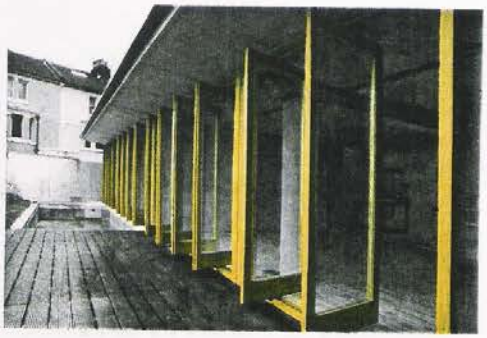


THE SMART HOUSE

The smart house is a single storey, single frontage dwelling that is embedded into the ground. Facing due south and with a grass roof the smart house uses passive environmental systems to provide a comfortable internal environment all year round. It also uses the latest environmental technology to generate energy and hot water to cater for the requirements of the residents.

DESIGN ETHOS

The design has fundamentally integrated the environmental aspects they are not bolted on as an after thought but form the basis for the design aesthetic, in part illustrating that sustainable architecture has to begin through a thoughtful understanding of environmental techniques. In principle, the scheme could be constructed as a modular system that is designed to be fairly accessible to most people.

- Almost zero energy
- Low maintenance
- Minimum visual impact
- Minimal running costs
- Interior to be constructed of Sustainable materials
- Contemporary design but with ethical values

WSP Environmental Ltd.

SMART HOUSE, BRIGHTON

Performance Specification for the for integration of renewable and energy efficiency technologies

WSP Environmental Ltd
Buchanan House
24-30 Holborn
London
EC1N 2HS

Tel: +44(0)207 314 5000
Fax: +44(0)207 314 5005

http://www.wspgroup.com

Issue/revision	Issue 1	Revision 1	Revision 2	Revision 3
Remarks	Draft	Final		
Date	19 March 2003	28 April 2003		
Prepared by Signature	Rosa Schiano-Phan			
Checked by Signature	Camilo Diaz			
Authorised by Signature	Peter Sharrat			
Project number File reference	12081232-001			

SMART HOUSE, BRIGHTON

Performance Specification for the for integration of renewable and energy efficiency technologies

CONTENTS **PAGE**

SMART HOUSE, BRIGHTON

Performance Specification for the for integration of renewable and energy efficiency technologies

1 INTRODUCTION

WSP Environmental were asked to outline a performance specification on the integration of renewables and energy efficiency technologies into the Smart House, Brighton. The integration of the following items is described below:

- Photovoltaics
- Solar Water Heating
- Rain Water Collection
- Natural Ventilation and Heating Systems

SOLAR UK

LaZer2 Advanced Solar Water Heating Systems
&
Photovoltaic Solar Electricity Systems

Prepared By: Duncan Lee

Prepared For: Mr Brace

Date: 20/05/2013

Reference: C699842.P699889.Q3

SolarUK, Commonswood Farm, Hastings Road, Northiam, East Sussex, TN31 6HY

Tel: 01797 253 563

Fax: 01797 253 784

Web: www.SolarUK.com

eMail: Annette.Softley@SolarUK.com

The dimension of a panel is 1640 x 992 x 50mm.

I have looked at various alternatives, and would propose to use a larger panel with higher wattage, but with a reduced number of panels.

This will give you a slightly higher wattage system, and a slightly increased annual energy yield.

System Specifications

System Size:	*2.295kWp*
Modules:	*9 X Suntech 255w*
Inverter:	*1 X Sunny Boy 2000HF*
Cost Including VAT:	*£3,887.97*

2.295 kW System

Smart House Q3

Qty	Code	Item
9	A798888	Suntech STP255S
1	A799744	SMA Sunny Boy SB2000HF
2	A799946	Mounting framework - On roof (Per kW)
1	CRN100	Generation meter 20 KW Single phase
1	A799940	DC & AC Switches and cables
3	899823	Installation

Total (excluding VAT)

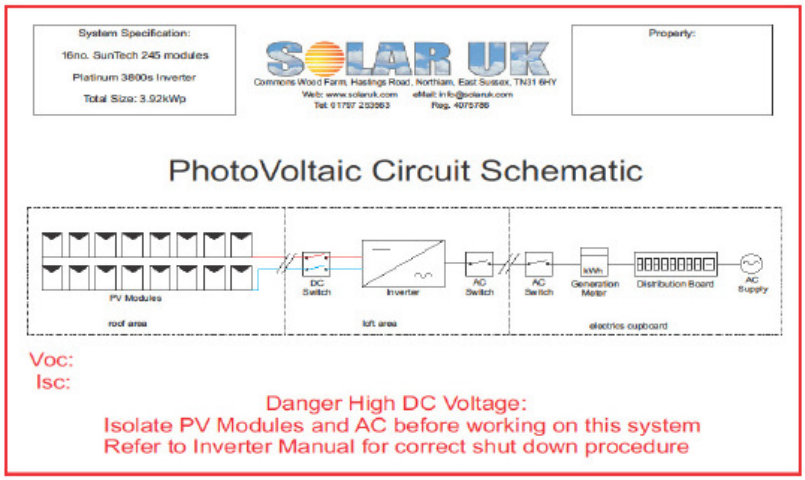
Total (invoice value inc. VAT @ 5%)

