM @ ℒ Base	
	(68.25 x 0.775 − 22) / 76.89 = 0.042	
	Mid 1/3 = 1200/6 = 0.200 ∴ 1/3	Mid 1/3
	W/A = 76.89 / 1.2 =	64.075
F	M/Z = 76.89 x 0.042 / 0.24 =	13.455
	Z = 1.0 x 1.2²/6 = 0.24 Max Pressure	77.53 kN/m²

P03/2

CASLEY RUDLAND

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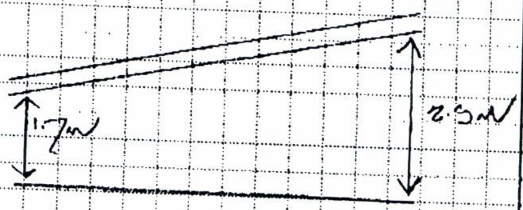
CALCULATIONS

PROJECT: Sydenham Rd	Date: 17/04/07	Project No: 10603120
	Made by: BS	
	Checked by:	Sheet No: 8

ITEM | ELEMENT | OUTPUT



Ratio of Grd Slb = 1.75 + 2.91 = 4.66 kN/m
1.7/2 × " = 4.0
2.9/2 × " = 6.8

" " Slb = 1.5 + 1.5 = 3.00
1.7/2 = = 2.6
2.9/2 = = 4.4

Wall & Grd Beam = 18.00

for design see shts 9/1 ~ 4, summary :-

Beam 390 × 450 dp
Top Reinforcement 5 T12
Bott " 5 T20
Links T10s @ 270 c/c
Concrete C35
cover to Links 40mm

P03/2

CSC TEDDS CASLEY RUDLAND Consulting Structural Engineers 14 Whiteladies Road Clifton, Bristol BS8 1PD	Project SYDENHAM ROAD			Job Ref. 1060320	
	Section BOUNDARY WALL GROUND BEAM			Sheet no./rev. 9/ 1	
	Calc. by BS	Date 17/04/2007	Chk'd by	Date	App'd by	Date

Analysis for a simply-supported single-span concrete beam to BS 8110

Span length & partial factors for loading

Span (mm)	Factors for moments & forces γ_{fd}	γ_{fl}	γ_{fw}
6500	1.40	1.60	0.00

Loading data (unfactored)

Ref.	Category	Type	Load kN/m	Position mm	Load kN/m	Position mm
1	"Dead"	UDL	16.0	0	-	6500
2	"Dead"	VDL	4.0	0	6.8	6500
3	"Imposed"	VDL	2.6	0	4.4	6500

Analysis results

R_a kN (fac)	R_b kN (fac)	V kN (fac)	M kNm (fac)
121.0	126.4	126.4	202.6

Unfactored support reactions

Support A	Dead load -74.5 kN	Live load -10.4 kN	Wind load 0.0 kN
Support B	Dead load -77.6 kN	Live load -12.3 kN	Wind load 0.0 kN

Member design checks for a simply-supported single-span concrete beam to BS 8110

RC BEAM DESIGN (BS8110) CONCRETE RECTANGULAR BEAM DESIGN (CL 3.4.4.4)

BEAM DEFINITION

Beam width $b = 350$ mm

Overall beam depth $h = 450$ mm

Nominal cover to all reinforcement including links $c_{nom} = 44$ mm

Tension bar diameter (try) $D_{try} = 20$ mm

Link bar diameter (try if applicable) $L_{dia\_try} = 10$ mm

Depth to tension steel $d = h - c_{nom} - L_{dia\_try} - D_{try}/2 = 386$ mm

Characteristic strength of reinforcement $f_y = 460$ N/mm²

Characteristic strength of concrete $f_{cu} = 35$ N/mm²

Clear span of beam $L = 6500$ mm

The beam is not a deep beam - calculations OK

CHECK FOR SLENDERNESS (CL 3.4.1.6)

Check for slenderness applies to simple or continuous beams only

CSC TEDDS CASLEY RUDLAND Consulting Structural Engineers 14 Whiteladies Road Clifton, Bristol BS8 1PD	Project SYDENHAM ROAD			Job Ref. 1060320	
	Section BOUNDARY WALL GROUND BEAM			Sheet no./rev. 9/ 2	
	Calc. by BS	Date 17/04/2007	Chk'd by	Date	App'd by	Date

Clear distance between lateral restraints $l = 6500$ mm

Breadth of the compression face $b_c = 350$ mm

Limiting length $l_{lim} = \min(60 \times b_c, 250 \times b_c^2/d) = 21000$ mm

Slenderness check satisfied

CONCRETE RECTANGULAR BEAM COMPRESSION STEEL REQUIRED? (CL 3.4.4.4)

