GLA Energy Comments – Updated Design Response

9,11 & 19 Osiers Road, Wandsworth, London

Prepared by: Hollybrook Limited

September 2019

HOLLYBROOK

Introduction

The following document is aimed to address the comments raised by the GLA Sustainability Team on 4th September 2019 with regard to the development proposals at 9,11 & 19 Osiers Road, Wandsworth, London.

The document has been formatted in order to respond to all questions raised, and therefore does not address any factual statements relating to the application, that do not pose a query.

It is noted that the proposals do not comply with the October 2018 Energy Assessment Guidance, adopted in January 2019. This is because the proposed scheme design was frozen long before this new guidance was published – Please note the original planning application was submitted in July 2018. Therefore, the requirements of the October 2018 energy planning guidance should not be deemed applicable to the scheme.

More importantly, the proposed energy strategy, as demonstrated in the submission and this note, is an appropriate response to the site and its constraints, complies with the relevant policies in the current London Plan and will perform well.

Design Response

4. An Overheating Analysis using thermal dynamic modelling should be undertaken to assess the overheating risk within the conditioned areas of the building; this should be in line with CIBSE TM59 using all CIBSE TM49 weather files.

This was submitted in July 2018 with the Planning Application and has been sent over to the Sustainability Team for review.

7. Based on the information provided, the residential elements of the proposed development do not appear to achieve any carbon savings from energy efficiency alone compared to a 2013 Building Regulations compliant development. The applicant should model additional energy efficiency measures and commit to the development exceeding 2013 Building Regulations compliance through energy efficiency alone.

The applicant has stated that the energy statement demonstrates a 0.12% improvement from energy efficiency alone compared to a Building Regulations compliant development, and as such is compliant with London Plan Policy. The level of improvement is not considered adequate and the applicant should therefore model additional measures to maximise the savings acquired from the 'be lean' stage of the energy hierarchy. Further fabric and energy efficiency improvements should be modelled and the applicant should submit the revised carbon emissions, savings and accompanying DER evidence. <u>This item is still outstanding.</u>

Further calculations have been undertaken in order to increase this performance buffer. It has been determined that the specification of high performance thermally broken bolt-on balcony connectors, rather than a traditional cantilevered balcony junction, shall significantly reduce the cold bridging at balcony junctions. This shall report a revised Be-Lean emissions improvement of circa 4% over building regulations, with indicated residential emissions of 198.5 tonnes/annum. A Block Sap compliance report has been provided detailing this change (See Appendix 1).

The current design already relies on low U-values & good levels of heat loss mitigation. Increasing the glazing g-value would increase this further, however, it would come at the cost of impacting the overheating mitigation strategy.

Investigation is also underway as to the potential of reducing the external wall U-value. However, this would result in an increase in wall thickness, and reduction of internal floor area. This must be carefully evaluated throughout the detailed design process to ensure feasibility. Therefore, this potential improvement has not been included within the revised results.

MVHR is also not considered feasible, as would need additional ceiling void depths of circa 100mm to allow for larger ducts crossing over which would increase the building heights significantly. The addition of MVHR within each dwelling would require larger utility cupboard space for internal plant (circa 1m2 per unit), space requirements would mean that some apartments would require layout alterations, which could increase the building footprint or reduce the proposed number of units. The addition of approximately 200kW ASHP capacity would increase electrical supply by circa 100kVA. Currently, the UKPN application is for 750 kVA which would need to increase to 850kVA.

It is noted that the GLA targets of 10% and 15% respectively within their new guidance (not applicable to this application) are based on data collected before the ban on combustible materials. This ban effectively worsened attainable U-values by 10%-20% across high-rise schemes, due to the lower thermal efficiency of non-combustible alternatives.

10. The applicant should be proposing a site heat network where all apartments and non-domestic building uses will be connected. A drawing showing the route of the heat network linking all uses/buildings on the site should be provided.

The applicant has stated that the site heat network is proposed to supply all residential units. On the other hand, it has been stated that the commercial aspects of the scheme are to be provided with cooling for commercial purposes, due to their proposed usages. The alternative option of providing heating via the district scheme and cooling via centralised chiller systems was investigated, however found to be a less sustainable option, due to the lower efficiencies and greater distribution losses associated with such systems. The applicant needs to provide the associated heating demand of non-residential elements to justify the omission of connection to the DH network. Capped connections to the heat network will be provided for the non-domestic units; this should be demonstrated through appropriate drawings. All relevant drawings showing the route of the heat network should also be submitted. <u>This item is still outstanding.</u>

The predicted heating & hot water consumption (regulated) of the commercial space is reported by the BRUKL as approx. 35,700 kWh/year. This relates to <5% of the total site demand of approx. 760,000 kWh/year.

Two schematic drawings have been included in Appendix 2; one showing how capped connections shall be provided for the commercial uses and the other showing the route of the heat network.

The commercial spaces are being provided to shell only, therefore it would be the responsibility of the occupier to decide whether to connect to the capped heating connections or not.