50% deposit requested with order

Commonswood Farm
:ings Road, Northiam, Rye
East Sussex, TN31 6HY
info@solaruk.com
www.Solar*UK*.com
Sales: 01797 253563
Admin/Technical: 01797 252654
Reregistered in England:4075786

MCSR 6.03 V1.3

Typical System Schematic



To order this system please complete and return the attached order acceptance, or to discuss any aspects of this quote, please call me on 01797 253 563. We typically ask for a 50% deposit inclusive of VAT to confirm an order.
The remaining balance will be due immediately on completion of the installation. This quote is valid for 4-weeks.

MCS Statement:
The performance of solar PV systems is impossible to predict with certainty due to the variability in the amount of solar radiation (sunlight) from location to location and from year to year. This estimate is based upon the Government's standard assessment procedure for energy rating of buildings (SAP) and is given as guidance only. It should not be considered as a guarantee of performance.

Please note that it is the customer's responsibility to obtain the relevant planning permission/consent and for informing build control of the works to be undertaken. Any remedial work on the house wiring for it to comply with the electrical regulations is outside the scope of this quotation.

A copy of our terms and conditions are available upon request.

If you have any further queries please do not hesitate to contact me.

Yours sincerely

Duncan Lee

Commonswood Farm
Hastings Road, Northiam, Rye
East Sussex, TN31 6HY
info@solaruk.com
www.Solar*UK*.com
Sales: 01797 253563
Admin/Technical: 01797 252654
Reregistered in England:.4075786

3 SOLAR WATER HEATING

A Solar Hot Water System will be located on the roof area indicated on the annotated sketches (SK3 Appendix B). This will provide hot water to the kitchen and toilets. Hot water will be generated by:

Option 1. $2m^2$ Evacuated tubes Solar Collector Thermomax System or equally approved;

Option 2. 4.12 m^2 Flat Plates Solar Collector AES System or equally approved.

Option 1 shall comprise:

- 20 evacuated heat-pipe solar collector tubes with insulated stainless steel manifolds;
- Active pack including digital read-out controller
- Pipe work and isulation
- Twin-coil (10M head) cylinder (48"x18")

Option 2 shall comprise:

- 4.12 m^2 collectors (see Appendix B);
- 1 x mains pressure AquaSol Duo unit;
- 1 x 140 litre unvented cylinder;
- pipes, fittings and electrics.

4 RAIN WATER HARVESTING

Rainwater drained from the roof of the Smart House will be employed for normal household use such as bathrooms, toilet flushing and washing appliances, etc.

The proposed rainwater system shall comprise:

- 1 x 1,500 litre ECO-VAT GRP (Glass reiforced plastic) tank supplied by Polypipe Civils Ltd or similar approved. The tank shall be located in the storage room as shown in sketch 4 in Appendix C.
- Rainwater collection systems will be fitted with ECO-VAT system ECVT1.5GG comprising gravity components and leaf filter supplied by Polypipe Civils Ltd or similar approved.
- Installation will be in accordance with manufacturers recommendations, taking into full account the structural implications of the rainwater storage tanks.

- Pumping systems will be installed where necessary to ensure the tank can be filled to maximum capacity.

Overflow systems are to be installed to remove excess drainage water in the event of the tank becoming full. Overflow water will be disposed of as per the rest of the non-harvested roofwater.

5 PASSIVE VENTILATION AND HEATING SYSTEMS

A Natural Ventilation Strategy has been developed to provide adequate ventilation and remove part or the whole of the cooling loads in the different spaces. Underfloor heating shall be provided in winter to meet the house's heating loads. Provisions to achieve the required indoor environmental conditions shall be made in providing the following systems:

- **Natural Ventilation System;**
- **Control System;**
- **Underfloor Heating System.**

Natural Ventilation System

A description of the Natural Ventilation Strategy and related system follows for each room.

