

Design & Access Statement PSDS Blackley Cemetery Office & Yard Manchester City Council

December 2024

Blackley Cemetery Office & Yard
Victoria Avenue
Blackley
Manchester
M9 8JP

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1.0 Introduction

This Design & Access Statement has been prepared by Drees & Sommer UK Ltd on behalf of Manchester City Council, to support the planning and listed building consent application submissions for works associated with decarbonisation comprising the following:

- i. Replacement of the existing gas boilers with Air Source Heat Pumps (ASHP)*
- ii. Upgrade existing heating infrastructure and BMS*
- iii. Replacement fluorescent lighting with LED*
- iv. Installation of Solar PV*
- v. Installation of cavity Wall insulation*
- vi. Replacement Windows & Doors*
- vii. Upgrade flat roof coverings*
- viii. Replacement Rooflights*

Blackley Cemetery Office and Yard is within the curtilage of the Grade II Listed Blackley Crematorium and it is considered to be a part of the listing. The information provided in this report is specific to the Office and Yard in order to clearly demonstrate the work content and any impact on the Grade II Listed areas of the building.

The potential impact of the proposed works on the Grade II Listed Building is discussed in further detail in the accompanying Heritage Statement. This document has been prepared in accordance with the requirements of DCLG Circular 01/2006 and the CABE Publication Guidance “Design and Access Statements”.

The report considers:

- Scope of Works
- Methods of Construction
- Impact on Building Structure, Fabric and Finishes
- Outline Specifications

Instructions

Client

Manchester City Council
Town Hall
182 Sefton Street
Manchester M60 2LA

Property Discussed in this Report

Blackley Cemetery Office & Yard
Victoria Avenue
Blackley
Manchester M9 8JP

Lead Consultant/Designer

Drees & Sommer UK Ltd
1.06 South Harrington Building
182 Sefton Street
Liverpool L3 4BQ

2.0 Background

2.1 Project Need

Manchester City Council (MCC) is committed to becoming a more sustainable organisation, with a key component to achieving this being the decarbonisation of their corporate estate. The council has targeted Net Zero Carbon status by 2038.

Surveys have been undertaken of the building stock, a number of potential decarbonisation measures were reviewed which prioritised the use of the energy hierarchy model to initially look to reduce energy demand and improve efficiency, followed by installing low or zero carbon solutions including renewable energy before finally looking to offset remaining emissions.

Various mechanical and electrical upgrades have been proposed for MCC buildings which include installation of roof mounted solar PV, replacing gas boilers with Air Source Heat Pumps, replacement LED lighting etc. in conjunction with Building Fabric Improvements comprising upgrading roof coverings, installation of cavity wall insulation and replacement windows and doors.

2.2 Existing Site

Blackley Cemetery Office and Yard was constructed in 1959. Whilst not individually listed, by virtue of the relationship with the Grade II Listed Blackley Crematorium, the Offices and Yard is considered to be curtilage listed. The building comprises office accommodation connected to the memorial chapel situated to the front west facing elevation. The Yard building is adjoined to the rear of the Office which houses plant rooms drying room, toilets, mess room and storage.

The building is single storey which is raised above the streetscene due to the topography of the site. The walls are of cavity construction which are uninsulated. Steel lattice beams and internal walls support the woodwool flat roof structures which are weathered with high-tensile mineral felt. There are several single skin skylights throughout the building and the original windows are single-glazed with aluminium frames .

The Crematorium and Chapels currently utilise 169,558 kWh of natural gas and 17,442 kWh of electricity per annum. All of the natural gas usage on site is used for space heating.

There have been several upgrades to the building since its original construction including recovering flat roofs with rigid insulation in 2011, and replacing many of the original single-glazed windows with aluminium and Upvc framed double-glazed windows in 2013.

This report provides a route to Net Zero for Blackley Cemetery Office and Yard with harm minimised and avoided where possible.

3.0 The Development

3.1 Outline Scope of Works

The proposed development will provide a positive contribution to decarbonising the existing buildings which includes the following works:

1. Installation of 35No. roof mounted Solar PV panels to the Yard buildings (Storage Roof Area), refer to Image 01. PV array is to be laid at 10° pitch to reduce visual impact as detailed on drawing ref: 3390-CWC-XX-EX-DR-E-6100-T3.



Image 01: Office & Yard Solar PV Roof Reference Plan

2. The existing flat roof is constructed with a channel reinforced woodwool deck that would not be suitable to support the solar PV (refer to image 02).

Installing low level steel framework above the roof would provide support to the PV enabling the existing roof structure to be retained as detailed on drawing ref: 24127-FMA-B2-ZZ-DR-S-0100-S4-P01.



Image 02: Office & Yard Woodwool Slab Roof Deck

3. Existing insulated roof coverings to areas receiving solar PV are degrading and would be overlaid with mineral felt membrane to ensure long-term durability and weathertightness.

Office and Chapel roof areas are to be upgraded with replacement built-up mineral felt roof system with improved 130mm thick insulation to achieve U Value 0.18 W/m²K (refer to image 03).

Existing single skin rooflights are also to be upgraded with quadruple skin polycarbonate to match existing profile to achieve U Value 0.14 W/m²K all as detailed on drawing ref: P24606.108-A.



Image 03: Office & Yard Flat Roof Covering and Rooflights

4. The period that external walls to the Office and Yard buildings were built pre-date Building Regulations, consequently the cavity walls are not insulated (refer to image 04). It is proposed that expanded polystyrene insulation is applied by injection method to external cavity walls of the Office building to achieve a U-value of 0.40 W/m²K to areas identified on drawing ref: P24606.107.

Due to narrow cavity's and absence of a damp proof course, the Chapel and Yard buildings would not receive cavity wall insulation.



Image 04: Office & Yard External Cavity Wall

5. Triple-glazed slimline aluminium framed windows and doors are proposed to replace the remaining original single-glazed crittal and timber units to Office (refer to image 05) to achieve U-value of 1.1 W/m²K, the Yard building windows would be replaced with double-glazed units to locations detailed on drawing ref: P24606.104.



Image 05: Office & Yard Original External Windows and Doors

The replacement double-glazed aluminium windows to the Office would be retained, Upvc windows are to be replaced with slimline aluminium. Original timber doors to the Yard building are also to be retained. The memorial sculpture would be reinstated on the new entrance doors (refer to image 06).



Image 06: Office & Yard Memorial Sculpture

6. Removal of existing gas boilers and installation of high temperature Air Source Heat Pump (ASHP) is proposed to the East facing elevation (refer to image 07), with associated pipework connections as indicated on drawing ref: 3390-CWC-XX-00-DR-M-5001-T3.



Image 07: Office & Yard Proposed ASHP Location

7. Formation of ASHP compound enclosure up to 3.0m in height, comprising timber acoustic fencing with gated access including formation of concrete base support as indicated on drawing ref: 3390-CWC-XX-00-DR-M-5001-T3.
8. Associated works would be necessary for accessing and maintaining the Solar PV, including mansafe system with walkway to Storage Roof Areas, and fixed ladder to the external wall (refer to image 08) all as detailed on drawing ref: 3390-CWC-XX-EX-DR-E-6100-T3 and 24606.110.



Image 08: Office & Yard Access Ladder Location

3.2 Method Statement for Roof Structure

Steel framework is proposed to be installed above the roof deck to support the Solar PV array, existing woodwool slab and steel roof trusses are to remain in-situ.

Openings would penetrate the roof deck and covering to insert steel column stubs to secure beams 150mm above roof level. Pockets are to be formed top section of internal load-bearing internal walls to install concrete padstones for fixing baseplates and columns (refer to image 09).

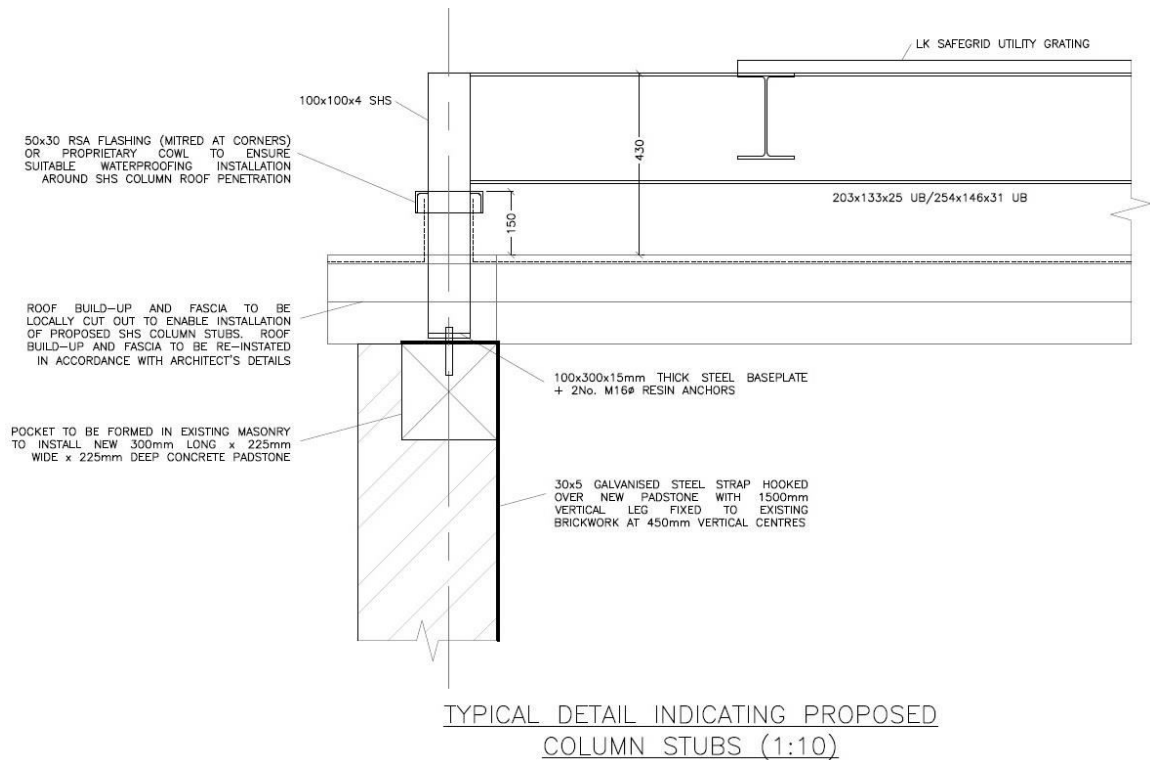


Image 09: Office & Yard Steel Framework PV Support

3.3 Method Statement for Solar PV

The solar PV array is to be secured to supporting galvanised steel tilted framework mounted on the over roof steel beam structure with suitable fixings to accommodate wind uplift, refer to The Solar Edge Design Report provided in Appendix 'E'.