12. **The applicant is proposing to install a gas fired CHP unit as the lead heat source for the site heat network. The CHP is sized to provide the domestic hot water load, as well as a proportion of the space heating leading to a 75% contribution. A reduction in regulated CO2 emissions of 55 tonnes per annum (20%) will be achieved through this second part of the energy hierarchy.**
13. **Given the scale of the development, and in line with the GLA guidance on preparing energy assessments, a CHP-led heating strategy is not considered appropriate for the proposed development. The applicant should consider the potential of other, more appropriate, low carbon/renewable technologies that could supply the heating requirements of the site.**

    The applicant has stated that the M&E design team have determined that CHP is a viable option for this development. If CHP were to be replaced with air source heat pumps the scheme would have to be completely redesigned for reasons associated with roof space and building height and general re-design of the heating distribution system. The information submitted is not considered satisfactory to dismiss a CHP alternative for the site. The applicant should carry out a detailed feasibility analysis for all potential heating options for the site and demonstrate their viability. Should a CHP be proposed, it should be demonstrated that the site will be future proofed for on-site low carbon replacement when the CHP is at the end of its life. <u>This item is still outstanding.</u>

<u>Technical Feasibility Analysis</u>

This note provides a summary of other low carbon or renewable heat sources that could be considered and the implications on the M&E design if it were to be changed. Implications on other aspects of the project have also been provided.

Current Design

The project was designed in 2017-2018 and submitted for planning in July 2018. A site wide heat network has been designed for the Osiers Road development to deliver heat to all dwellings and with capped connections to shell only for the commercial spaces. The system will use indirect heat interface units for each dwelling to provide heat for space heating and domestic hot water generation. The district heating system will circulate water at 70°C flow and 40°C return. A basement heating plantroom will be positioned in Block B2, containing a gas fired CHP as the lead heat source and gas fired boilers as secondary heat sources. Boiler and CHP flues will terminate at roof level of Block B2.

Alternative Low Carbon Heat Sources

This design note is intended to review alternative low carbon/renewable technologies and to quantify the implications of these alternatives on the design. Alternative low carbon/renewable technologies that could be considered are as follows:

Combustion based:

- Biomass and Bio-diesel boilers

These types of system would require large space for storage of fuel, either solid or liquid. Regular heavy vehicle movements would be required to bring fuel to the site. Infrastructure would be required at ground floor level for fuel delivery which would result in a loss of public realm or commercial space which are both big positives of the scheme. Biomass and bio-diesel boilers will exceed limitations on emissions, such as particulates and NOx and so would not be compliant with the clean air requirements. Due to the central city nature of the site, a system relying on regular heavy vehicle movements for fuel delivery is not thought to be appropriate. This approach is not considered to be feasible.

Electrical based:

- Water / Ground source heat pumps (WSHP / GSHP)
- Sewerage Heat Recovery
- Air source heat pumps (ASHP)

The site is approximately 100m from the river Thames, so theoretically it would be possible for a water source heat pump to make use of the river water as a heat source. It is also theoretically possible, assuming suitable ground conditions are present on the site, for a water source heat pump to make use of water from river gravels beneath the site through open bore holes. Both approaches would require significant civils works to install bore holes or pipework between the site and the river, as well as relevant permissions from bodies such as the Environment Agency. These approaches are non-standard, and would carry significant risk to both the construction and ongoing operation. Due to these risks, as well as expected complication, likely costs, and programme implications these approaches are not considered to be feasible.

A ground source heat pump system requires a network of pipework to be installed below ground with water circulated to extract heat from the ground using a heat pump. Vertical bore holes, circa 150m deep are typically used. This approach would be very costly to install, and would require an annually balanced load between heating and cooling to avoid over depleting the heat resource in the ground. Cooling is only proposed to be delivered to the commercial parts of the development, and so the annual cooling load would be far exceeded by the annual heating load. This approach is not considered to be feasible.

Another manifestation of water source heat pump that could be considered is a sewerage heat recovery system. This approach takes heat from sewerage using a heat pump, and is suited to sites that have large sewer mains in close proximity. From review of the sewer maps for the area, the site does not have a main trunk sewer in close proximity. This approach is not considered to be feasible.

An air source heat pump makes use of external ambient air as a heat source. This approach would require an external plant space to house air source heat pump equipment in open air, which is typically located on the roof of a building. This approach is feasible from an M&E perspective, however would have significant implications on the design of the M&E systems which are outlined below. Implications on other aspects of the development have also been included.

Implications of changing the design to air source heat pump (ASHP) based heating

Heat Network Configuration:

There are a number of ways that an air source heat pump could be implemented as follows:

1. Air source heat pumps, Gas fired boilers, heat network with HIUs in dwellings.

   This would involve a substantial redesign of the scheme. There would be a direct swap between the CHP and the air source heat pump with the rest of the heating network remaining as currently designed. As the ASHP needs to be installed in open air, the most appropriate position would be the roof of the tower above the main heating plantroom, with heating pipework linking to the heating plantroom in the basement below. If the entire heating plantroom were located at roof level, then this may have implications on the structure and building massing.