Buffer Zone

- External Solar Shadings (depth 1800mm) as Colt Louvers or equally approved;
- Double glazing unit to the external openable glass doors as Pilkington clear glass or eq. appr.;
- Motorised high level louvers on the external glass doors (see sketch 5 and picture – Appendix D) to provide 0.35m² max net free opening area, as colt Eurolam or equally approved; in winter minimum fresh air will be provided by crack opening the louvres.
- Motorised low level louvers on the external glass doors (see sketch 5 and picture – Appendix D) to provide 0.35m² net free opening area as Colt Eurolam or equally approved; in winter minimum fresh air will be provided by crack opening the louvres.
- Low emissivity double glazing unit (6-12-6mm) to the internal openable glass doors as Pilkington Kappafloat/Clear or eq. appr.;
- Motorised floor dampers under DG doors to provide 0.025m² net free opening area (see SK5 – Appendix D);
- Insulated shutters to the bedroom's DG doors (U-value 1.6W/m²).

Lounge and dining areas

- Low emissivity double glazing unit (6-12-6mm) to the internal openable glass doors as Pilkington Kappafloat/Clear or eq. appr.;
- Motorised dampers and floor grill under DG doors to provide 0.05m² total net free opening area for trickle ventilation from the buffer zone (see sketch 5 – Appendix D);
- Motorised dampers and floor grill to provide 0.26m² net free opening area. This applies only if a underfloor ventilation system is adopted (see sketch 6, 7 – Appendix D);
- The concrete soffit shall be left exposed to increase the thermal mass of the room.

Bedrooms

- Low emissivity double glazing unit (6-12-6mm) to the internal openable glass doors as Pilkington Kappafloat/Clear or eq. appr.;
- Motorised dampers and floor grill under DG doors to provide 0.025m² net free opening area in each bedroom for trickle ventilation from the buffer zone (see sketch 5 – Appendix D);
- Motorised dampers and floor grill to provide 0.13m² net free opening area for each room. This applies only if an underfloor ventilation system is adopted (see sketch 6, 7 – Appendix D);
- Cross ventialtion in summer will be enhanced by opening the doors.
- The concrete soffit shall be left exposed to increase the thermal mass of the room.

Toilets

- Manually or automatically operated horizontal pivoted vents on the N facing perimeter wall to provide 0.5m2 max net free opening area, as Colt Eurolam or equally approved. The vents shall use translucent glass blades to provide privacy and maximise daylighting.
- The concrete soffit shall be left exposed to increase the thermal mass of the room.

Kitchen

- Manually or automatically operated horizontal pivoted vents on the N facing perimeter wall to provide 0.5m2 total net free opening area.

Controls

The openings shall be manually controlled and automatically operated using:

- Motorised louvers, vents and dampers;
- Automatic opening gear and motors.

A list of manufacturers and suppliers of automated opening devices is appended (App. E).

Underfloor Heating

The new area is to be heated by means of a tubular, under floor system, which will comprise:

- A system of pipework suitable for solid or suspended floors as may be specified by the Architect. The material shall be cross-linked polyethylene pipe with integral oxygen diffusion barrier and outer protection barrier.
- Any necessary bend supports.
- Manifolds and heat emission plates.
- Pump(s)
- Controls.
- Insulation.
- Valves etc.

The whole shall be designed and installed by a specialist company (Wirsbo, Tel 01293 548512 or similar approved) and be provided to the Architect at an early stage to ensure that provisions such as edge insulation and Polythene protection barriers shall be included in the overall design.

The system shall carry a British Board of Agre'ment certificate.

The system sensible heat load to suit the application for a total of 3.2kW (to be re-calculated by the contractor). This figure does not account for the boiler's efficiency and applies if the underfloor ventilation system is adopted (Case 4).

6 BUILDING ENVELOPE

The table below shows the proposed building envelope's U – values.

