Metropolitan Police Service
Bexleyheath Police Station Decarbonisation Works
Design & Access Statement

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hamilton ARCHITECTS

Quality Information

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Bexleyheath Police Station Decarbonisation Works Design & Access Statement		MPS	Hamilton Architects		Peter Carr

Revision History

Revision	Revision Date	Details	Authorised	Name	Position

Contents

1. Background

1.1 Introduction

The building for Bexleyheath Police Station was constructed in the mid 1990's and the fabric is generally original with double glazed metal framed windows, original clay brick, zinc cladding and a combination of flat and standing seam roofs.

There is a service yard and car park to the rear of the building consisting of stores and service facilities. Primarily the space is used for parking for the police station's operational vehicles.

1.2 Details of Met Zero Carbon & Policies / Legislation

The Mayor of London has introduced a new policy to make London Net Zero Carbon (NZC) by 2030 (from the legal requirement of 2050). In the 2018 GLA Environment Strategy, the MPS is shown to emit 80% of all GLA family members' carbon (noting that TFL exclude trains and buses from this calculation). The major MPS emitters are fleet (40%), property (60%).

As a result of the policy, all carbon related lifecycle works (such as boiler and window replacements, fabric improvement etc.) would need to accelerate from a 30 year plan to delivery within the next seven years. MPS has identified sites where lifecycle works are due, and where there are opportunities for additional interventions that will enable NZC to be achieved in the estate.

Included with this submission is a copy of a feasibility report for Bexleyheath PS detailing the analysis of the existing energy usage of the building and explaining the option appraisal process that lead to the chosen strategy for the decorbonisation of the site and the energy and carbon savings.

Existing aerial view of site showing roof and service yard/car park to rear of building.

2. Proposals

2.1 Decarbonisation Works

2.1.1 Carbon savings.

The existing gas-fired boilers of Bexleyheath Police Station have reached the end of their economic life and are now due replacement.

Options have been explored for replacing this plant. The possible proposals included like-for-like replacement of the existing gas-fired boiler plant and associated equipment, and also proposals for decarbonising the heating system by replacing the existing gas-fired heating plant with electric heat pumps.

Thermal modelling software and a review of gas meter records covering the past five years have been used to establish the anticipated heating demand of the building, which has demonstrated that the existing heating plant capacity of 951 kW could be reduced to 400 kW. By using a green energy tariff for electricity with an effective carbon factor of zero due to the use of renewable energy sources, the carbon emissions associated with the heat pump heating system become zero, therefore decarbonising Bexleyheath's heating system. This would mean a saving of approximately 124 tonnes of carbon dioxide per annum based on current carbon emissions.

2.1.2 Decarbonisation Options

When considering heating decarbonisation solutions for Bexleyheath PS, at the outset, several options were reviewed:

1. Electric heat pumps
2. Direct electric heaters
3. Variable refrigerant flow (VRF / VRV) direct expansion systems
4. Biofuel boilers / CHP
5. Connection to District Energy Network

Of the above, the electric heat pump option was deemed the most favourable and so passed to further technical analysis. The other options did not progress to further review for the following reasons.

Direct electric heaters

- Effective coefficient of performance (COP) of 1 as 1 kW of electric energy becomes 1 kW of heat energy. This is significantly less than other heat pump options which have COPs of at least 2, even under the least favourable conditions. This low COP would result in higher running costs and larger electrical infrastructure requirements.

- Significant additional refit works required to replace existing radiators, trench heaters and heating coils throughout the whole building.
- Covered electric heaters can lead to heightened fire hazards.
- Significant electrical works to provide supplies to units throughout the building.