2. Air source heat pump, gas fired boilers, ambient loop with ambient loop heat pumps in dwellings.

   This would require a complete redesign of the heating system. This approach circulates water through the building at a low temperature fed by boilers in the basement and air source heat pumps at roof level. Each dwelling would be provided with an ambient loop heat pump (ALHP), taking low grade heat from the ambient loop and providing high grade heat to the dwelling for space heating and domestic hot water production. This approach would require approximately 1sqm additional space within each dwelling for the ALHP unit. This approach relies on technology that is new to the market, and does not have a proven track record. It would therefore present a construction and operation risk going forward. A significant redesign time would be required for the M&E systems.

3. Air source heat pump, heat network for space heating to dwellings, electrical heating domestic hot water production in dwellings.

4. Air source heat pump, heat network for domestic hot water production in dwellings, electrical space heating in dwellings. Different approaches have been outlined below.

   Options 3 & 4 would be a variant on Option 1 but with part of the load met by direct electric heating. These approaches would reduce the required capacity of ASHP.

Electrical Infrastructure

The current electrical design includes a 1000kVA transformer, with 750kVA allocated to the development and 250kVA allocated for the UKPN network. Any electrical based heating system will impact the electrical infrastructure to the site. Assuming system architecture Option 1, a high-level assessment has determined that a heat pump of approximately 200kW with a COP of 3 would be required for the site. It is estimated that this would result in an increase in electrical demand to the site of approximately 100kVA. This will increase the demand of the development to 850kVA. Based on discussion with UKPN, this increase in capacity would exceed the capacity of a 1000kVA transformer and so a second transformer would be required. Systems, 2, 3 and 4, would result in a further increase in electrical demand for the site.

Plant Space

For all system architecture types, plant space would be required at roof level. This will affect the structure and building massing. Considering system Option 1, a roof plant area of approximately 120sqm would be required for ASHP equipment. Additional riser space would be required of approximately 1sqm for riser pipework between the roof plant and the basement energy centre. The additional plant space would displace other uses for the roof, e.g. PV installations. A roof sketch showing the plant space requirements has been provided in Appendix 3.

Noise

The air source heat pump equipment is inherently noisy, and so the acoustic impact must be considered. The required plant space would need to be positioned at roof level with acoustic screening to the perimeter to lower airborne noise plus further measures to mitigate vibration. Furthermore, the acoustic screening would need to be continuous around all sides of the roof plant area, and extend above the height of the plant itself. This would result in screening that would be approximately 3m tall, equivalent to another storey on the building.

Access and Maintenance

Air source heat pump equipment is typically packaged plant that is delivered in single units. Based on initial plant assessments, the ASHP units would be approximately 4100mm long x 2200mm wide x 2150mm high and would weigh approximately 2400kg. Plant replacement would require erection of a large mobile crane. Due to the downtime associated with replacement of ASHP equipment it would always be recommended to provide complete backup from gas fired boilers to reduce impact on residents.

Energy

If ASHPs were to be implemented, the 35% SAP emissions improvement would no longer be met. Initial calculations indicate that heat pumps with a high seasonal COP of 3.0 supplying 50% of the site heat demand, would report an emissions reduction of approx. 20%, which is not in line with local and regional planning policy. This would then require a redesign of the building to achieve as close of possible to the 35% target, likely including a change in ventilation strategy which would have implications on the building layouts, height etc. as noted in an earlier section.

It is accepted that assessing the scheme to the new October 2018 carbon factors would report over a 35% saving from a heat pump strategy. However, as noted, the guidance referring to these factors was released months after the design of the scheme was frozen, and the planning application had been submitted. Therefore, they are not deemed applicable.

The PV would need to be omitted from one of the roofs (see Appendix 3), leading to a drop in renewable generation and further increase in SAP emissions. The embodied energy of multiple ASHP units would be significantly higher than a single CHP due to additional pipework & ancillary equipment required.

Distribution losses from the system would be increased as the buffer vessels could not be located on the roof, distribution pipework would need to run from the roof, to the basement plant, and then back up the building to the apartments. This would increase losses and the pumping power required for operation. Additional riser space would be required which will have an impact on the internal layouts of the apartments.

Structural Impacts

The heat pumps could add approximately 2.5 tonnes of weight to the roof, which would have implications on the structural design of the scheme, possibly increasing the size of the structural frame and therefore the height and footprint of the blocks.

Planning related issues

In addition to the technical issues set out above, changing the Energy Strategy from CHP to ASHPs will have a number of major planning implications which are outlined below:

- Increasing the building scale and bulk to accommodate the larger internal and rooftop plant requirements may be unacceptable in townscape terms.
- Daylight sunlight impacts are a particularly sensitive issue for this Project, therefore any further increase to the height and bulk of the scheme would have a negative impact on surrounding buildings.
- Rooftop plant impacts on provision of PV's to roof and amenity space.