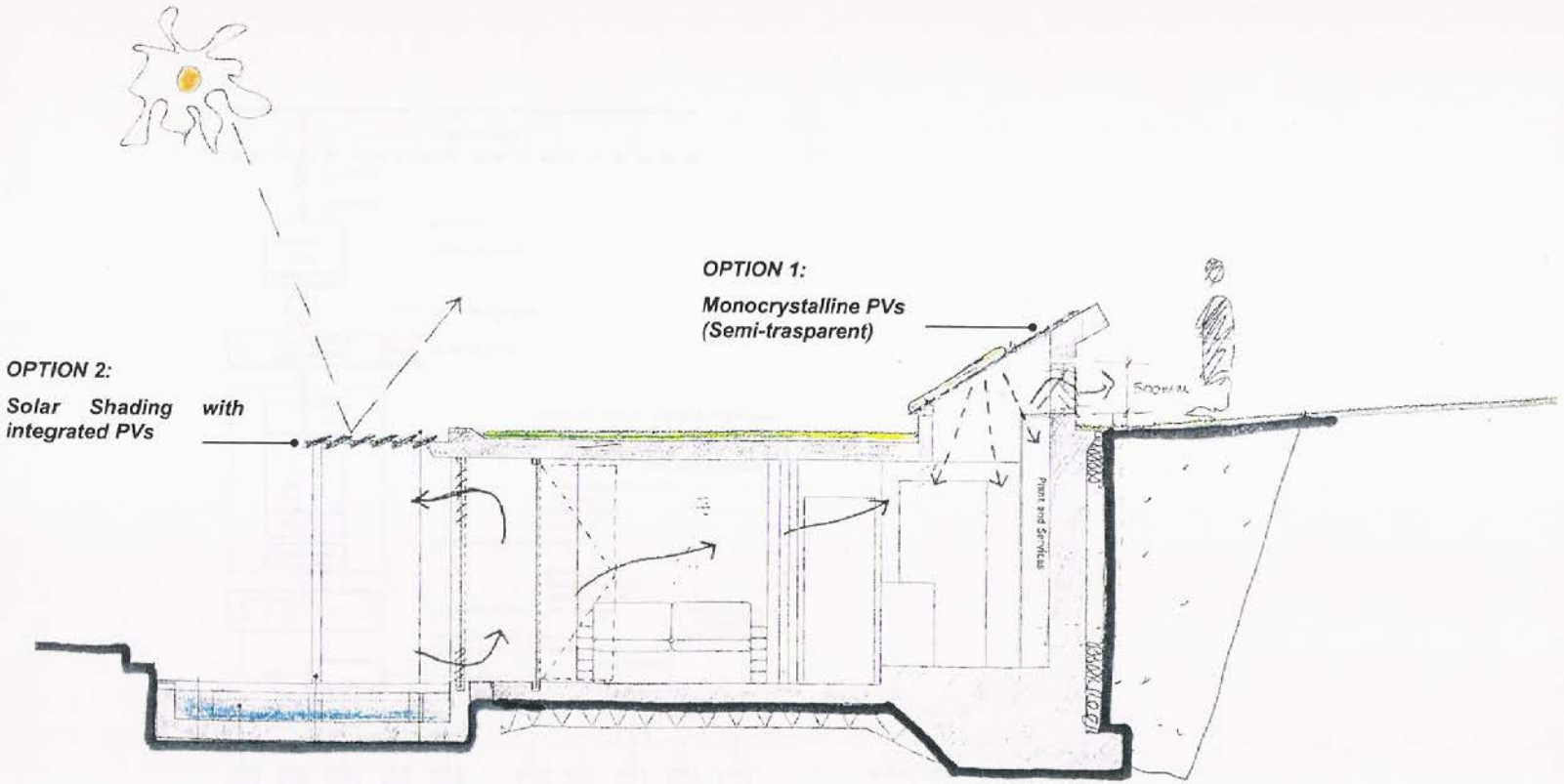
Proposed U-Values

Building Element	U-Value (W/m2K)	Description
Roof	0.2	Grass, 200mm soil, 20mm asphalt mastic, 110mm Polyurethane board, 200mm Dense concrete
PV Slope Roof	0.2	Monocrystalline PV panel 120mm Polyurethane board, 15mm plasterboard, foil backed
SC Slope Roof	0.2	Solar collector panel 120mm Polyurethane board, 15mm plasterboard, foil backed
External Wall	0.3	15mm render, 105mm Brick, 75mm Mineral Wool, 50mm Air Cavity, 100mm Concrete block, 15mm Plaster.
External / internal side Walls	0.2	soils, 500mm gravel aggregate, waterproof membrane, 50mm mineral wool 300mm dense concrete
External / internal Back Walls	0.2	soils, 500mm gravel aggregate, waterproof membrane, 50mm mineral wool 400mm dense concrete
Window	2.2	6mm Double Glazing with 12mm Cavity Low E with internal blinds 7% solar Transmittance.
Ground floor/services	0.135	soils, 750mm crushed brick aggregate, 1000mm concrete, waterproof membrane, 50mm mineral board, 50mm screed, 25mm tiles
General Ground floor/Rooms	0.15	soils, 750mm crushed brick aggregate, 200mm concrete, waterproof membrane, 75mm mineral board, 50mm screed, 25mm tiles
Internal Partitions		Various, 1) Plastered double block; 2) Plastered single brick.
Internal Partitions Store		Opaque 10mm single glass.

Note: The underfloor ventilation Option (case 4) uses the arrangement below (Labyrinth height 500mm).