Cables trays are also to be supported and fixed to steel beam framework, the cable will penetrate the roof covering and structure and terminate within the below store room as detailed on drawing ref: 3390-CWC-XX-EX-DR-E-6100-T3.

Please also refer to the photos in Appendix 'B' providing reference to the building fabric locations.

3.4 Method Statement for Roof Coverings

Existing insulated roof coverings over Yard Storage building are to remain in-situ and overlaid with vapour layer and high tensile mineral felt bitumen membrane system. Steel column stub penetrations through the roof structure are to be made good and sealed with upstand detail formed in accordance with Icopal Specification ref: 10134951.

Office and Chapel roof areas are to be stripped back to the decking with insulation removed, a new built-up mineral felt roof system will be applied over 130mm thick insulation. Roof coverings are to be applied under the Safe2Torch guidance with no naked flames to roof areas at risk (refer to image 10).

The single skin rooflights are to be replaced with triple skin polycarbonate to match existing profile and size to fit existing roof openings.

Plan View - Blackley Crematorium Office and Chapel Roofs

Visual impression of the areas where it is not Safe2Torch

 No Naked Flames

 Safe2Torch



Image 10: Office & Yard Roof Membrane Safe Application

3.5 Method Statement for Cavity Wall Insulation

Expanded polystyrene (EPS) beads are to be injected to fill the cavity of external walls with exception of the Chapel and Yard buildings. Small holes 22mm Ø, will be drilled between bricks at the junction between horizontal and vertical mortar joints.

The installation should be conducted in accordance with the drilling pattern dimension guidance to ensure there is no risk weakening the wall structure and cavities are fully filled (refer to image 11).

Insulation would be applied as not to bridge the existing damp proof course that could cause dampness into the building.

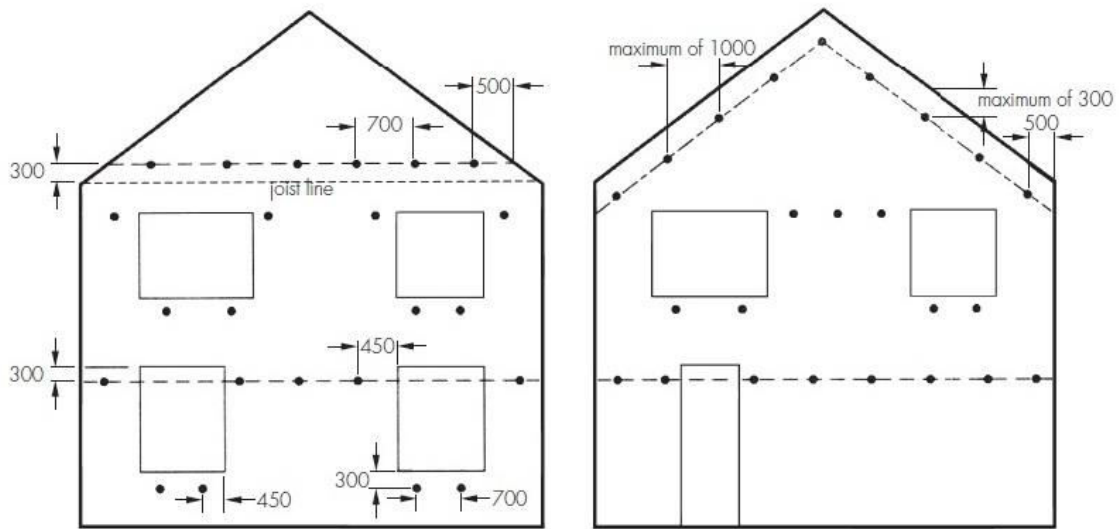


Image 11: Office & Yard Cavity Wall Insulation Application

3.6 Method Statement for Windows and Doors

Existing original single glazed windows and doors and replacement UPvc units are to be carefully removed and openings temporary propped as necessary to ensure there is no risk to the building structure.

New triple and double glazed window and doors sizes will match existing profile and size to fit existing wall openings. Framework is to be fully sealed at joint with external wall with low modulus silicone sealant to provide a fully weathertight seal.

3.7 Method Statement for ASHP's

ASHP's are to be installed externally to a discrete location at the rear East facing elevation of the Yard building. The location is relatively flat, to be excavated and ground supported concrete slab constructed to provide a level base to support the ASHP's as detailed on drawing ref: 24127-FMA-B2-EX-DR-S-0001-S4-P02.

Pipework will be fixed at low level to the external face of the Yard building and will penetrate an external wall of the Plant Area enclosure at two points, with a maximum clearance opening of 200mmØ. Power cable would follow the same route with similar clearance opening of 200mmØ. Pipework and cable route to be encased with powder coated steel boxing as detailed on drawing ref: 3390-CWC-XX-00-DR-M-5001-T3.

Please also refer to the photos in Appendix 'B' providing reference to the wall locations.

Acoustic fencing enclosure to height of 3.0m is proposed to conceal and secure the ASHP's (refer to image 12). Fence posts are to be set in concrete with 800mm embedment, the fencing would be constructed independently, and not fixed to the existing building, refer to Section 5.0 of this report for details and specification.

NOTE
COUNTER RAIL FIXINGS
65mm DECK SCREWS @ 600mm MAX CENTRES (5 PER COUNTER RAIL)
CAPPING RAIL FIXINGS
65mm DECK SCREWS 2 ROWS @ 600mm MAX CENTRES (20 PER CAPPING RAIL)

FENCING TO BE RAKED
(NOT STEPPED) TO SUIT
GROUND LEVELS AS
STANDARD

2340 TYPICAL
END POST CENTRES

2410 TYPICAL
INTERMEDIATE POST CENTRES

145

DETAIL 'B'

4810 TYPICAL BOARD LENGTH

60

2400 END BOARD LENGTH

C

CAPPING RAIL

DOUBLE COUNTER RAIL

TIMBER SCREWS x 100mm Lg
ALTERNATELY STAGGERED UP POSTS
(@ ~125mm CENTRES OUTSIDE
& @ ~500mm CENTRES INSIDE)

3010 ACTUAL HEIGHT
(3m NOM. HEIGHT - 24 No. ACOUSTIC BOARDS)

(102)

60

1675

2500

825
EMBEDMENT
UP TO
50

25

STEEL SPUR POST FIXED
TO FENCE POSTS USING:
1 No. COACH SCREW &
2 No. M10 BOLTS

BOTTOM BASE BOARD ONLY -
CAN BE DUG INTO GROUND
UP TO 50mm

ALL BOARDS SUPPLIED AT 4.8m Lg END
BOARDS CUT TO 2.4m Lg. BOARDS ARE
STAGGERED WITH 20mm EXPANSION GAP
JOINS ARE CO-INCIDE WITH POST CENTRES

JAKOUSTIC FENCE - 3m HIGH

LEAVE SPOIL SO THAT BASE BOARD
CONTACTS THE GROUND TO AVOID AIR GAP

1461

The Office and Yard roofs are predominantly flat, the Memorial Chapel roof is formed on a slight incline. Installation of solar PV panels to the Yard roof areas would require safe method of maintenance and fall protection.

A constant force type mansafe system would need to be installed above the Yard storage roofs, with posts secured to the steel beam framework structure with mechanical steel rivet fixings as detailed in image 13.

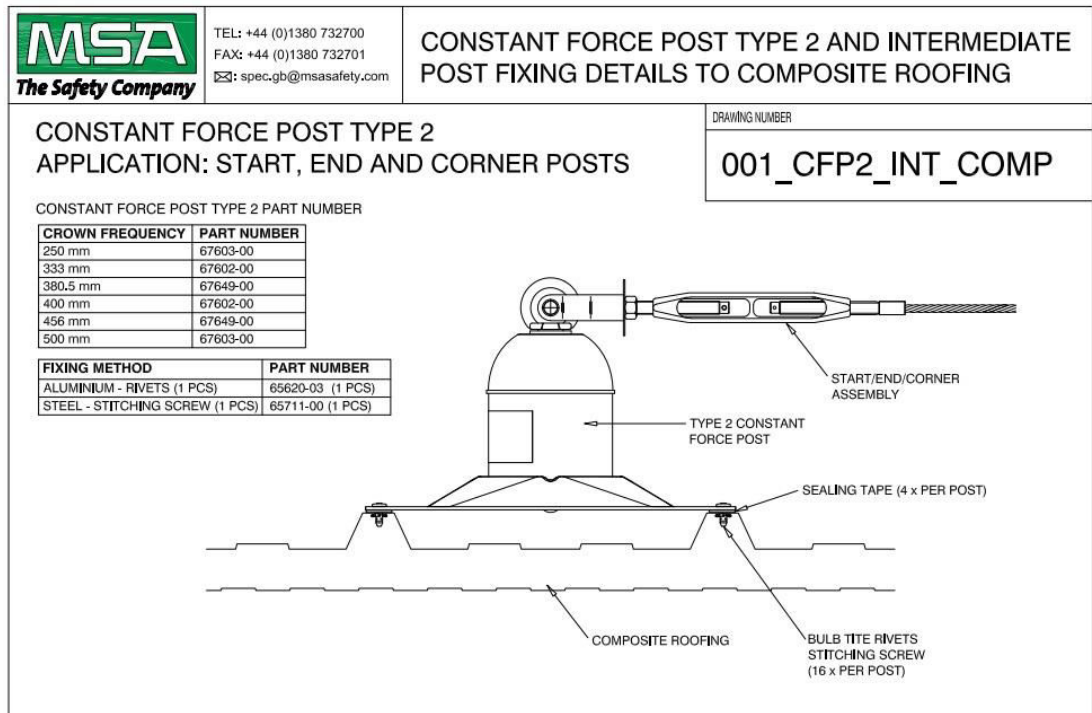


Image 13: Office & Yard Mansafe System Fixing Detail

3.9.2 Fixed Ladder Roof Access

To maintain the roof mounted PV panels, permanent roof access would be required; retractable vertical steel ladders are proposed to minimise visual impact when not in use as detailed in image 14.