VRF systems

- Some in depth analysis, including thermal modelling of COPs, was carried out into this option before ruling it out.
- Due to the heating capacity required for the building, an extensive number of separate systems would be required due to limitations in the maximum capacity of VRF systems, especially when considering that it is desirable to operate on the refrigerant R32 to have less sensitivity to potential F-Gas phase down of the typical R410A.
- Whilst this VRF system itself offers reasonable COPs and the ability to both heat and cool the building, recovering heat in the case of a 3-pipe / 4-pipe system, significant works would be required to fit units throughout the building.
- VRF indoor units are not suitable for every space in the building requiring heating, such as WC's, showers, stores and the custody suite. When factoring in that these areas may be heated by electric panel heaters with a COP of 1, the SCOP for the overall system could be reduced to below 2.
- Refrigerant pipe length and height change limitations add complications to finding suitable external plant locations for outdoor units.
- Significant electrical works to provide supplies to units throughout the building.
- Future replacement of units may require significant works throughout the building.

Biofuel boilers / biofuel combined heat and power

- These systems tend to have elevated nitrous oxide (NOx) emissions which exceed NOx emission guidance set out in the London Environment Strategy, London Plan Air Quality Positive and the London Borough of Bexley Air Quality Plan for the Air Quality Management Area (AQMA). Biofuel boilers have higher NOx emissions than equivalent ultra-low and low NOx gas boilers.
- The efficiency of boiler plant tends to be lower than equivalent gas-fired boilers. This can be offset in part by using biofuel combined heat & power for suitable applications.
- Additional on site fuel storage would be required to store sufficient supplies of biofuel, which would be subject to various environmental and technical requirements.
- Fuel would need to be delivered to the site by delivery vehicles.

Given the above noted obstacles for alternative decarbonisation options, heat pumps have been recommended as the preferred decarbonisation method. Below are several advantages of this approach.

- Aligns well with ongoing plans to decarbonise the electricity grid. No carbon generation at the point of use.
- A reasonably good efficiency / coefficient of performance (COP) can be achieved.
- Ability to connect to existing chilled water system as a heat source, helping to improve the effective COP and recycle heat which would otherwise be rejected to atmosphere back into the building.
- Existing heat distribution system and heat emitters can be retained and reused.
- Centralised plant in a dedicated plant area permits maintenance of the system without requiring access into office areas.
- Centralised plant limits the extent of works areas and associated mechanical and electrical infrastructure.
- Fed with mains electricity, so no transport fuel deliveries required to site.
- Running cost is comparable and perhaps slightly less than equivalent gas-fired plant. This is subject to variances in electricity and gas unit costs and efficiency levels achieved by plant.
- Can use non-HFC refrigerants and therefore not subject to future F-Gas phasedown.

2.1.3 Air Source Heat Pumps

Options for air source, ground source and water source heat pumps were considered. There would be no suitable water system available that could be used for water source heat pumps. Given the significant additional expense of a ground source heat pump system due to the need for boreholes, and associated risks such as environmental planning and achieving the required thermal performance from boreholes, it was decided to rule ground source heat pumps out at this point. Air source heat pumps were the chosen solution.

It is planned that the air source heat pumps would be open to external air as this is necessary for their operation, with the existing boiler plant room used to house thermal stores and distribution plant including pumps etc

2.1.4 Power Supply Resilience

The provision of heat pumps, along with other improvement works to the building, will require an upgrade the power supply to the site. Because of this a new substation will be constructed in the grounds of the police station.

2.2 Proposed Works

2.2.1 Elevated Plant Platform

It is necessary to locate the new plant in the car park. The roof to the Police Station is currently pitched apart from a small area of flat roofing to the central section. There is not enough spare area on this roof to accommodate the required Air Source Heat Pumps and this would be the case even if the existing plant and PV panels were relocated. There is a single storey custody block to the northern corner of the site with air handling plant to its roof behind a mansard roof. This air handling plant will remain so there would be no room on this roof for the new plant.

Air source heat pumps require access to free air in order to operate properly. The use of the existing plant rooms would not have been practical to accommodate the new equipment.