Labyrinth Ground floor	0.28	soils, 750mm crushed brick aggregate, 200mm concrete
Labyrinth ceiling-Ground floor/Rooms	0.29	200mm concrete, waterproof membrane, 75mm mineral board, 50mm screed, 25mm tiles

APPENDIX A



SK1 – Photovoltaic modules

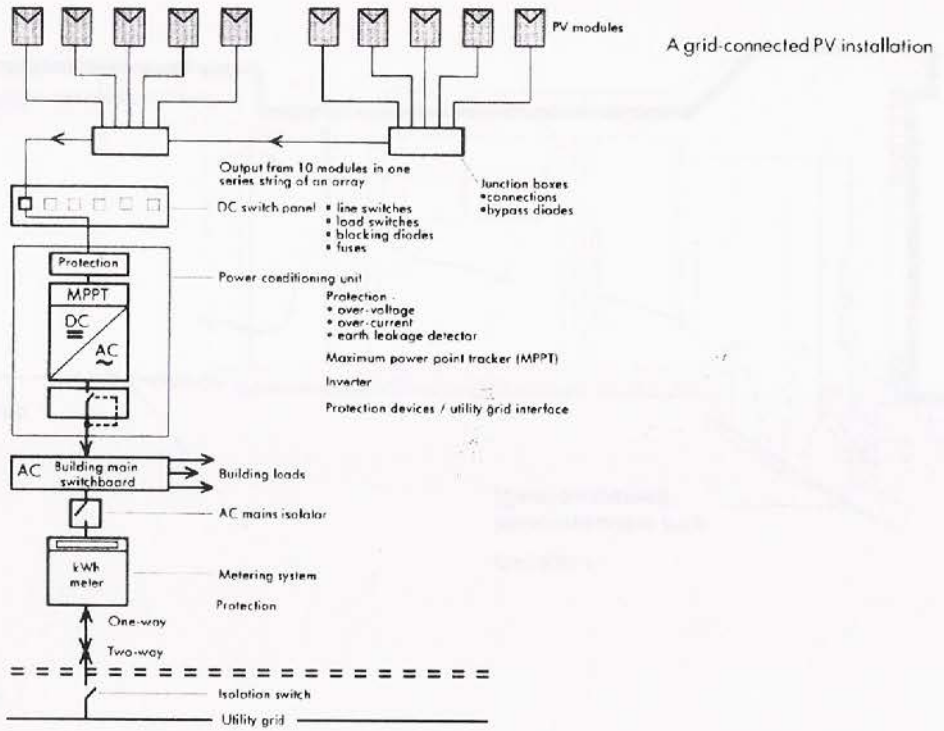
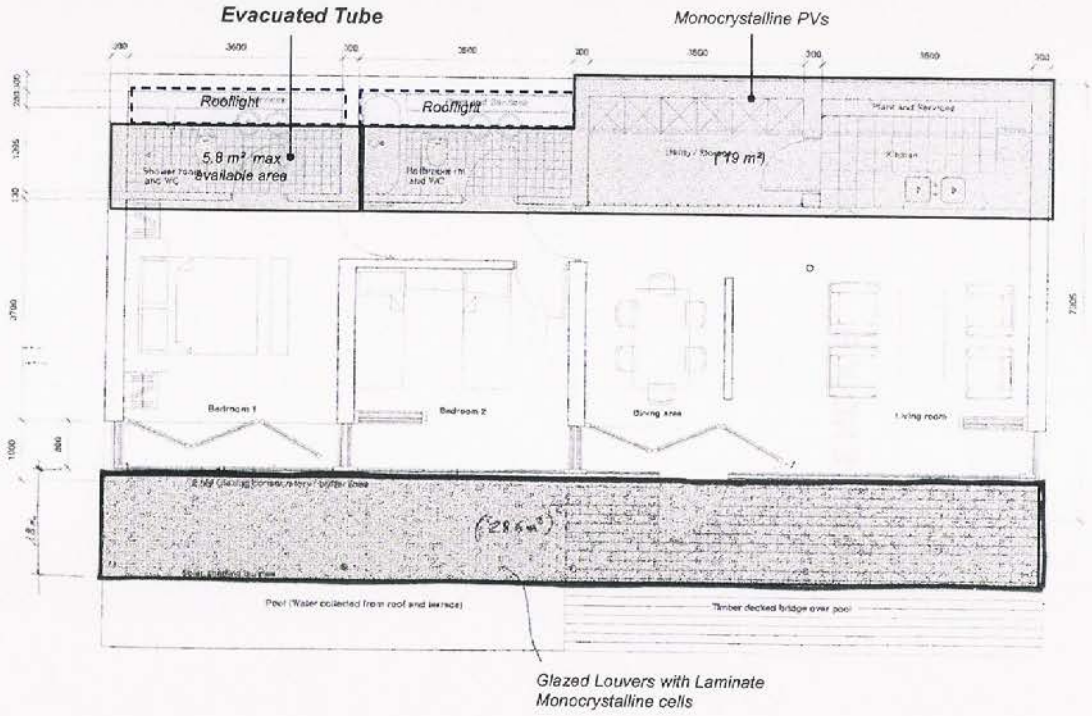