Image 14: Office & Yard Retractable Vertical Ladder System

Roof areas with a climb height above 3m require fall protection. To minimise visual impact, a change overrail system is also proposed opposed to a cage, that would be mounted 1m above the roof parapet for the operative to safely harness onto as detailed in Section 5.0 Specification.

The ladders and overrail system would need to be secured to external walls and parapets with mechanical steel anchor fixings as detailed in image 14. Please also refer to the photos in Appendix 'B' providing reference to the wall locations.

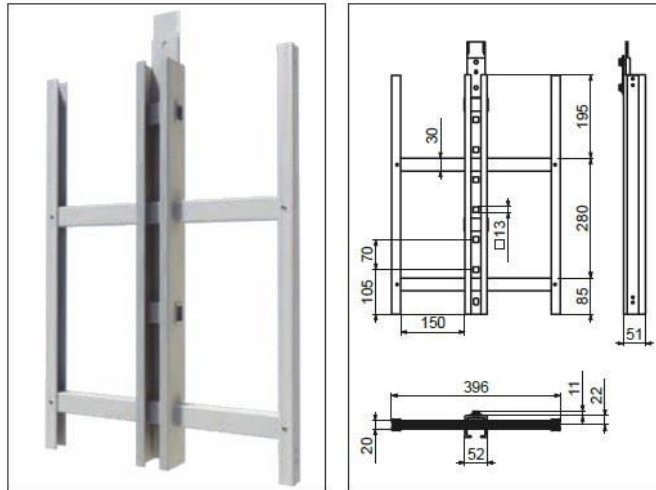
Twin ladder

- With side rails
- Profile 5 x 51 mm
- With connector
- Mounting distance: recommended 1,400 mm - max. 2,240 mm
- The bracket is mounted to the ladder through the rectangular cut-outs in the back of the guide rail or through the guide rail catch bar
- Max. section length 4,480 mm
- Rung distance 80 mm
- Step width per side 150 mm

Material: Anodised aluminium

Weight: 3.5 kg/m

Part no. ZAL-<ladder length in mm>



Set of connectors

- To connect twin ladders
- Complete with all mounting elements
- Included in the delivery of each twin ladder
- Must be used when an existing twin ladder is cut and reconnected

Material: Anodised aluminium

Weight: 0.25 kg/each

Part no. 21876

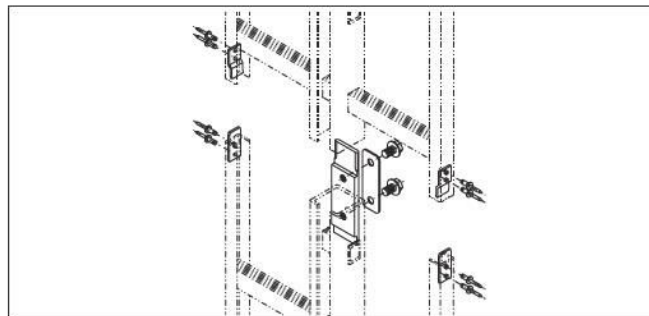


Image 15: Office & Yard Vertical Ladder Fixing Detail

4.0 Building Fabric /Finishes and Structural Considerations

4.1 Roof Structure and Coverings

BMI Icopal were appointed to undertake intrusive inspection of the flat roof coverings to determine condition and material build-up, that would assist with the appraisal of roof structure in determining the feasibility of installing surface mounted PV panels above the Yard building roofs.

Existing bituminous membrane roof coverings were confirmed to be in varying degrees of condition with sufficient insulation to Yard Storage Areas and below the recommended thermal requirements for Office and Chapel as indicated within Icopal Roof Condition Report ref: 10134951 dated 07.11.24 provided within Appendix 'C'.

Structural Engineers Frederick G Markland Associates were also instructed to undertake inspection and appraisal of the roof structure and supporting framework to determine additional load associated with installation of surface mounted PV panels would not compromise the weathertightness and structural integrity of the existing building.

FG Markland's assessment and appraisal report ref: Y24127.02 concluded the construction of the woodwool roof decks would not have sufficient capacity to support the additional weight imposed by the PV panel systems, consequently some form of strengthening over roof works or replacement roof structure would be necessary, refer to Appendix 'D'.

4.2 PV Solar Panel Support & Fixings

The additional weight of the proposed PV system will continue to be assessed by the Structural Engineer as the design progresses to ensure that the additional weight imposed causes no detriment to the existing structure or roof coverings.

The roof steel framework support has been designed and assessed by the Structural Engineer to ensure that the additional weight imposed causes no detriment to the existing structure or roof coverings.

4.3 Mansafe System & Fixings

Mansafe system is proposed to be installed above the Yard storage roofs, with posts secured to the steel frame structure with mechanical steel rivet fixings suitable for the required resistance loadings.

The additional weight of the proposed mansafe system and walkway have been fully assessed and taken into consideration by the Structural Engineer, to ensure that the additional weight imposed causes no detriment to the existing structure or roof coverings.

4.4 Access Ladder & Fixings

Vertical fixed ladder is proposed to be installed at a single location to provide unrestricted access to the Office & Yard roofs for maintaining the Solar PV. The ladder and overrail would be secured to external wall with mechanical steel anchor fixings. Pull-out testing would need to be undertaken prior to installation to ensure wall structures are suitable for the required resistance loadings.

The additional weight of the fixed ladders will continue to be assessed by the Structural Engineer as the design progresses to ensure that the additional weight imposed causes no detriment to the existing wall structures.

The means of the fixing ladder to the existing structure will also be checked by a specialist to ensure that a sufficient quantity of fixings are installed to allow the weight of operatives using the ladder to be adequately supported and not damage the building fabric.

4.5 Heating Infrastructure

The forming of holes to allow distribution routes through external walls and pipework /cable duct entry points will first be assessed by a Structural Engineer to ensure there is no structural impact to the existing building wall structures.

The means of fixing to the existing structure will also be checked by a specialist to ensure that sufficient quantity of fixings are installed to support the weight of new pipework and cabling.

ASHP pipework and cable duct protrusions through walls will be sealed with a suitable weatherproof sealing compound.

4.6 Acoustic Fencing Enclosure

The proposed acoustic fencing structure is to be built independently and set in concrete footings, which is not reliant on support from any existing walls, foundations would not be undermined. Site Investigation report has been commissioned to confirm suitability of ground conditions and design is appropriate.

5.0 Specifications

5.1 Cavity Wall Insulation

EPS expanded polystyrene thermal insulation is proposed to be injected to external cavity walls of the Office building to achieve a target U-value of 0.40 W/m²K as detailed below.



Kiwa Ltd,
Unit 5 Prime Park Way
Prime Enterprise Park
Derby
DE1 3QB
T: +44 (0)1332 383333
W: www.kiwa.co.uk/bda



BAW-18-057-S-A-UK
BDA Agrément®
superbead
Injected Bonded Bead Cavity Wall
Insulation



Energystore Ltd,
21-23 Shore Road
Holywood
BT18 9HX
T: +44 (0) 2890 301500
E: info@energystoreltd.com
W: www.energystoreltd.com

SCOPE

This Agrément relates to superbead Cavity Wall Insulation (CWI) hereinafter the "System". The System is for use as injected CWI and improves the thermal insulation of external closed construction cavity walls with masonry inner and outer leaves (where masonry includes clay and calcium silicate bricks, concrete blocks and natural and reconstituted stone blocks), masonry party walls or external masonry outer leaf with sheathed load-bearing timber framed stud internal walls. The System is for filling cavity walls in existing or new, residential and non-residential buildings in the UK and Ireland.

DESCRIPTION

The System is available in two variants, 'superbead 33' and 'superbead 32', offering slightly different thermal performance. The System consists of a grey, spherical, closed cell, carbon enhanced expanded polystyrene (EPS) bead manufactured with a pentane expanding agent in accordance with draft BS EN 16809-1. A water-based dispersion of acrylic co-polymer emulsion, air-drying, contact bonding adhesive is simultaneously injected with the EPS beads with appropriate injection machinery. The EPS beads are coated with the bonding adhesive in the injection gun to bond and set the EPS beads and make the EPS bead fill stable over the long-term. The System is injected through a series of holes, drilled in a predetermined pattern. Layers of EPS beads are built up until the whole cavity wall is fully filled in accordance with BS EN 16809-2.

SYSTEM ILLUSTRATION



5.2 External Windows and Doors

Reynaers triple-glazed slimline 68 aluminium framed windows and doors are proposed to replace the remaining original single-glazed crittal and timber units to the Office building to achieve a target U-value of 1.0 W/m²K as detailed below.