Any redesign of the scheme would take a considerable amount of time and would likely require a re-consultation period due to the change in bulk and massing, the daylight sunlight impacts on neighbouring properties and the amount of supporting documentation that would need revising. This would include:

- Application Drawings
- DAS (and Tall Building Assessment)
- Planning Statement
- Energy Report
- Daylight Report
- Noise Report
- Air Quality Report
- BREEAM
- Wind Microclimate Study

Site Future Proofing

Capped connections will be provided in the plantroom to allow connection to any area wide network that may be provided in future. It will be possible to replace the CHP at the end of its life with another low carbon heat source. The positioning in the basement plant room would allow for water to water heat pump technologies recovering heat from nearby waste heat sources, e.g. sewerage heat recovery such as the SHARC system, or take heat from river water from the Thames. The gas grid may also decarbonise in future and infrastructure within the plantroom can be adapted accordingly.

Summary

This design note has considered a number of low carbon technologies as an alternative to CHP plant as currently designed. The assessment has determined that air source heat pumps installed on the building would be feasible from an M&E perspective however, implementing this change would involve a complete re-design of the scheme and would have wide ranging implications on a number of different elements of the project.

Most importantly, redesigning the scheme to accommodate anything other than CHP would make it impossible to deliver the 100% affordable housing scheme in line with Peabody’s requirements.

15. **A PV array with a rated output of 48kWp is being proposed. A roof layout should be provided indicating the proposed PV installation. The applicant should also confirm the proposed PV area and demonstrate that the site's full potential for a PV installation has been maximised, regardless of the on-site London Plan target having been met.**

    A PV layout has been provided demonstrating the PV allocation. It has been stated that PVs to lower roofs would suffer from over-shading, and require additional inverters, cabling and maintenance. An over-shading analysis for the lower roof areas should be submitted to support the above statement. <u>This item is still outstanding.</u>

    PV is currently proposed to all high-level roof space. The southern lower roofs could feasibly include PV however, this would impede the visual amenity for residents. These roofs are currently proposed as green roofs for this reason.

    The current proposals exceed the on-site target of a 35% SAP carbon reduction. The northern lower roof would suffer from shading from the higher floors to its immediate south, in addition to the above impact. An overshading analysis has been provided for the lower roof areas (See Appendix 4).

    Urban Greening Factor calculations have also been included in Appendix 5.

Appendices

Appendix 1: Block Sap compliance report

Block Compliance WorkSheet: test

User Details

Assessor Name: | **Stroma Number:**

Software Name: Stroma FSAP | **Software Version:** Version: 1.0.4.12

Calculation Details

Dwelling	DER	TER	DFEE	TFEE	TFA
a1-2-01	17.63	18.74	43	54	74.94
a1-2-02	18.14	19.34	38.9	48.3	53.81
a1-2-03	16.52	17.75	37.8	47.6	73.35
a1-2-04	17.13	18.36	40.7	51.9	72.42
a1-2-05	14.36	15.05	37.3	46.1	120.39
a1-3-01	15.21	15.82	33.3	39	74.94
a1-3-02	15.69	16.47	28.9	33.4	53.81
a1-3-03	14.23	14.9	28.4	32.9	73.35
a1-3-04	14.94	15.44	31.8	36.8	72.42
a1-3-05	12.29	12.62	28.9	33.7	120.39
a1-4-05	13.25	13.56	32.8	38.5	120.39
a1-5-05	15.19	15.52	35.4	41.4	85.47
a1-8-01	16.29	17.45	37.6	47.3	74.94
a1-8-05	15.89	16.64	38.3	47.1	85.47
a1-9-01	17.5	18.42	45.8	57.6	89.66
a1-9-02	17	18.3	39.8	50.7	71.39
a1-9-03	17.39	18.74	42.1	54.4	74.1
a1-9-04	18.33	19.35	49.6	63	92.47
b1-10-01	22.71	23.77	58.1	71.7	54.19
b1-10-02	17.76	19.04	46.5	60.5	88.34
b1-10-03	18.48	19.44	47	58.2	74.36
b1-2-01	16.73	17.95	41.8	54	86.14
b1-2-02	17.96	19.49	43.3	56	71.42
b1-2-03	19.61	21.23	44.7	58	53.01
b1-2-04	15.95	17.31	37.4	48.7	79.03
b1-2-05	14.91	16.14	37.2	48.1	105.24

Block Compliance WorkSheet: testCont...