Calculations also valid for flanged beams with neutral axis in flange

Design ultimate moment $M = 203$ kNm

Moment redistribution factor $\beta_b = 1.00$

Reinforcement required

$K = \text{abs}(M) / (b \times d^2 \times f_{cu}) = 0.111$

$K' = \min(0.156, (0.402 \times (\beta_b - 0.4)) - (0.18 \times (\beta_b - 0.4)^2)) = 0.156$

Compression steel not required

Beam requiring tension steel only

$z = \min((0.95 \times d),(d \times (0.5+\sqrt{(0.25-K/0.9)}))) = 330$ mm

$A_{s\_req} = \text{abs}(M) / (1/\gamma_{ms} \times f_y \times z) = 1400$ mm^2

Tension steel

Use 5 No. 20 dia bar(s) $A_{s\_prov} = A_{st} = 1570$ mm^2

Area of tension steel provided sufficient

Check min and max areas of tension steel

Total area of concrete $A_c = b \times h = 157500$ mm^2

Minimum percentage of tension steel $k_t = 0.13$ %

$A_{st\_min} = k_t \times A_c = 205$ mm^2

$A_{st\_max} = 4\ \% \times A_c = 6300$ mm^2

Area of tension steel provided $A_{s\_prov} = 1570$ mm^2

Area of tension steel provided OK

NOTIONAL COMPRESSION STEEL

Provide 5 No. 12 dia bar(s) $A_{s'prov} = A_{sc} = 565$ mm^2

SHEAR RESISTANCE OF CONCRETE BEAMS - $A_v > 2D$ (CL 3.4.5)

Breadth of beam (average web width of flanged section) $b_v = 350$ mm

Effective area of tension reinforcement - at section x-x $A_{s\_shear} = 1570$ mm^2

Design ultimate shear force $V = 128$ kN

Applied shear stress

$v = V / (b_v \times d) = 0.950$ N/mm^2

Check shear stress to clause 3.4.5.2

$v_{allowable} = \min((0.8\ N^{1/2}/mm) \times \sqrt{(f_{cu})}, 5\ N/mm^2) = 4.733$ N/mm^2

Shear stresses to clause 3.4.5.4

Shear stress OK

CSC TEDDS CASLEY RUDLAND Consulting Structural Engineers 14 Whiteladies Road Clifton, Bristol BS8 1PD	Project SYDENHAM ROAD			Job Ref. 1060320	
	Section BOUNDARY WALL GROUND BEAM			Sheet no./rev. 9/ 3	
	Calc. by BS	Date 17/04/2007	Chk'd by	Date	App'd by	Date

It is assumed that nominal shear reinforcement is provided and reinforcement provided by bent up bars is not considered.

Design shear stress

v_c = 0.75 N/mm²

0.5 × v_c = 0.37 N/mm²

Applied shear stress v = 0.950 N/mm²

Shear reinforcement required

The shear stress component resisted by shear reinforcement

v_{sv} = max (abs(v) - v_c , 0.4 N/mm²) = 0.40 N/mm²

Reinforcement Requirements

Characteristic strength of shear reinforcement f_{yv} = 460 N/mm²

A_{sv}_to_s_v_reqd = b_v × v_{sv}/ (0.95 × f_{yv}) = 0.320 mm

Define Links Provided

Provide 10 dia links in 1s @ 275 centres ***Ratio provided*** A_{sv}_to_s_v = 0.571 mm

Link spacing s_v = 275 mm Link diameter L_{dia} = 10 mm No of links in each group L_n = 1

Area of shear steel provided sufficient

SPACING OF SHEAR LINKS (CL 3.4.5.5)

Shear steel Link spacing s_v = 275 mm

Max spacing s_{limit} = 0.75 × d = 289.5 mm

Shear link spacing OK

CONCRETE BEAM DEFLECTION CHECK (CL 3.4.6)

Design ultimate moment M = 203 kNm

Modification Factors

Basic span / effective depth ratio (Table 3.10) $ratio_{span\_depth}$ = 20

The modification factor for spans in excess of 10m (ref. cl 3.4.6.4) has not been included.

f_s = f_y × A_{s_req} / (1.4 × γ_{ms} × A_{s_prov} × β_b) = 279.1 N/mm²

$factor_{tens}$ = min (2 , 0.55 + (477 N/mm² - f_s) / (120 × (0.9 N/mm² + abs(M) / (b×d²)))) = 0.895

$factor_{comp}$ = min (1.5 , 1 + (100×$A_s'_{prov}$/(b×d)) / (3 + (100×$A_s'_{prov}$/(b×d)))) = 1.122

Calculate Maximum Span

This is a simplified approach and further attention should be given where special circumstances exist. Refer to clauses 3.4.6.4 and 3.4.6.7.