Technical specifications

Maximum vent height (mm) (to be read in conjunction with max. width and max. weight)	Side hung	1500
	Top hung	1470
Maximum vent width (mm) (to be read in conjunction with max. height and max. weight)	Side hung	738
	Top hung	1300
Maximum vent weight (kg) (to be read in conjunction with max. height and max. width)	Side hung	40
	Top hung	50
Minimum visible widths (mm) (outward opening window)	Frame + Vent	65
Overall system depths (mm)	Frame	68
	Vent	68
Minimum visible width T-profile (mm)		56
Rebate height (mm)		18
Glass thickness (mm)		26 to 43
Glazing method		Dry glazing with EPDM or neutral silicones
Thermal insulation		Omega-shaped fibreglass reinforced polyamide strips (32 mm)
High insulation variant (HI)		Available

Performance data

Thermal Insulation EN ISO 10077-2	U _w ≥ 1.1W/m ² K with TGU U _w ≥ 1.4W/m ² K with DGU
U-value – triple glazed	U _w ≥ 1.1W/m ² K based on windows size and configuration as per BS EN 14351 ¹
U-value – double glazed	U _w ≥ 1.4W/m ² K based on windows size and configuration as per BS EN 14351 ¹
Window energy rating – double-glazed	A
Acoustic performance ² EN ISO 140-3; EN ISO 717-1	R _w (C; C _{tr}) = 36 (-1; -5) dB / 47 (-2; -7) dB, depending on glazing type
Air tightness, max. test pressure ³ EN 1026; EN 12207	600Pa (Class 4)
Water tightness ⁴ EN 1027; EN 12208	600Pa (9A) / >1050Pa (E1050)
Wind load resistance, max. test pressure ⁵ EN 12211; EN 12210	2400Pa (E2400)
Wind load resistance to frame deflection ⁵ EN 12211; EN 12210	C (s1/3000)
Burglar resistance ⁶	PAS 24 and Secured by Design

Double Casement

Maximum vent (mm) (not including T profile)	730 x 1370
Maximum opened dimension (mm)	1420 x 1050 (dependent on friction stays)
Air tightness, max. test pressure ³ EN 1026; EN 12207	Class 4
Water tightness ⁴ EN 1027; EN 12208	Class 9A E600
Wind load resistance to frame deflection ⁵ EN 12211; EN 12210	C4
Burglar resistance ⁶	PAS 24: 2016



5.3 Roof Coverings

Office and Chapel roof areas are to be upgraded with replacement built-up mineral felt roof system with improved 130mm thick insulation to achieve **U value of 0.18 W/m²K**, existing insulated roof coverings to Yard Storage roofs are to be overlaid with mineral felt membrane as detailed below.

Client: Drees & Sommer UK Ltd
Project: Blackley Crematorium Office and Chapel Roofs
Project Ref: 10134951



3. SPECIFICATION SUMMARY

Roof Area Reference	Blackley Crematorium Storage Roof	
Roof Area(m2)	186	
Deck	Prescreeded Woodwool	
Substrate	Existing BUR	
Primer	Siplast Primer	
Vapour Control Layer	Not Required	
Adhesive	Not Required	
Packerboard	Not Required	
Insulation	Not Required	
Baselayer	Not Required	
Underlay Primer	Not Required	
Underlay	Total Torch Vapour Dispersion Layer	
Capsheet	Thermaweld FireSmart Mineral Capsheet	
Type of System	TORCHON(J41)	
Roof Area Reference	Blackley Crematorium Office and Chapel Roofs	
Roof Area(m2)	538	
Deck	Prescreeded Woodwool	
Substrate	Existing Bituminous VCL	
Primer	BMI Icopal S.A. Spray Primer	
Vapour Control Layer	TorchSafe T.A. VCL - Sanded	
Adhesive	BMI Icopal Insulation Spray Adhesive	
Packerboard	Not Required	
Insulation	Thermazone Torch-on Board 130mm	
Baselayer	Not Required	
Underlay Primer	Not Required	
Underlay	Total Torch Vapour Dispersion Layer	
Capsheet	Thermaweld FireSmart Mineral Capsheet	
Type of System	HEATACTIVE(J41)	

5.4 **Rooflights**

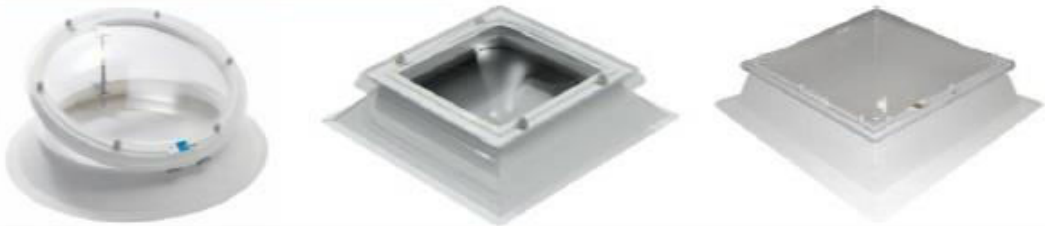
Quadruple skin polycarbonate rooflights are proposed to replace the existing single skin rooflights with matching pyramid profile to achieve a target U-value of 1.4 W/m²K as detailed below.



DRIVEN BY

DAYLIGHT

COXDOME TRADE RANGE



The high quality, cost-effective, universal 'out-of-plane' rooflight system

COXDOME TRADE RANGE

- Manufactured to European Standards and CE marking to EN 1873
- Manufactured from extruded white PVC-u
- Choice of 150mm splayed, or 160mm vertical upstands in UV-stable white PVC-u
- Available in single, double, triple or quadruple skin polycarbonate, impact resistant glazing in spherical or pyramidal specifications
- Excellent waterproofing properties when fitted to manufacturer's instructions
- High security fixings as standard
- Glazing available in clear, diffused, opal or cool & clear

SUMMARY OF BUILDING REGULATIONS FOR GLAZING

Non-fragility ACR(M)001:2014 – 'Test for the Fragility of Profiled Sheet Roofing Assemblies'.

All trade domes are classified to Class B Non-Fragile according to ACR(M)001:2014 and when tested, demonstrated full compliance with EN 1873 soft body test, based on an impact of 1200 Joules.

Fire Classification EN 13501-1 – 'Fire test to Building Material – Classification'.

All trade rooflights are manufactured using minimum 3mm polycarbonate. According to EN 13501-1, this achieves B-s1-d0 and therefore attains Class 1 certification. TP(a) is realised with a solid polycarbonate sheet minimum 3mm thick.

DOMES, CIRCULAR AND PYRAMID/TRAPEZOID GLAZING

	Glazing	Light Transmission	'G' Value Solar Heat Gain	'U' Value	Sound Reduction (dB)	Fire classification	Impact Resistance
SINGLE							
	Clear	88%	82%	5.0 W/m ² K*	12dB	1-3mm: B-s1-d0	> 200 N/mm ²
	Diffused	77%	67%				
	Opal	44%	51%				
	Cool & Clear	48%	36%				
DOUBLE							
	Clear	77%	67%	2.6 W/m ² K*	20dB	1-3mm: B-s1-d0	> 200 N/mm ²
	Diffused	77%	67%				
	Opal	44%	51%				
	Cool & Clear	48%	36%				
TRIPLE							
	Clear	71%	57%	1.7 W/m ² K*	22dB	1-3mm: B-s1-d0	> 200 N/mm ²
	Diffused	71%	57%				
	Opal	62%	52%				
	Cool & Clear	45%	31%				
QUADRUPLE							
	Clear	66%	49%	1.3 W/m ² K*	23dB	1-3mm: B-s1-d0	> 200 N/mm ²
	Diffused	66%	49%				
	Opal	57%	45%				
	Cool & Clear	41%	26%				

*U-values calculated according to EN 1873 and based on a 1600x1600mm domelight. Sound reduction (dB) according to DIN52210.
*Fire classification according to BS EN 13501:1 2007.

5.5 Acoustic Fencing

ASHP compound is proposed to be constructed with Jakoustic Absorptive fencing system and gates up to 3.0m in height as detailed below.

JSW 130 Issue 03

JAKOUSTIC® ABSORPTIVE

**Jacksons
Fencing**



Jakoustic® Absorptive acoustic fencing has the same interlocking V board construction as Jakoustic® Reflective, but has an additional absorptive layer on one side of the fence, made up of a mineral Rockwool fibre and protective membrane. It is ideal for applications where a noise source is in a tight confined area surrounded by other reflective surfaces.

- Timber construction with planed boards visible on one face
- Unique tuning fork design posts
- Special fixings clamp the acoustic boards between posts
- Can accommodate changes in level or profile
- With timber capping and counter rail
- Jakoustic® fencing with an additional absorptive layer covered with a protective membrane
- Matching pedestrian, swing and tracked sliding gates
- Up to 32dB reduction in noise*
- High privacy barrier
- 25-year Jakcure® guarantee

*Jakoustic® Plus Absorptive Layer barrier certified laboratory results:

Category B3 rating according to BS EN 1793-2:1998

Category A3 rating according to BS EN 1793-1:1998

Laboratory sound reduction 32 dB Approximate Superficial Mass 28kg/m²

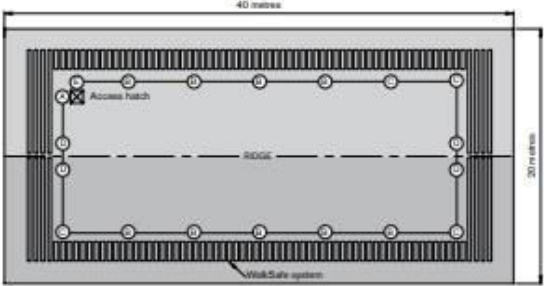
5.6 Mansafe System

A constant force type mansafe system would need to be installed above the Yard Storage roofs to provide safe access for installation and maintenance of the solar PV as detailed below.

Latchways **Fall Protection**

Constant Force post: System design

A typical roof layout for a perimeter system is illustrated identifying the different system components. Posts must not be spaced more than 10 m apart. Designers should try to ensure that access to all areas is achieved without the requirement for PPE (Personal Protective Equipment) adjustment. MSA provides a bespoke Latchways system design service for your project requirements.
Email: spec@latchways.com for more information.

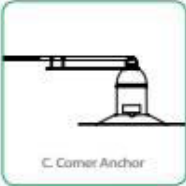




A. End Anchor



B. Intermediate Anchor



C. Corner Anchor



D. Variable Anchor



E. End Anchor

System components

The following components complete the system allowing hands-free operation. Latchways components are manufactured in marine-grade stainless steel and are individually numbered to allow complete traceability. Inspection and maintenance are required annually.

Transfasteners

The user, wearing a full body harness and energy-absorbing lanyard, is continuously attached to the system with a Transfastener™, which rotates allowing it to pass through the intermediate cable supports. For systems on inclines over 15° a Climblatch device is required instead of the Transfastener.





Turnbuckle assembly

The turnbuckle assembly provides a cable termination and method of tensioning the system. The integral indicator disc will spin when the correct tension is reached.



Swage & Clevis

The swage and clevis unit provides the method of terminating the cable at the opposite end of the system to the turnbuckle assembly.



90° Corner bracket

This one-piece corner bracket attached to an intermediate post provides an angle change of 90° within the system.



Variable bracket

This bracket attaches to an intermediate post and provides an angle change of between 0 and 80° both in the horizontal and the vertical plane.



D Ring & Hanger

The D ring and hanger form an intermediate cable support. The cable is threaded through the hanger allowing the Transfastener to travel the length of the system without disconnecting.