Dwelling	DER	TER	DFEE	TFEE	TFA
b1-2-06	16.66	17.88	41.6	53.7	86.91
b1-3-01	14.43	14.82	32.6	38.1	86.14
b1-3-02	15.69	16.28	34.1	39.4	71.42
b1-3-03	17.31	17.81	35.3	40.3	53.01
b1-3-04	13.76	14.2	28.4	32.7	79.03
b1-3-05	12.64	13.11	28.1	32.6	105.24
b1-3-06	14.3	14.64	32.1	37.2	86.91
b1-6-01	15.34	15.81	33.5	38.3	71.18
b1-6-03	15.46	15.73	32.2	37	69.44
b1-6-04	14.35	14.9	29.2	33.8	71.53
b1-6-05	15.75	16.62	27.2	31	50.7
b1-6-06	14.17	14.7	27.5	30.7	71.03
b1-6-07	14.98	15.47	32.7	37.8	74.5
b1-8-01	17.67	17.81	42.9	48.6	71.18
b1-8-02	16.65	17.07	38	43.4	71.42
b1-8-06	15.18	15.39	31.7	34.3	71.03
b1-8-07	17.51	17.56	42.9	48.4	74.5
b1-9-01	20.13	20.38	47.3	54	53.68
b1-9-02	19.07	19.52	41.7	47.7	50.65
b1-9-03	13.33	13.74	31.1	36.4	101.62
b1-9-04	15.3	15.51	39.8	46.5	104.77
b2-10-03	16.79	17.63	39.5	47.9	74.09
b2-10-04	16.16	17.24	37.2	46.8	75.18
b2-10-05	17.39	18.43	39.4	50	66.83
b2-10-06	18.6	19.07	40	45	49.58
b2-11-03	17.48	17.89	37.8	43.7	58.5
b2-11-04	18.62	19.09	40	45.1	49.58
b2-12-01	18.16	19.3	45	56.4	71.98
b2-12-02	15.28	16.15	40.5	51	110.51
b2-12-03	19.66	21.07	44.3	55.3	49.58

Block Compliance WorkSheet: testCont...

Dwelling	DER	TER	DFEE	TFEE	TFA
b2-12-04	17.49	18.65	42.8	53.8	73.39
b2-13-01	23.06	23.89	59.3	71.6	52.79
b2-13-02	20.77	22.27	50.5	64.3	54.69
b2-13-03	20.17	21.69	47.3	60.1	52.6
b2-13-04	22.78	23.71	57.4	69.3	50.5
b2-2-01	18.34	19.23	45.7	56	71.98
b2-2-02	18.65	19.95	39.6	49	50.81
b2-2-03	17.6	18.74	42.7	53.6	74.09
b2-2-04	15.55	16.51	34.7	43	75.18
b2-2-05	15.55	16.6	34.8	43.6	76.86
b2-2-06	16.74	17.95	39.3	50	73.72
b2-2-07	19.38	20.58	49.7	62.7	70.77
b2-2-08	18.15	19.14	45.4	56.3	73.39
b2-3-01	15.91	16.28	35.9	40.9	71.98
b2-3-02	16.15	16.99	29.3	33.6	50.81
b2-3-03	15.23	15.78	33.2	38.4	74.09
b2-3-04	13.36	13.92	25.6	29.6	75.18
b2-3-05	13.36	13.92	25.8	29.7	76.86
b2-3-06	13.58	14.17	26.3	30.5	73.72
b2-3-07	14.12	14.48	32.1	37.4	92.81
b2-3-08	15.77	16.15	35.8	41	73.39
b2-9-05	13.96	14.42	28.2	32.3	76.86
b2-9-06	16.46	17.56	38.1	48	73.72
b2-9-07	16.05	16.86	39.8	49.6	92.81