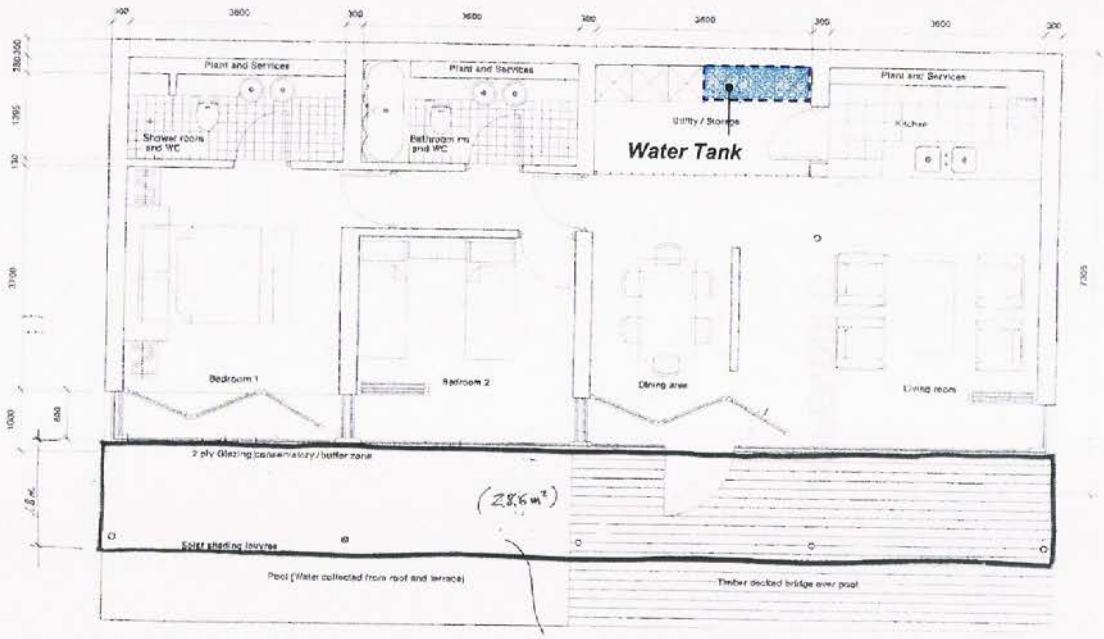
Fig. 2 Diagram showing a grid connected Pv installation