5.7 Fixed Ladders

Vertical fixed ladder would need to be installed to provide unrestricted access to maintain Solar PV on the Yard Storage roof as detailed below.

Söll PivotLoc foldable ladder system

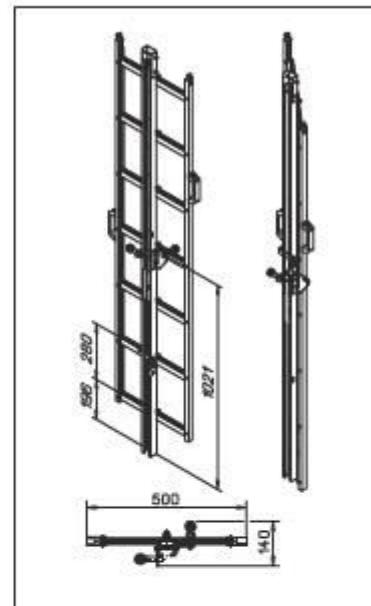
Design principle:

The ladders can be opened or folded closed. When the ladder is closed, it has a slim and unobtrusive profile. When open, the result is a high-quality ladder with Miller® fall protection. The foldable ladder system prevents unauthorised use of the system.

Söll PivotLoc, 1st ladder section:

- Profile 5 x 33 mm
- With arresting device, end-stop, recess, connector and side handles
- Mounting distance: Recommended 1,400 mm – max. 1,680 mm
- The brackets must be fixed on the pivot points of the rungs
- Max. section length 4,480 mm
- Rung distance 80 mm
- The system also includes a stainless steel clamp that is used to insert a padlock

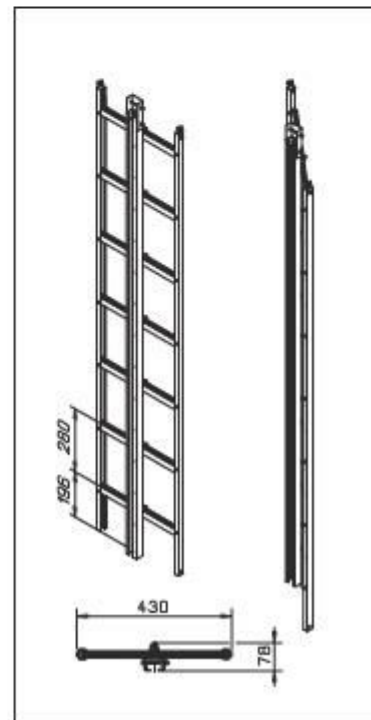
Material: Anodised aluminium
Weight: Approx. 4.0 kg/m
Part no. **ZALKLAPP- $\langle$ ladder length in mm $\rangle$ -A**



Söll PivotLoc, extension section:

- Profile 5 x 33 mm
- With connector
- Recommended mounting distance: 1,400 mm – max. 1,680 mm
- The brackets must be fixed on the pivot points of the rungs
- Manufacturing length max. 4,480 mm
- Rung distance 80 mm

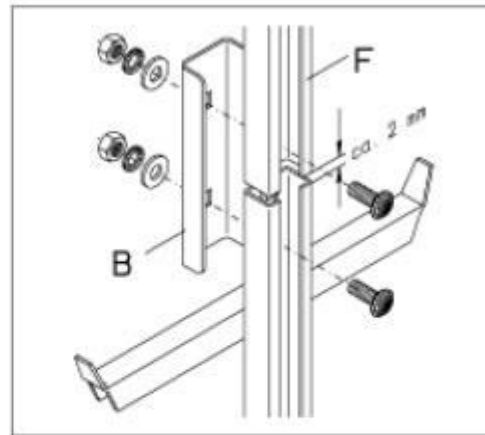
Material: Anodised aluminium
Weight: 4.0 kg/m
Part no. **ZALKLAPP- $\langle$ ladder length in mm $\rangle$**



4.9 Assembling the twisted change-over rail

When assembling from new, assemble the ascent route in accordance with the relevant assembly instructions. The free ladder projection at the upper end must not exceed 380 mm. If it is greater, an additional retaining bracket must be fitted.

- Fit the connecting piece (B) on the uppermost ladder element.
- Bolt the twisted change-over rail (F) to the connecting piece. Set the guide rail joint to about 2 mm. (Fig. 2)
- Use the attachment cross (F1) to mount the twisted change-over rail (F) at a sufficiently dimensioned fixing point (e.g. support foot, order no. 17509) at the free end. When doing so, make sure that all fixing holes of the attachment cross (F1) are used (2x fixing on change-over rail, 2x fixing on structure). (Fig. 3)



Attention!

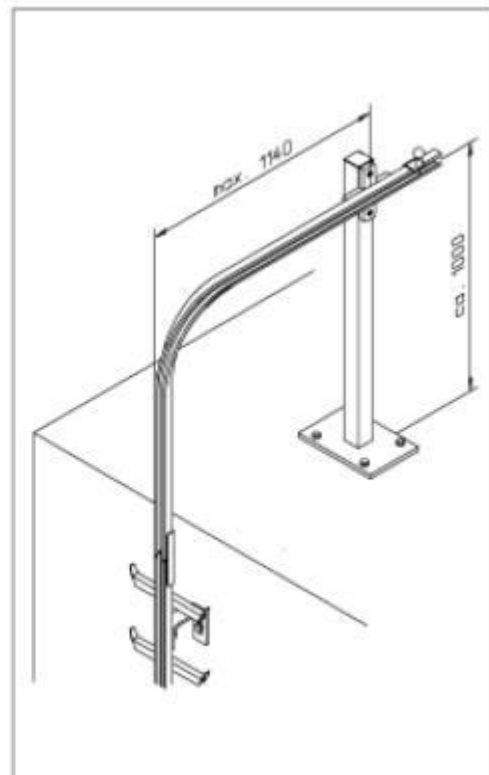
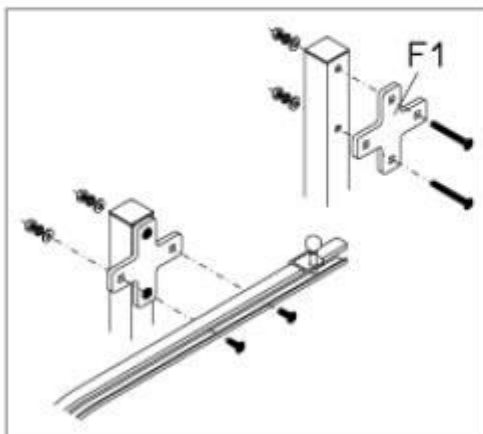
The distance between the front edge of the twisted change-over rail and the fixing point must not exceed 1,140 mm! (Fig. 4)

Note:

The catch noses of the twisted change-over rail must always point upwards when vertical.

Attention!

The twisted change-over rail must be securely mounted on at least 2 fixing points before being used.



6.3 Solar PV Modules

To ensure safe access is provided to roof areas for maintaining the Solar PV on a 6 month cycle, vertical fixed ladders are proposed with built-in fall protection. On accessing roof areas mansafe systems would be available to safely access the working areas.



7.0 Conditions of Use of this Report

This report is to be regarded as confidential to and for the sole use of the recipient. Consequently, no responsibility is accepted to any third party in respect of its contents in whole or in part.

APPENDIX A

Drawing Schedule

DRAWING REGISTER

Drawing Owner	Status	Drawing No.	Title	Rev No.
Drees & Sommer	Planning	24601.101	Existing Ground Floor	
	Planning	24601.102	Proposed Ground Floor	
	Planning	24601.103	Existing Elevations	
	Planning	24601.104	Proposed Elevations	
	Planning	24601.105	Window and Door Schedule	
	Planning	24601.106	CWI Plan Proposed	
	Planning	24601.107	CWI Elevation Proposed	
	Planning	24601.108	Roof Plan Proposed	
	Planning	24601.109	Fire Penetration Details	
	Planning	24601.110	Acess Ladder Details	
	Planning	24601.111	Roof Plan Existing	A
Crookes & Walker	Planning	3384-CWC-ZZ-EX-DR-ME-9001	Site Boundary	P01
	Planning	3384-CWC-ZZ-EX-DR-ME-9002	Location Plan	P01
	Planning	3384-CWC-XX-00-DR-M-5001	Proposed External Mechanical Services	T3
	Planning	3390-CWC-XX-00-DR-E-6201	Proposed Small Power Layout	T2
	Planning	3390-CWC-XX-00-DR-N-2801	Proposed Builders Work	T1
	Planning	3390-CWC-XX-00-DR-E-6100	Proposed Solar PV Layout	T3
	Planning	3390-CWC-XX-00-DR-E-6900	Proposed Lightning Protection Layout	T1
FG Markland	Planning	24127-FMA-B2-ZZ-DR-S-0100-S4	PV Array Support Proposal	P01
	Planning	24127-FMA-B2-EX-DR-S-0001-S4	Proposed ASHP Slab	P02

APPENDIX B

Photographic Schedule



Image 01 – Ladder Access Location Nr.1



Image 02 – Ladder Access Location Nr.1



Image 03 – Outer wall to receive low level pipework and cable tray protrusions



Image 04 – Outer wall to receive low level pipework and cable tray protrusions

APPENDIX C

Roof Covering Inspection Report

Drees & Sommer UK Ltd
182 Sefton Street
Brunswick Business Pa
Liverpool
L3 4BQ

Date: 7/11/2024

For the attention of Glen Moody

Re: Survey for Blackley Crematorium Office and Chapel Roofs

Thank you for your instruction to BMI Group UK Ltd to provide an intrusive roof condition survey, which has been carried out in good faith to specified roof waterproofing areas only.

The following roof survey was carried out by BMI Group UK Ltd. and is confined to the flat roofing waterproofing areas identified in the survey report. The survey is not exhaustive and the observations and recommendations are restricted to our area of flat roofing waterproofing.

The roof area(s) in this survey is approximate and should only be used as a guide. For accurate tendering purposes it is the client or contractors responsibility to confirm the exact roof areas.

I trust this Roof Condition Survey Report is of assistance to you. If I can be of further help on this, or any other project, please do not hesitate to contact me by email or on 07970455073.