Maximum span L_{max} = $ratio_{span\_depth}$ × $factor_{tens}$ × $factor_{comp}$ × d = 7.75 m

Check the actual beam span

Actual span/depth ratio L / d = 16.84

Span depth limit $ratio_{span\_depth}$ × $factor_{tens}$ × $factor_{comp}$ = 20.08

Span/Depth ratio check satisfied

CLEAR DISTANCE BETWEEN BARS IN TENSION (CL 3.12.11.2.4)

ACTUAL CLEAR DISTANCE BETWEEN TENSION BARS

Diameter of tension bars D_t = 20 mm

Number of tension bars L_{nt} = 5

Diameter of shear links L_{dia} = 10 mm

Nominal cover

Nominal cover to steel (links if present) $c_{nom} = h - d - D_t/2 - L_{dia}$ = 44 mm

Actual clear distance

Clear distance between bars $spacing_{bars} = (b - 2\times(c_{nom} + L_{dia}) - D_t) / (L_{nt} - 1) - D_t$ = 35.5 mm

Calculate maximum allowable clear distance

Tension steel

Characteristic strength of reinforcement f_y = 460 N/mm²

Moment Redistribution Factor β_b = 1.00

Approx Service Stress

$f_s = f_y \times A_{s\_req} / (1.4 \times \gamma_{ms} \times A_{s\_prov} \times \beta_b)$ = 279.1 N/mm²

Maximum allowable clear distance between tension bars

$spacing_{max}$ = min ((47000 N/mm) / f_s , 300 mm) = 168 mm

Max distance between bars check - OK

Minimum clear distance between tension bars

Assumed aggregate size h_{agg} = 20 mm

$spacing_{min} = h_{agg}$ + 5 mm = 25 mm

Min distance between bars check - OK

CLEAR DISTANCE BETWEEN FACE OF BEAM AND NEAREST LONGITUDINAL BAR IN TENSION (CL 3.12.11.2.5)

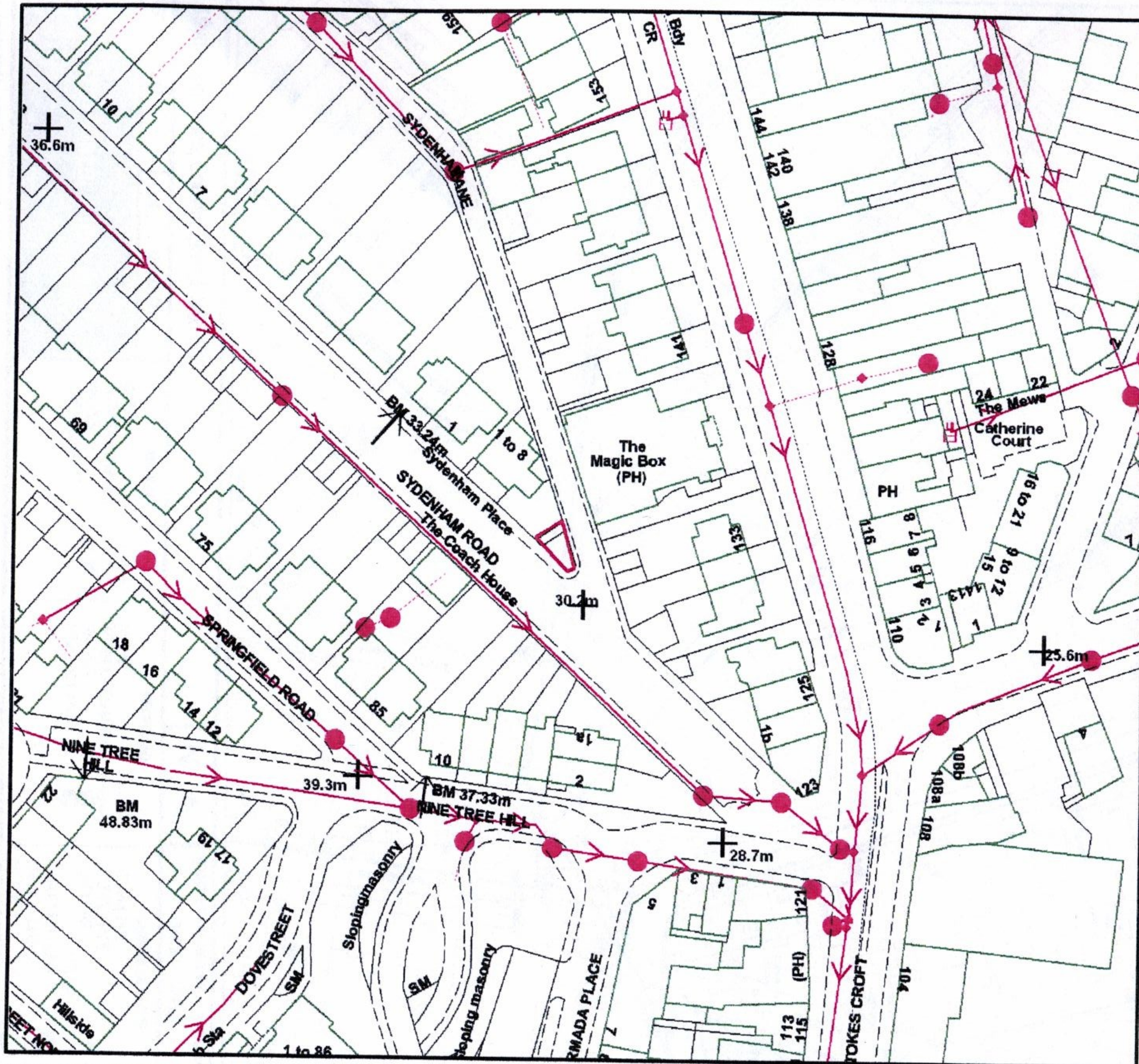
Distance from tension bar to face of beam