APPENDIX B



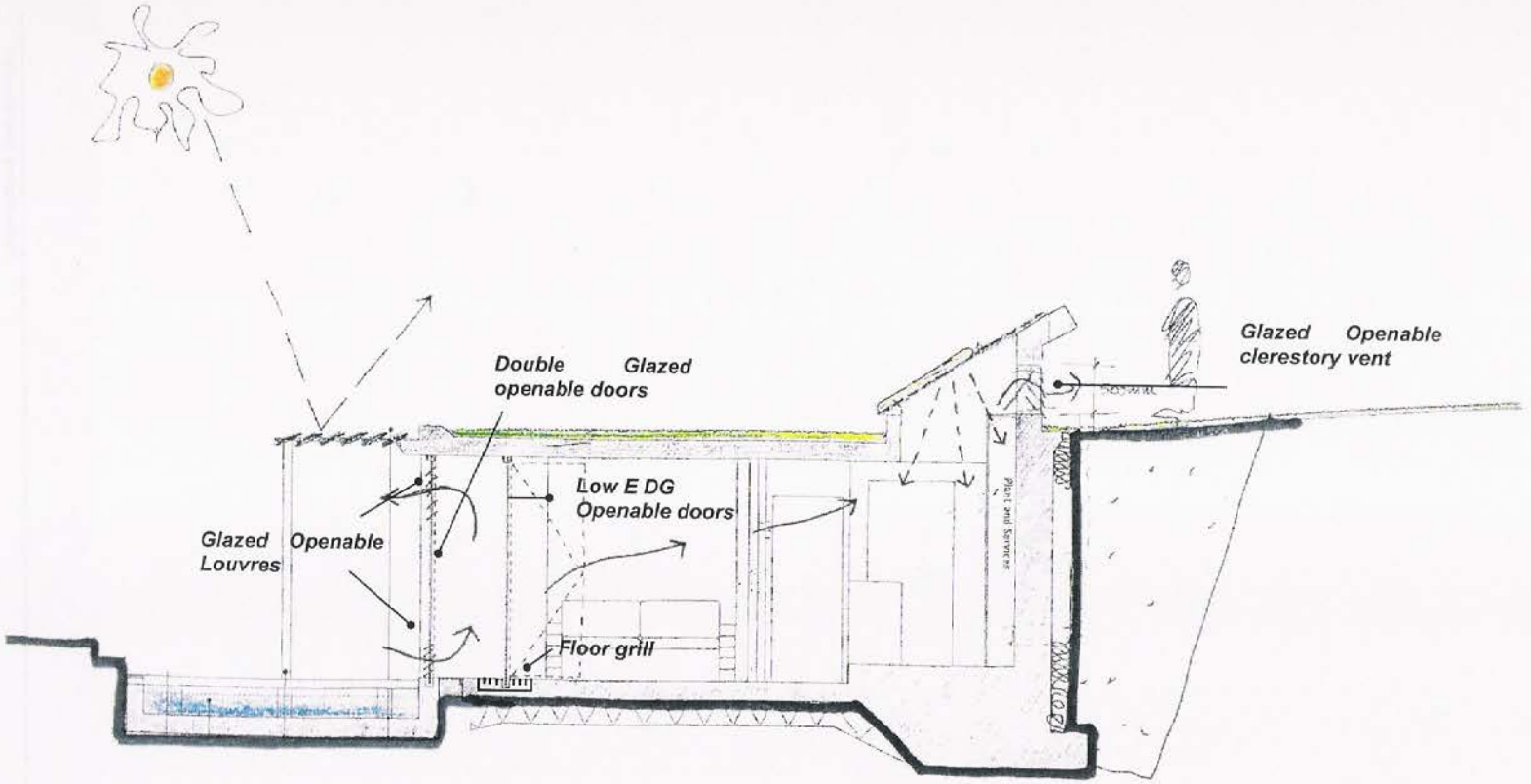
SK3 – Solar Hot Water System

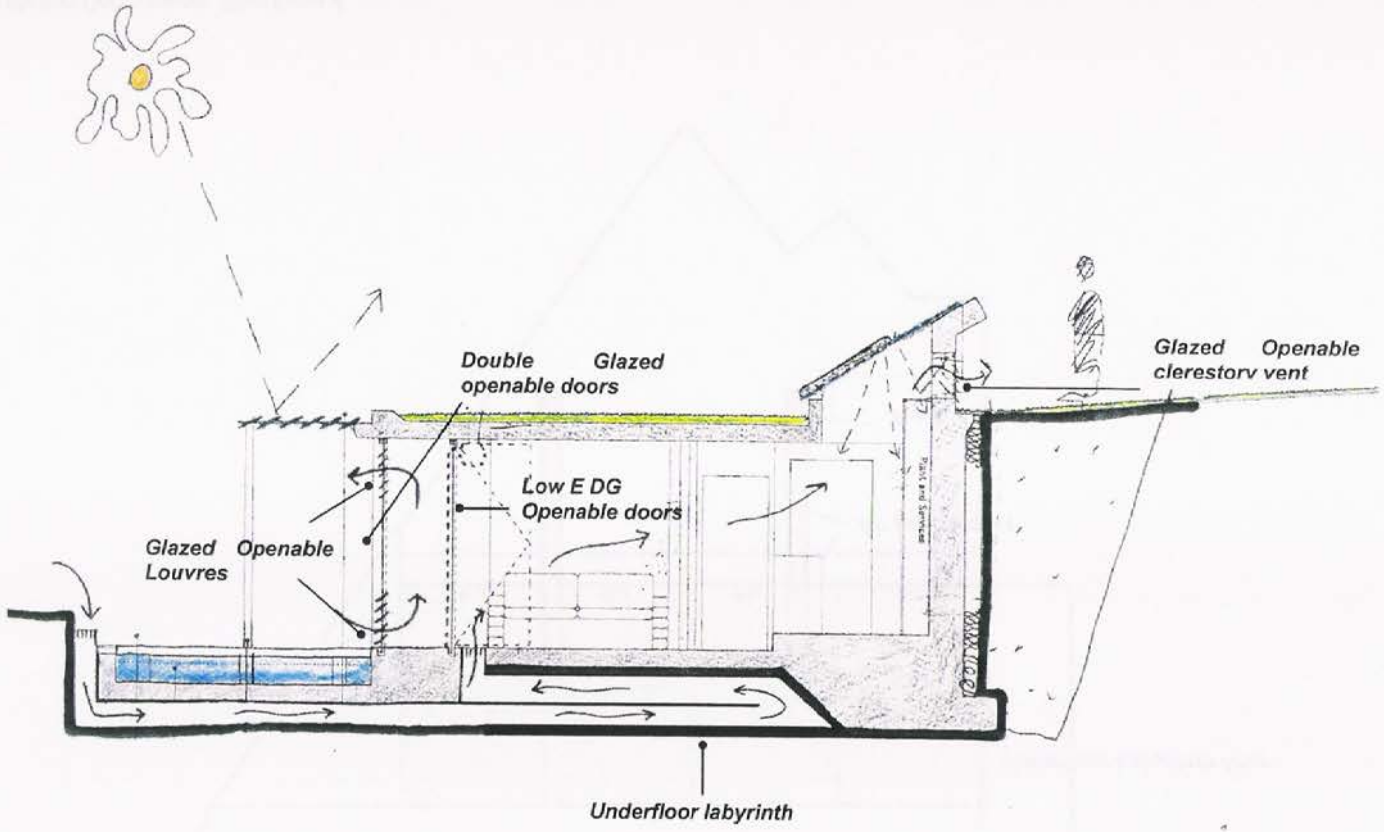
APPENDIX C



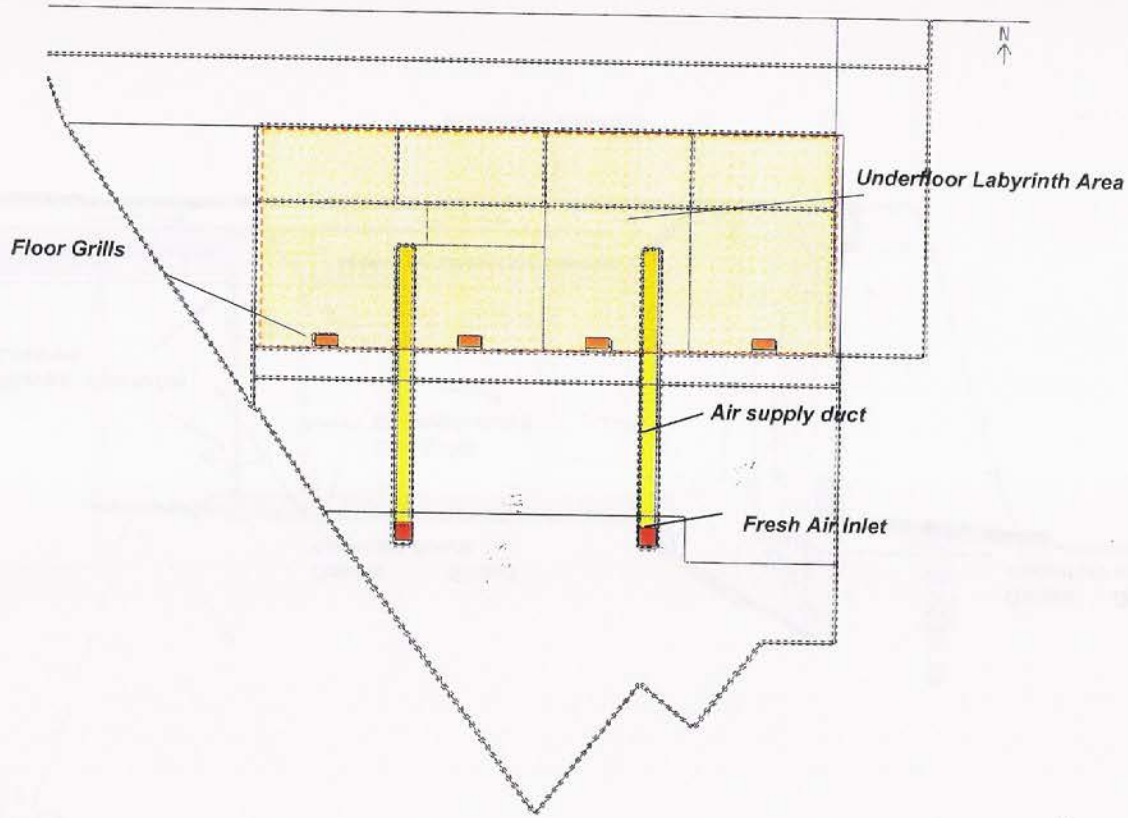
SK4 – Rainwater System

APPENDIX D


Double Glazed
openable doors
Glazed Openable
clerestory vent
Low E DG
Openable doors
Glazed Openable
Louvres
Floor grill



SK6– Ventilation Components, Section Case 4



SK7 – Ventilation Components, Plan Case 4

APPENDIX E