Yours sincerely

A handwritten signature in red ink, appearing to read 'Paul Seel', with a stylized, cursive script.

Paul Seel
Area Technical Manager
T: 07970 455 073
E: paul.seel@bmigroup.com

BMI ICOPAL SITE SURVEY



PROJECT ADDRESS:

PROJECT NAME:

Blackley Crematorium
Office and Chapel Roofs

POSTCODE:

M9 8PJ

DATE PREPARED

11/7/2024

CLIENT

PREPARAED ON BEHALF OF:

Drees & Sommer UK Ltd



CONTENTS

Section 1	Project Overview
Section 2	Project Observations
Section 3	Roof Details
Section 4	Core Sample Analysis
	4.1 Blackley Crematorium Storage Roof
	4.2 Blackley Crematorium Office and Chapel Roofs
Section 5	Condition Report and Recommendations
	5.1 Blackley Crematorium Storage Roof
	5A.1 Safe2Torch Plan
	5.2 Blackley Crematorium Office and Chapel Roofs
	5A.2 Safe2Torch Plan
Section 6	Summary of Condition

1. PROJECT OVERVIEW

Project Name:	Blackley Crematorium Office and Chapel Roofs	Client Name:	Drees & Sommer UK Ltd
Project No:	10134951	Address:	182 Sefton Street Brunswick Business Pa
Address:	Victoria Avenue	Town:	Liverpool
Town:	Manchester	County:	
County:		Postcode:	L3 4BQ
Postcode:	M9 8PJ	Contact:	Glen Moody
		Tel:	
		Email:	glen.moody@dreso.com
Inspected By:	Paul Seel	Date of Inspection:	11/5/2024
Position:	Area Technical Manager	Weather during Inspection:	Dry(>0°C and <10°C)

Plan View - Blackley Crematorium Office and Chapel Roofs



2. PROJECT OBSERVATIONS

The following survey conducted is a Building Survey of the defined roof areas only. This survey deals with the materials of the building, its general physical condition including any factual evidence of deterioration or performance failure. The survey includes assessments based on the survey observations.

The client requested that a representative of BMI Group UK Ltd. undertake a roof condition survey with the intent of producing a report in order to determine the existing roof build, its condition and highlight any issues, potential issues and failings of the existing waterproofing system.

3. ROOF DETAILS

Roof Area Reference	Blackley Crematorium Storage Roof	Blackley Crematorium Office and Chapel Roofs
Roof Area(m2)	186	538
Building Use	Warehousing & Storage	Office
Building Height(Floors)	1	1
Building Access	Surveyors Ladder	Surveyors Ladder
Pitch	Pitch less than 5 Degrees	Pitch less than 5 Degrees
Drainage Method	To External Gutters	To Internal Gutters
Falls On Roof	Adequate	Adequate
Internal Ceiling	None	Suspended Ceiling Tiles
Void	None	
Structural Deck	Prescreeded Woodwool	Prescreeded Woodwool
VCL	Bituminous VCL	Bituminous VCL
Insulation Type	PUR/PIR	PUR/PIR
Insulation Thickness(mm)	100	100
Existing Waterproofing	Bituminous Membrane	Bituminous Membrane
Surface Finish	Mineral	Mineral
Repairs		

4.10134951 CORE SAMPLE ANALYSIS - Blackley Crematorium Storage Roof



4.10134951 Blackley Crematorium Storage Roof

Core Sample 1

Area Sample Taken: Adjacent to Perimeter Edge - Low Point of Roof

Waterproofing Type: Steel Reinforced, Pre-screeded Woodwool Deck, Bituminous VCL, 90mm PUR, Bituminous Built Up System with Mineral Finish.

Core Result: Dry

Moisture Probe Reading:



4.10134951 Blackley Crematorium Storage Roof

Core Sample 2

Area Sample Taken: Adjacent to Perimeter Edge - High Point of Roof

Waterproofing Type: Steel Reinforced, Pre-screeded Woodwool Deck, Bituminous VCL, 90mm PUR, Bituminous Built Up System with Mineral Finish.

Core Result: Dry

Moisture Probe Reading:



4.10134951 Blackley Crematorium Storage Roof

Core Sample 3

Area Sample Taken: Adjacent to Office Roofs

Waterproofing Type: Steel Reinforced, Pre-screeded Woodwool Deck, Bituminous VCL, 90mm PUR, Bituminous Built Up System with Mineral Finish.

Core Result: Dry

Moisture Probe Reading:

4.10134951 CORE SAMPLE ANALYSIS - Blackley Crematorium Office and Chapel Roofs

	4.10134951 Blackley Crematorium Office and Chapel Roofs Core Sample 1	
	Area Sample Taken:	From Original Survey - Adjacent to Courtyard
	Waterproofing Type:	Pre-screeded Woodwool Deck, Bituminous VCL, 90mm PUR, Bituminous Built Up System with Mineral Finish.
	Core Result:	Dry
Moisture Probe Reading:		
	4.10134951 Blackley Crematorium Office and Chapel Roofs Core Sample 2	
	Area Sample Taken:	Adjacent to Perimeter Edge - High Point of Roof
	Waterproofing Type:	Pre-screeded Woodwool Deck, Bituminous VCL, 90mm PUR, Bituminous Built Up System with Mineral Finish.
	Core Result:	Dry
Moisture Probe Reading:		

5.10134951/1 CONDITION REPORT - Blackley Crematorium Storage Roof



A visual and intrusive inspection has been undertaken of the roof area to determine the condition of the existing roof waterproofing system. The survey includes a number of core samples with their relevant moisture readings. Core samples give an indication of the roof build up and the existence of any moisture in the specific area cored only. BMI Group UK Ltd. take no responsibility for changes in the roof build up outside the immediate area inspected.



The underside of the roof has been painted but it appears the deck is in a visibly good condition at the area inspected.



All core samples taken indicated that the roof was dry and the existing waterproofing system has been successful. Image of moisture meter from Core Sample 1.

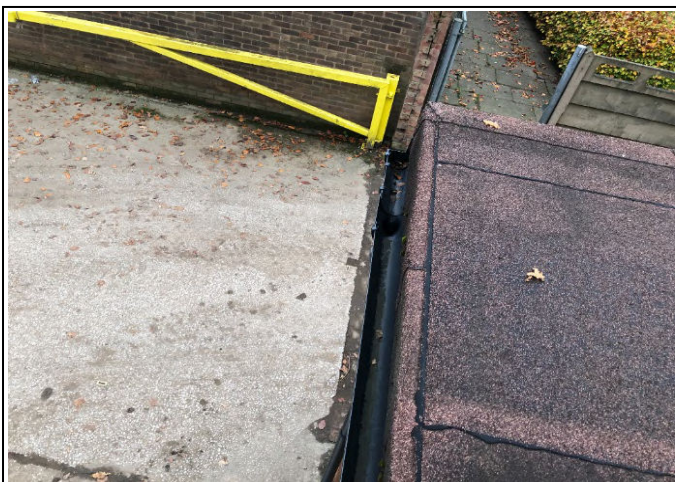
5.10134951/1 CONDITION REPORT - Continued



Small area of dirt indicates ponding water occurs in this area indicating possible deflection in the roof deck or inadequate roof falls. The presence of ponding water may have had a detrimental effect on the existing waterproofing system.



Pipe penetrations are evident across the roof area.



Existing drainage is to external gutters and downpipes.

5.10134951/1 CONCLUSIONS - Blackley Crematorium Storage Roof

Based on the survey findings the roof is in a good condition. The roof area is showing no wear and is clean and well maintained.

Small areas of dirt and debris were visible across the roof area during the survey, which suggest the roof is due for some seasonal maintenance.

Our conclusion is that the current waterproofing is in a suitable condition for a new waterproofing system to be overlaid onto it.

5A.10134951/1 RECOMMENDATIONS - Blackley Crematorium Storage Roof

Based on the conclusions of our survey we would recommend that a BMI Icopal high performance cold roof system is installed to your projects existing waterproofing.

5A.10134951/1 SAFE2TORCH PLAN -

BMI Icopal have pledged support to the National Federation of Roofing Contractors (NFRC) 'Safe2Torch' campaign. 'Safe2Torch' is an NFRC initiative, developed in partnership with contractor and manufacturer members of the NFRC, which seeks to significantly reduce the risk of roof fires when using gas torches, either to dry out roofs or when used to install torch-on membranes.

The roof plan below denotes the areas where naked flames are or are not permitted, a list of areas considered to be at risk under the Safe2Torch guidance may be found on

<https://www.nfrc.co.uk/safe2torch>

Plan View - Blackley Crematorium Office and Chapel Roofs

Visual impression of the areas where it is not Safe2Torch

■ No Naked Flames

■ Safe2Torch



This plan is offered in good faith and has been based on the findings of the Icopal roof survey, the installing contractor is to make their own assessment of the roof area prior to commencement of hot works to ensure all at risk areas have been identified. If any additional items of concern are identified please contact your Icopal representative prior to commencing works so the specification may be revised.

Areas with flammable substrates should be treated as Non Safe2Torch areas. To the areas with a flammable roof deck (shaded red areas on map) the specification will allow for the use of either a Thermally Activated VCL or Thermally Activated Underlay to protect the deck. As long as all flammable substrates have been encapsulated the remainder of the system can be torch applied. Non-flammable deck/substrates (green areas) can be installed using a torch on method. Flammable details (solid red areas on map, non-exhaustive) require a complete flame free installation. Please follow detailing as per the specification.

5.10134951/2 CONDITION REPORT - Blackley Crematorium Office and Chapel Roofs

These areas of roof have not been surveyed since January 2022, so we are assuming that the existing system is as per the original survey. Any amendments must be made clear to Icopal prior to commitment of the tender and prior to works commencing on site in case any changes of the specification are required.

5.10134951/2 CONCLUSIONS - Blackley Crematorium Office and Chapel Roofs

From the intrusive survey findings the current thermal performance of the roof does not meet current thermal performance regulations.

Our conclusion following discussions with the client is that the roof is stripped of its current waterproofing down to the vapour control layer and a new insulated flat roof waterproofing system installed.

5A.10134951/2 RECOMMENDATIONS - Blackley Crematorium Office and Chapel Roofs

Based on the conclusions of our survey we would recommend that a BMI Icopal high performance warm roof system is installed to the existing vapour control layer.