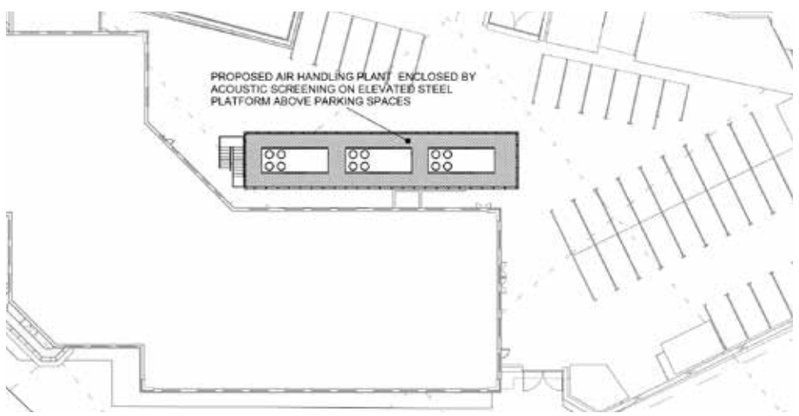
The car park is primarily used to accommodate operational vehicles rather than staff parking. Loss of parking spaces would have an adverse affect on the operational effectiveness of the police station. The only option to provide the necessary plant area, that would not disrupt the operation of the police station, was to place the equipment on a steel platform supported on columns above the car park ground level. The columns have been placed to allow the continued use of the parking spaces under the platform, access to the service garages and general vehicular circulation around the the car park.

The platform accommodating the air source heat pumps will be enclosed on four sides with acoustic louvre screening. A Noise Report is included with this application demonstrates that the acoustic louvres will provide sufficient screening to the air source heat pumps to maintain required noise levels to local receptors

2.2.2 Plant Platform Location

A number of locations and configurations for the elevated plant platform were considered. Initially a location in the middle of the eastern car park was proposed as this was felt to have the least impact on parking on the site.

However during PAD discussion concerns were raised about the potential for negative impacts on residential properties on Tower Road. The current proposal is to place the platform to the northern face of the building



This location will reduce the visual impact of the platform both from Tower Road and Arnsburg Way. There will only be imited visibility of the platfrom over the brick wall surrounding the site. This location will alsoremove any overshadowing issues with the the platform and the adjoining properties.

Proposed View from Tower Road

Proposed View from Arnsburg Way

The location will also reduce the potential noise impact of the plant on the residential properties on Tower Road. Another advantage of this position is that the plant is now closer to the existing plant rooms in the building. As noted below this location will have minimal imapct on parking and vehiclular circulation around the site.

2.2.3 Proposed Sub Station

As part of the upgrading of the power supply to the site a new sub station will be provided. This will be housed in a new enclosure with brick walls and concrete flat roof located to the northern boundary of the site behind parking spaces. This location will not affect parking and take up some existing external storage space.

3. Planning Implications

3.1 Visual Appearance of New Construction

3.1.1 Elevated Plant Platform

The platform accommodating the the air source heat pumps will be enclosed on four sides with acoustic louvre screening. The height of the screens is based on the requirements for acoustic screening to the plant. The louvres will be polyester powder coated aluminium. The colour will be a mid grey RAL 7004 to reflect the adjacent metal mansard roof to the single storey building. This screening will provide a more uniform appearance to the platform, concealing the variety of shapes and sizes of the new equipment. It will also provide acoustic mitigation for the noise produced by the plant. The plant will sit on an open weldmesh floor. The support structure will be galvanised steel. The appearance of the plant platform is demonstrated in the below 3D visuals. Attached product brochures indicate materials and appearance of the louvres.

3.1.3 Sub Station

The new Sub Station will have a brick enclosures and flat roof. Walls will be red smooth clay facing brick to match the existing buildings. The roof will be a concrete slab with a mastic asphalt finish. The building will include ppc aluminium louvred doors in colour RAL 7004.