Calculation Summary

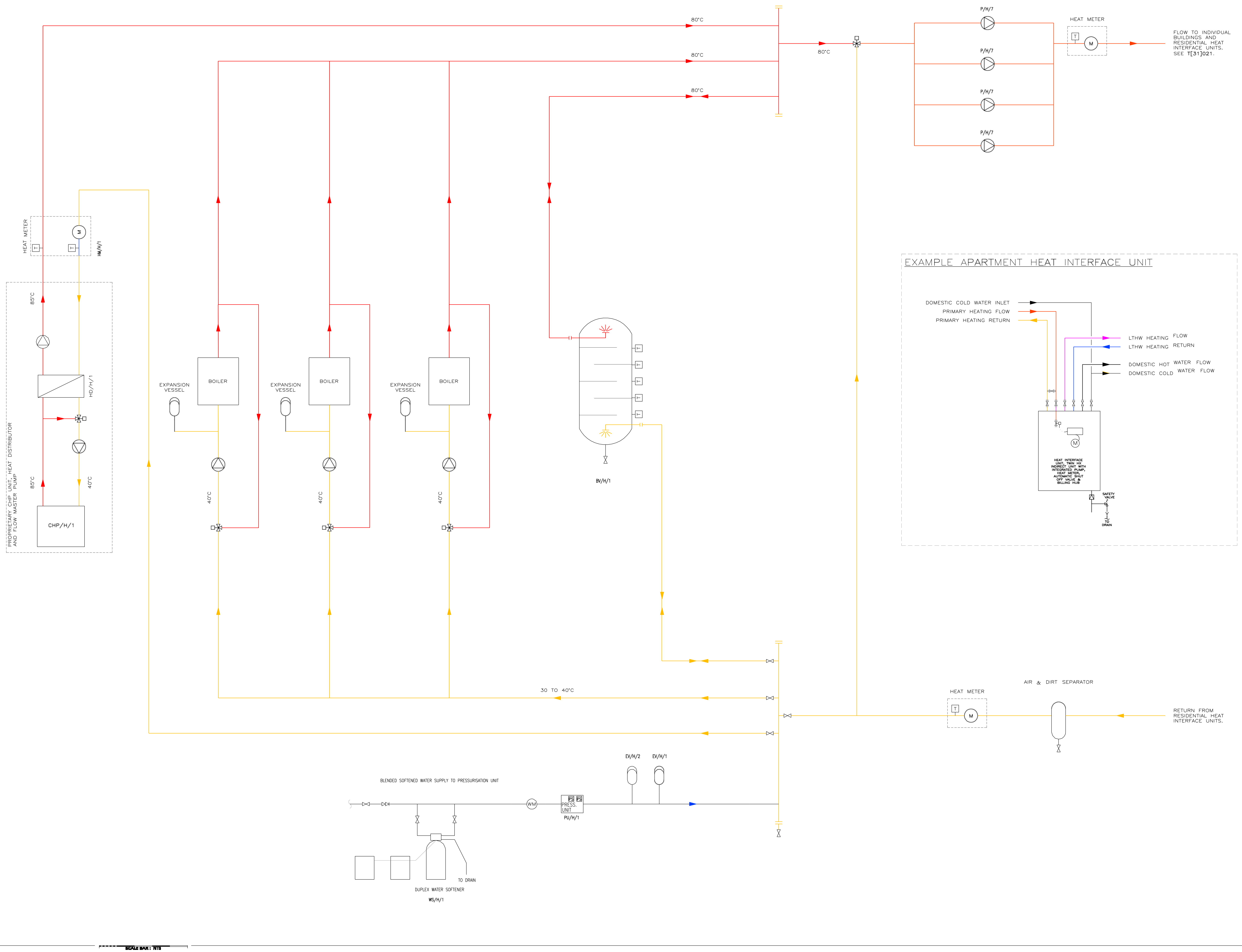
Block Compliance WorkSheet: testCont...

Total Floor Area	5960.16
Average TER	17.05
Average DER	16.27
Average DFEE	37.79
Average TFEE	45.85
Compliance % Improvement DER|TER % Improvement DFEE|TFEE	Pass 4.57 17.58

Appendix 2: Heat Network Schematic Drawings

NOTES:

1. THIS DRAWING IS FOR PLANNING PURPOSES ONLY AND SHALL NOT BE USED FOR BILLING OR DESIGN INFORMATION.



date	description	eng
13/11/18	PLANNING ISSUE	PD

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architect
ROLFE JUDD ARCHITECTS

job title
OSIERS ROAD

project leader	date	scale (at A1)
BC	**OCT 18**	**NTS**

drawing title
LTHW ENERGY CENTRE SCHEMATIC

job no	dwg no	rev
6328	**T[31]020**	/ *

NOTES:

1. THIS DRAWING IS FOR PLANNING PURPOSES ONLY AND SHALL NOT BE USED FOR BILLING OR DESIGN INFORMATION.

rev	date	description	eng
A	14/11/18	PLANNING ISSUE	PD
*	13/11/18	PLANNING ISSUE	PD