Offering total protection, our systems are able to meet every project need. Core elements include the waterproofing layer together with insulation, vapour control layers and accessories.

The following BMI Icopal specification proposes our recommendations for your project.

5A.10134951/2 SAFE2TORCH PLAN -

BMI Icopal have pledged support to the National Federation of Roofing Contractors (NFRC) 'Safe2Torch' campaign. 'Safe2Torch' is an NFRC initiative, developed in partnership with contractor and manufacturer members of the NFRC, which seeks to significantly reduce the risk of roof fires when using gas torches, either to dry out roofs or when used to install torch-on membranes.

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Plan View - Blackley Crematorium Office and Chapel Roofs

Visual impression of the areas where it is not Safe2Torch

■ No Naked Flames

■ Safe2Torch



This plan is offered in good faith and has been based on the findings of the Icopal roof survey, the installing contractor is to make their own assessment of the roof area prior to commencement of hot works to ensure all at risk areas have been identified. If any additional items of concern are identified please contact your Icopal representative prior to commencing works so the specification may be revised.

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APPENDIX D

Structural Report



Corby House
38A Chorley New Road
Bolton
BL1 4AP
Tel: 01204 531 208
Fax: 01204 380 474
Email: fgmarkland@btconnect.com
Web: www.fgmarkland.co.uk

Structural Report

Manchester City Council Decarbonisation. Blackley Cemetery Office and Yard – Roof Appraisal

Prepared by

Frederick G. Markland Associates Limited
Corby House
38A Chorley New Road
Bolton
BL1 4AP

Prepared for

Drees & Sommer UK Ltd
Jackson House
Sibson Road
Sale
Manchester
M33 7RR

Blackley Cemetery Office and Yard – Roof Appraisal

Brief

Frederick G Markland Associates have been instructed to undertake a site inspection to determine the existing roof structure and prepare an appraisal relating to the feasibility of the proposed PV panel installation.

Site Address

Blackley Cemetery Office and Yard
Victoria Avenue
Manchester
M9 8PJ

Inspection Date

The inspection was carried out on 5th August 2024.

Observations

The Blackley Cemetery Office and Yard is a single storey building comprising of offices surrounding an internal courtyard, and additional office space and store rooms surrounding an externally accessible courtyard.

Generally, all the office areas have hard ceilings, therefore it was not possible to determine the roof construction in this area. Within the machine store room, the structural roof deck soffit was exposed, revealing a channel reinforced woodwool deck. It is assumed that this form of roof construction is consistent throughout the single storey building.

The structural layout of the building is largely modular, with load-bearing masonry supporting the flat roof construction. In the machine store room, due to the larger internal space, thin gauge steel truss members spanning between external walls support the flat roof deck. Similar arrangements may be present in other areas of the building but were not possible to observe due to finishes.

The felt finish to the roof appeared to be in poor condition, with various areas where the felt had bobbled/lifted. Isolated areas within the ceilings to some rooms indicated possible historic leaks, with staining evident.

Measurements taken within the machine storage area indicated a total roof profile depth of approximately 220mm.

Proposals

A number of potential decarbonisation measures have been identified on behalf of the client to attain the client's target of achieving Net Zero Carbon status by 2038.

One of the measures identified across a number of properties within the client's corporate estate include the installation of an array of photovoltaic (PV) panels. At the Crematorium Office and Yard, the proposals entail the installation of a PV panel array on the easternmost flat roof above the Machine Store, Store & Garden Tool Store rooms.

The existing permanent loadings will be assessed in conjunction with both the original design variable loading, applicable at the time of construction for this building, along with current design

variable loading, to determine whether the existing roof structure has sufficient capacity to support the proposed PV panels.

An assumed weight of PV panel & mounting system of 25 kg/m² has been considered for the purposes of this appraisal. On the assumption that a PV panel array mounting system will not be penetrating the flat roof covering, additional loading due to ballast will need to be considered. This should be confirmed upon receipt of detailed proposals from the PV panel specialist supplier/installer. For the purposes of this appraisal, an estimation for the required ballasting load will be made based on the worst-case wind uplift load case.

Loading

Permanent loading

The existing dead loading can be considered as follows:

- Woodwool slab (assume 150mm thick)	0.90
- Roof covering	0.20
- Ceiling	0.15
- Services	<u>0.10</u>
	1.35 kN/m²
- Typical PV panel system self-weight	0.25 kN/m²

Variable loading

On the basis of the building being constructed circa 1959, the relevant design code describing dead and variable loadings was CP3: Chapter V: Part 1.

Section 6.3 of the above document states that for a roof slope of 30° or less, the following imposed loads (including snow) should be allowed for:

- Roof variable load	0.75 kN/m²
----------------------	------------------------------

Current British Standards (UK NA to BS EN 1991-1-1:2002) indicate that for a roof not accessible except for normal maintenance and repair, imposed loads on roofs should be taken as follows:

- Roof with slope less than 30°	0.60 kN/m²
---------------------------------	------------------------------

Snow loading

The site-specific snow loading can be considered as follows:

In accordance with EN 1991-1-3:2003 and UK national annex NA to BS EN 1991-1-3:2003

Altitude, A =	65m
Zone number, Z =	3
Density of snow, γ =	2.00 kN/m ³
Characteristic snow load, s_k = $((0.15 + (0.1 \times Z + 0.05)) + ((A - 100) / 525))$ =	0.43 kN/m ²

Roof type:	Flat roof
Width of roof pitch,	b = 6.7m
Slope of roof,	$\alpha = 0^\circ$

Shape coefficients:

Shape coefficient roof (Table UK NA.1)	$\mu_{1_NA1} =$	1.00
--	------------------	------

Loadcase 1 (Table UK NA.1)

Snow loading,	$s_1 \times \mu_{1_NA1} =$	0.43 kN/m²
---------------	-----------------------------	------------------------------

Wind loading

Type of roof	Flat
Length of building	L = 26000 mm
Width of building	W = 6700 mm
Height to eaves	H = 3000 mm
Pitch of roof	$\alpha_0 = 0.0$ deg

Basic values

Location	Manchester
Wind speed velocity (Figure NA.1)	$v_{b,map} = 22.5$ m/s
Distance to shore	$L_{shore} = 50.00$ km
Altitude above sea level	$A_{alt} = 65.0$ m
Altitude factor	$C_{alt} = A_{alt}/1\text{m} \times 0.001 + 1 = 1.065$
Fundamental basic wind velocity	$v_{b,0} = v_{b,map} \times C_{alt} = 24.0$ m/s
Direction factor	$C_{dir} = 1.00$
Season factor	$C_{season} = 1.00$
Shape parameter K	$K = 0.2$
Exponent n	$n = 0.5$
Air density	$\rho = 1.226$ kg/m ³
Probability factor	$C_{prob} = 1.00$
Basic wind velocity (Exp. 4.1)	$v_b = C_{dir} \times C_{season} \times v_{b,0} \times C_{prob} = 24.0$ m/s
Reference mean velocity pressure	$q_b = 0.5 \times \rho \times v_b^2 = 0.352$ kN/m ²

Wind0 Loadcase:

Exposure factor (Figure NA.7)	$C_e = 1.65$
Exposure correction factor (Figure NA.8)	$C_{e,T} = 1.0$
Peak velocity pressure	$q_p = C_e \times C_{e,T} \times q_b = 0.58$ kN/m ²

Consider Roof Zones H & I:

Zone H = $(C_{pe} - C_{pi}) \times q_p = (-0.7 - (0.2)) \times 0.58 =$	-0.52 kN/m ²
Zone I = $(C_{pe} - C_{pi}) \times q_p = (0.2 - (-0.3)) \times 0.58 =$	0.29 kN/m ²

Wind90 Loadcase:

Exposure factor (Figure NA.7)	$C_e = 1.65$
Exposure correction factor (Figure NA.8)	$C_{e,T} = 1.0$
Peak velocity pressure	$q_p = C_e \times C_{e,T} \times q_b = 0.58$ kN/m ²

Consider Roof Zones H & I:

Zone H = $(C_{pe} - C_{pi}) \times q_p = (-0.7 - (0.2)) \times 0.58 =$	-0.52 kN/m ²
Zone I = $(C_{pe} - C_{pi}) \times q_p = (0.2 - (-0.3)) \times 0.58 =$	0.29 kN/m ²

Appraisal

The permanent loading due to the PV panel arrays will increase the net permanent loading by 0.25 kN/m² to 1.60 kN/m². This load increase will need to be confirmed in conjunction with the PV panel supplier's details to suit the specific system used. Based on a worst-case wind uplift of -0.52 kN/m², a conservative estimate for the ballast load will be taken as 0.27 kN/m², taking the net permanent loading to 1.92 kN/m².

Based on the derived values for the site-specific snow and wind loading, the worst-case variable load case is considered to be attributed to the variable loading attributed to access for maintenance can be omitted within the footprint of the PV panel array, as due to the fragility of the PV panels the owner should ensure that the PV panel array should not be trafficked. The load combinations can be considered as following:

Original Design Load Combination 1 (no PV panel):

Permanent	1.35	kN/m ²
Variable (access for maintenance)	<u>0.75</u>	kN/m ²
<i>Working load (1.0P + 1.0V)</i>	<i>2.10</i>	<i>kN/m²</i>
<i>Ultimate load (1.4P + 1.6V)</i>	<i>3.09</i>	<i>kN/m²</i>

Proposed Design Load Combination 2:

Permanent (incl. PV panels + ballast)	1.92	kN/m ²
Variable (within footprint of PV panel array)	<u>0</u>	kN/m ²
<i>Working load (1.0P + 1.0V)</i>	<i>1.92</i>	<i>kN/m²</i>
<i>Ultimate load (1.35P + 1.5V)</i>	<i>2.59</i>	<i>kN/m²</i>

Proposed Design Load Combination 3:

Permanent (incl. PV panels)	1.92	kN/m ²
Snow	<u>0.43</u>	kN/m ²
<i>Working load (1.0P + 1.0S)</i>	<i>2.35</i>	<i>kN/m²</i>
<i>Ultimate load (1.35P + 1.5S)</i>	<i>3.24</i>	<i>kN/m²</i>

Proposed Design Load Combination 4:

Permanent (incl. PV panels)	1.92	kN/m ²
Wind	<u>0.29</u>	kN/m ²
<i>Working load (1.0P + 1.0W)</i>	<i>2.21</i>	<i>kN/m²</i>
<i>Ultimate load (1.35P + 1.5W)</i>	<i>3.03</i>	<i>kN/m²</i>

The above load combinations indicate that there is an increase in area loading due to the PV panel installation when compared with the original design loading.