$Dist_{face} = c_{nom} + L_{dia} + D_t/2$ = 64.0 mm

$Dist_{max} = spacing_{max} / 2$ = 84.2 mm

Max distance to beam face check - OK

Appendix 2 – Site Location With Sewer Map



1, SYDENHAM ROAD

Drainage & Water Search

114009

WATER MAINS	Public	Private
Public		
Raw Water		
Abandoned		

Valve ✕ Hydrant ● PRV ⧓ Meter

SEWERS	Public	Private/S104
Foul		
Combined		
Surface		

Abandoned Sewers

OTHER WESSEX PIPES

- Rising Main
- Effluent Disposal Main
- Overflow

NON-WESSEX PIPES

- Private Rising Mains
- Culverted Water Course
- Highway Drain

The information supplied in this plan is for the purposes of identification only. The precise route of pipework may not exactly match that shown. Wessex Water does not accept liability for inaccuracies. In carrying out any works, you accept liability for the cost of any repairs to be undertaken by Wessex Water as a consequence of any actions or those of your contractors. You are advised to commence excavations using hand tools only and not to use mechanical digging equipment until pipework has been precisely located. If you are considering any form of building works and pipework is shown within the boundary of the property owned by you or to be purchased (or very close by) you should ask a surveyor to plot its exact position on the ground prior to purchase. Building over or near Wessex Water's apparatus is not normally permitted.

Printed on: 17/05/2005 11:31

Centre: 359074.81 , 174116.12

Scale = 1:1000

Metres 20 40

Appendix 3 – Foamglas Certification

This is a separate document available on http://www.toblerhome.co.uk/TechDocs

Appendix 4 – Foamglas Radon

08/03 2007 THU 14:54 FAX 0118 950 9019 Pittsburgh Corning UK →→→ Mandy

RADON

Recent findings link radon gas emissions from bed rock, i.e. Granite to certain forms of Leukaemia.

Radon is a colourless, odourless, radioactive gas given as a by-product of the decay of naturally occurring uranium and radium. The potential concentration of radon within the Granite is variable and as such the risk may be greater on some sites than on others.

Being gaseous, radon penetrates up through the subsoil and through cracks and fissures, and as such can make its way into the atmosphere and into spaces under and within buildings, where it is then trapped.

HOW RADON GETS IN

1. Through cracks in solid floors
2. Through construction joints
3. Through cracks in walls below ground level
4. Through gaps in suspended floors
5. Through cracks in walls
6. Through gaps around service pipes
7. Through cavities in walls

METHOD OF PROTECTION

The installation of FOAMGLAS Floorboard with our own PC56 adhesive in the joints completely stops the permeability of radon gas. This in turn gives a very high degree of protection and has the advantage of being easy to install.

In 1989 tests were carried out by Pittsburgh Corning Europe to establish whether FOAMGLAS was a safe and restrictive material to use in buildings as far as radiation seepages were concerned.

In the UK Government Guidelines suggest that actions should be taken as soon as reasonably practicable for average radon concentrations of 400 Bq/m^3 over a full year.

In Belgium where the tests were carried out the contribution to the radon concentration in the test room due to leakage through the FOAMGLAS Floorboard was less than 3.2 Bq/m^3 which is 15 times lower than the average radon concentration in Belgium (50 Bq/m^3), and 125 times lower than the average in the UK.

It is obviously easier to design new buildings to have low levels of radon than it is to reduce high levels in existing buildings, but at least in FOAMGLAS Floorboard building owners can be sure that it is a safe barrier against radon passing through it.

With FOAMGLAS Floorboard 50 mm thick applied to the existing floors an improvement in insulating value and better use of heating energy can also be achieved.

Appendix 5 – Block and Beam Design and Calcs

Appendix_5_Beam_Block_Calc1.pdf and Appendix_5_CBS_Design.pdf are separate documents available on http://www.toblerhome.co.uk/TechDocs