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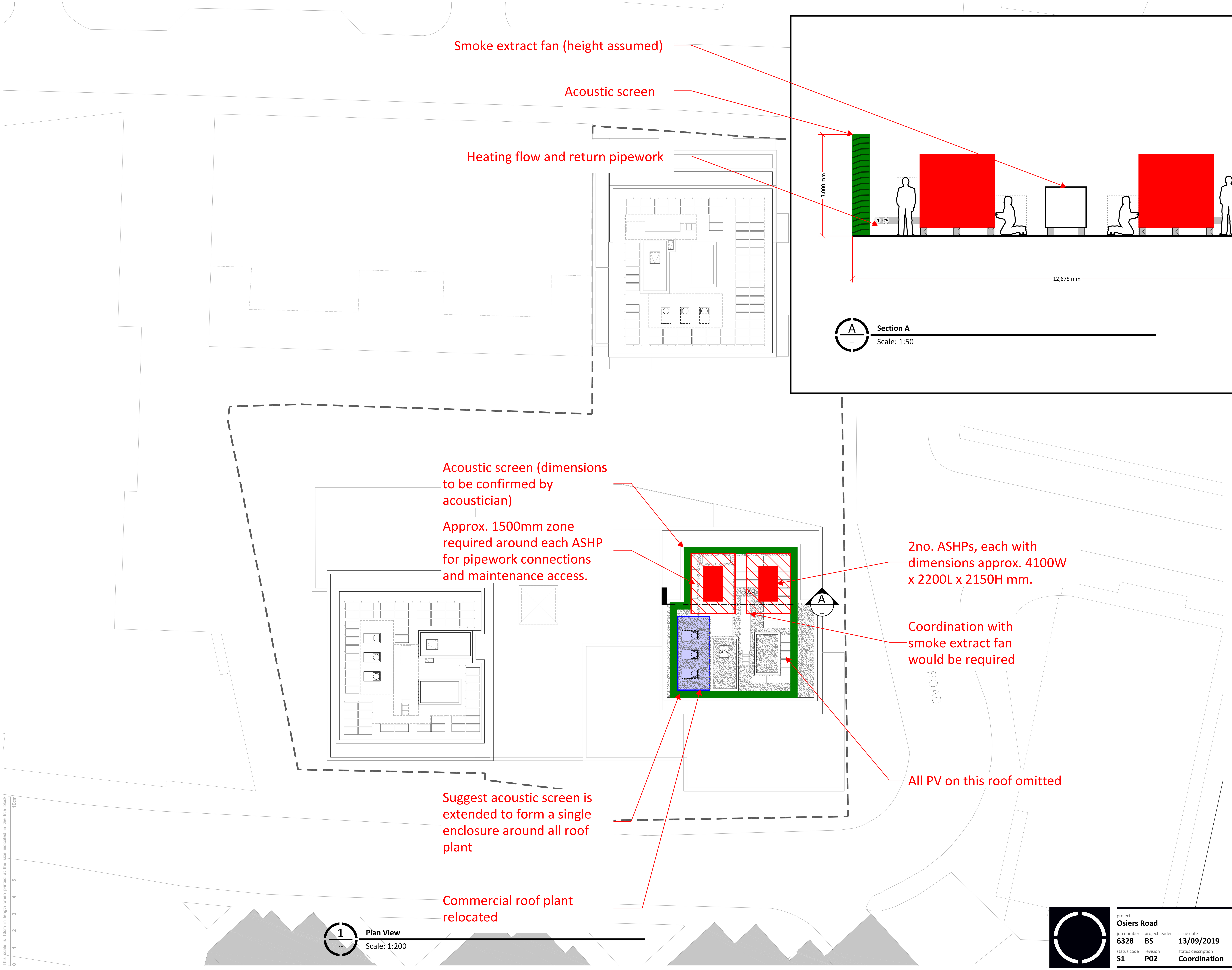
job title
OSIERS ROAD

project leader	date	scale (at A1)
BC	**NOV 18**	**NTS**

drawing title
LTHW ENERGY CENTRE DSITRIBUTION

job no	dwg no	rev
6328	**T[31]021**	/ *

Appendix 3: Roof Sketch for ASHP Plant Requirements



NOTES

1 The Contractor must check and confirm all dimensions ... rted and resolved by the ... e

... d

... accordance with current ... and to comply with all ... British Standards

Rev		Date
P2	Issued for Planning	19/07/18
P1	Issued for Planning	17/07/18

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Client
Hollybrook Limited

Project
Osiers Road

Drawing
Roof Floor Plan

project
Osiers Road

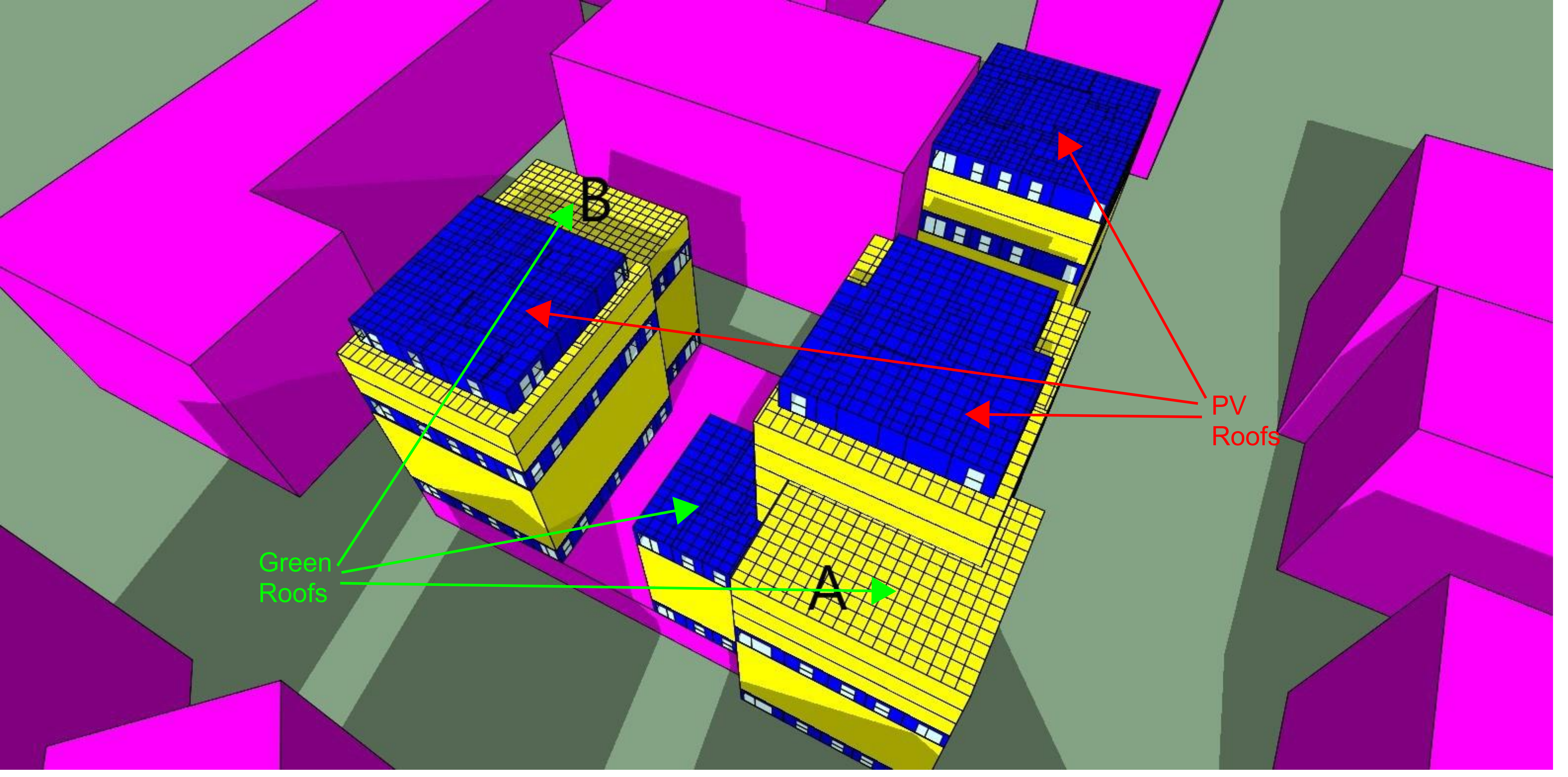
job number **6328** project leader **BS** issue date **13/09/2019**