However, the above loadings are based on area loads being applied uniformly across the full area of the roof deck, which is not necessarily applicable when considering the PV panel installation specific to flat roofs. Generally, ballasted PV panel mounting systems utilise a series of rails spanning between EPDM 'matts', which effectively transfer the loading of the PV panel & ballast onto the existing roof surface. These matts can range from 75 to 100mm wide, with lengths going up to 400mm. Consequently, the localised pressure generated at the matt locations due to concentrated load can be significantly higher than the area loadings listed above.

Woodwool slabs are now classified as a fragile material under the HSE – Health and Safety in Roof Work (HSG33). This is due to the brittle nature of woodwool as a structural material.

Due to the increase in area loading, in conjunction with the fragile classification of woodwool slabs, the PV panel installation proposals are not considered feasible without undertaking some form of strengthening/over-roofing works.

Conclusions

In summary, it is considered that the existing roof structure does not have sufficient capacity to accommodate the proposed PV panel installation in its present condition. To proceed with the PV panel proposals, it is recommended that some form of strengthening, or replacement works are undertaken.

One means of potentially mitigating the fragile nature of the roof construction would be to provide some form of suitable overlay that would distribute any concentrated loads. This route would require a competent contractor to develop suitable RAMs associated to working on and around a fragile roof construction.

Alternatively, the roof deck would need to be replaced with a structural deck that is designed to accommodate the PV panel loading.

Report Prepared by:

A handwritten signature in black ink, appearing to read 'Ben Clelland', with a horizontal line extending to the right.

Ben Clelland
BSc (Hons)
Structural Engineer

APPENDIX E

The Solar Edge Design Report

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Chapel Lane, Manchester, M9 8JP, United Kingdom | 10 Oct 2024



NOTIFICATIONS

 Warning: Batteries are not connected to a StorEdge inverter(s) (SE10K-RWB48 Home Hub).



SYSTEM OVERVIEW

 26 PV modules

 1 Inverter

 26 Optimizers

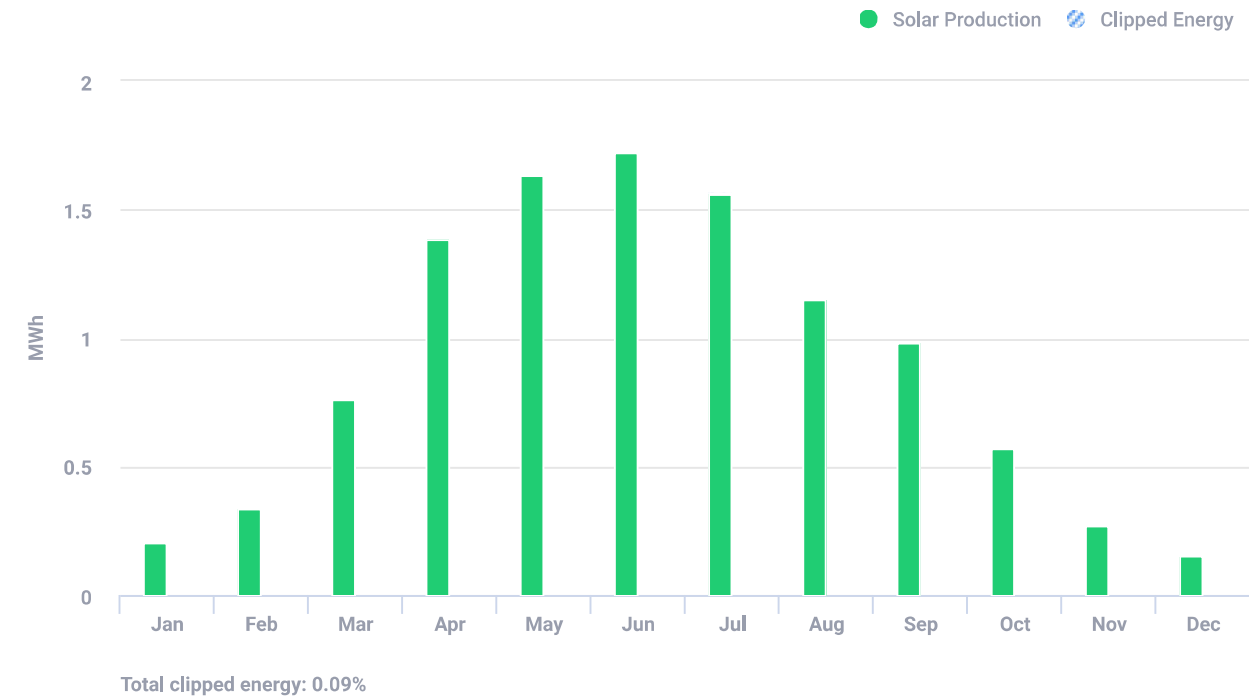
SIMULATION RESULTS

 Installed DC Power 13.00 kWp	 Max Achieved AC Power 10.00 kW	 Annual Energy Production 10.74 MWh	 CO2 Emission Saved (Annually) 2.08 t	 Equivalent Trees Planted (Annually) 95
 Max Achieved DC Power 11.91 kW	 DC/AC Oversizing 119 %	 Max Active AC Power 10.00 kW	 Performance Ratio 90 %	 Performance Index 826 kWh/kWp

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ESTIMATED MONTHLY ENERGY



Month	Solar Production (kWh)	Consumption (kWh)	Self-consumption (kWh)	Clipped Energy (kWh)
Jan	206	-	-	-
Feb	335	-	-	-
Mar	764	-	-	-
Apr	1,386	-	-	8
May	1,636	-	-	-
Jun	1,724	-	-	-
Jul	1,563	-	-	2
Aug	1,151	-	-	-
Sep	983	-	-	-
Oct	573	-	-	-
Nov	268	-	-	-
Dec	152	-	-	-

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PV MODULES

# Module	Model	Peak power	Racking type	Orientation	Azimuth	Tilt
26	JA Solar, JAM66S30-500/MR (1000V)	13 kWp			232°	10°
Total:	26	13 kWp				

BILL OF MATERIALS (BOM)

Items	Part Number	Quantity	Price (£)	Total (£)
SE10K-RWB48 Home Hub		1		
S500 input up to 500Wp, Max Isc 15A	S500-1GM4MRM	26	0.00	0.00
JAM66S30-500/MR (1000V)		26		

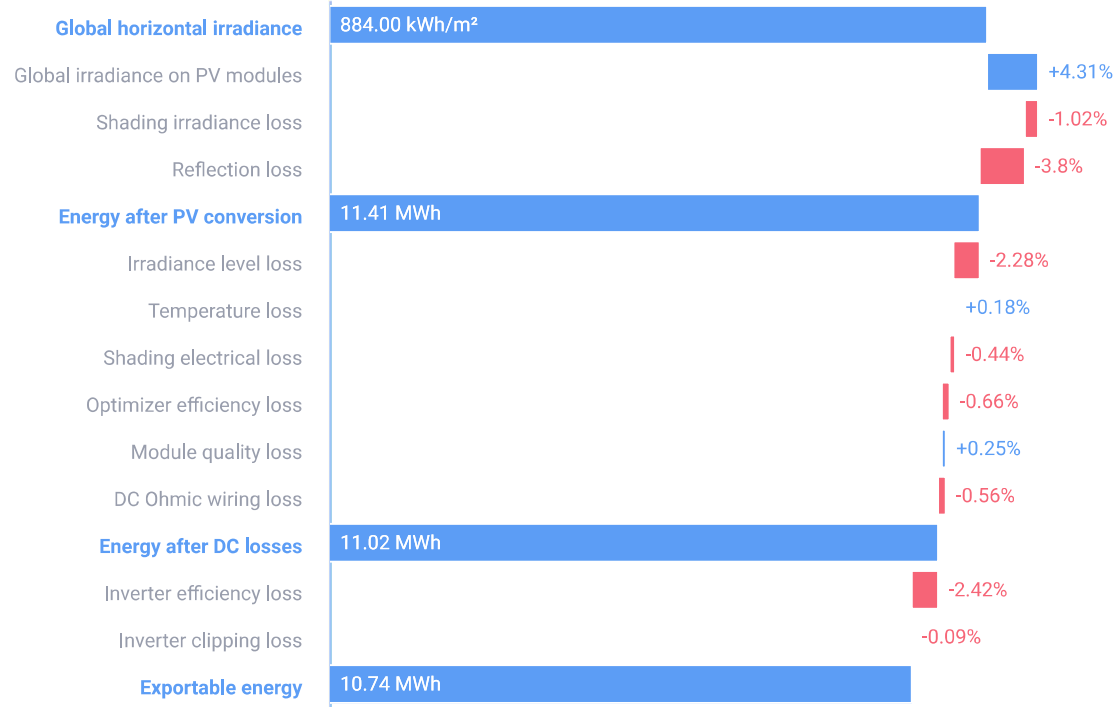
ELECTRICAL DESIGN

Inverters & Storage	Strings per inverter	Optimizers per string	PV modules per string
1 xSE10K-RWB48 Home Hub 11.91kW 119% Oversizing	1 x string	26 x S500	26

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SYSTEM LOSS DIAGRAM



SIMULATION PARAMETERS



LOCATION & GRID

Time zone	BST (London)
Weather station	Manchester (20.27 km away)
Station altitude	67 m
Station data source	Meteonorm 7.1
Grid	400V L-L, 230V L-N



LOSS FACTORS

Near shading	Enabled
Albedo	0.20
Bi-Facial Albedo	0.30
Soiling/Snow	0%
Incidence angle modifier (IAM), ASHRAE b0 param.	0.05
Thermal loss factor Uc (const) Flush mount	20
Thermal loss factor Uc (const) Tilted	29
LID loss factor	0%
System unavailability	0%