status code **S1** revision **P02** status description **Coordination**

sketch title
ASHP Plant
Roof Level Markup

project code	originator	volume	level	type	role	number
6328	- MXF -	ZZ -	RF -	SK -	J -	30001

Appendix 4: PV Overshading Analysis



B
A
PV
Roofs
Green
Roofs

Appendix 5: Urban Greening Factor Calculations

Notes

1. This drawing is the property of fabrik ltd. It must not be copied or reproduced without written consent.
2. Only figured dimensions are to be taken from this drawing. All contractors must visit site and be responsible for taking and checking all dimensions related to the works shown on the drawing.

Legend

Application Boundary
Total Area: 4092.5m2

Intensi\ie Green Roof / Vegetation Over Structure
Total Area: 131.7m2 X 0.8 = 105.36

Standard trees with soil volume more than 2/3 projected canopy area
Total Area: 30.77m2 X 0.8 = 24.6

Standard trees with soil volume less than 2/3 projected canopy area
Total Area: 385.6m2 X 0.6 - 231.36

Extensive Green Roof
Total Area: 258 m2 X 0.7 = 180.6

Extensive Brown Roof
Total Area: 633.9 m2 X 0.3 = 190.17

Ornamental Planting
Total Area: 97.4 m2
Consisting Of:
50% Flower Rich Perennial Planting
Total Area: 48. 7m2 X 0.7 = 34.
50% Groundcover Planting
Total Area: 48.7m2 X 0.5 = 24.35

Amenity Grassland
Total Area: 83.8m2 X 0.4 = 296.4

Permeable Paving
Total Area: 174.8m2 X 0.1 = 17.48

Remaining area classed as
'Sealed Surfaces' with factor 0

TOTAL: 808.0 / 4092.5 = 0.20

Assumptions:

- Ornamental planting assumed to be a 50/50 split of 'groundcover' and 'perennials' categories.
- All rooftop / podium hard landscape counted as permeable as surface water will be collected in drainage layer
- All rooftop / podium soft landscape counted as 'intensive green roof' (vegetation over structure)
- All trees on natural ground in hard paving assumed to be soil volume greater than 2/3 mature canopy size as volume can be made up with root cells
- All 'street trees' assumed to be mature canopy area of 13m2 (based on selected species)
- Areas given for all trees taken as 2/3 mature canopy area based on the above
- Areas with tree planting double counted. i.e. an area with a tree under planted with groundcover wi\\ be counted in both categories

No.	Date	Reason	Name

Revisions

External References:
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for Hollybrook (South East) Limited

Drawing

Proposed Landscape Areas -
GLA Policy G5 Urban Greening Factor

Scale	Date	Checked	Drawn
1:250 @ A1	Sep '19	PB	MS

Drawing No.	Revision
D2611 L.900	00

☐ Preliminary
■ Issued for Planning Approval
☐ Issued for Construcjtion
☐ Issued for Design/Information
☐ Issued for Tender
As Built

Drawing sheet size - A1