3.2 Vehicular transport Implications

3.2.1 Vehicle Parking

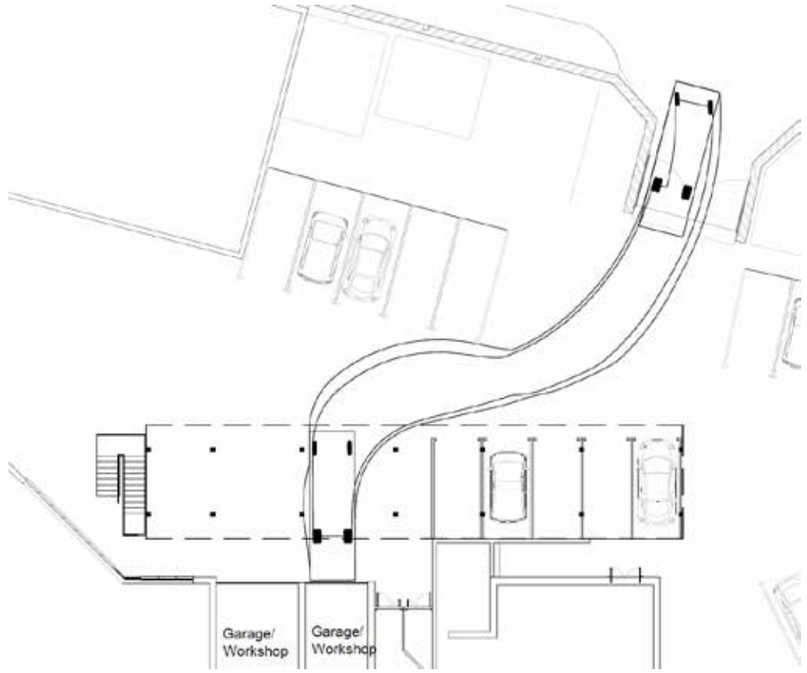
The primary purpose of placing the air source heat pumps on the elevated platform is to avoid the loss of parking spaces. There are at number of parking spaces under the platform. These parking spaces will remain accessible and, as whole, no parking spaces will be lost as a result of the new work.

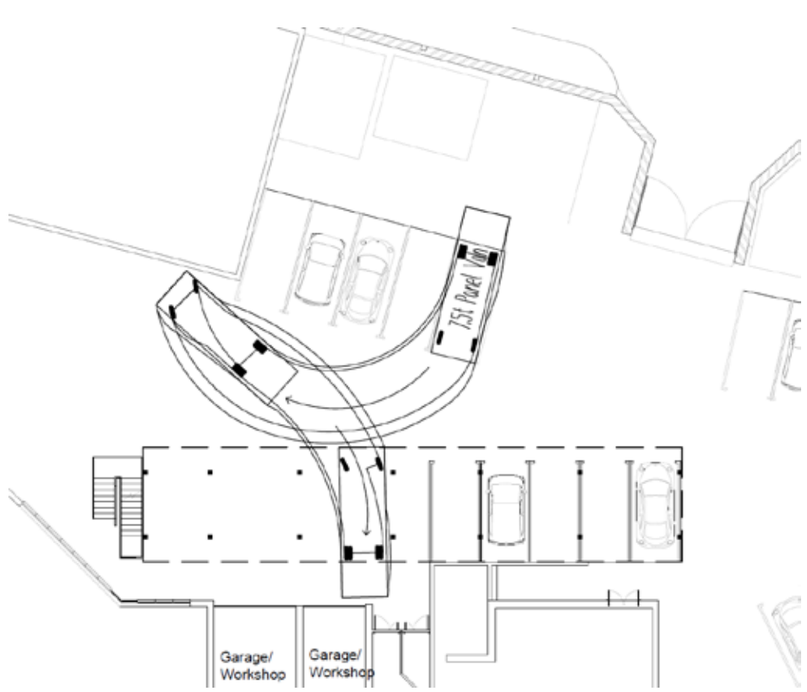
3.2.2 Vehicle Circulation

There is also space under the platform that provides access to garage workshops in the police station.

The platform columns will be placed to be clear of the parking spaces amd allow access into the workshop/garages. The clear height under the platfrom will match the height of the opening to the garage/workshops.

The following drawings show that the movment of vehicles will not be restricted by the platform and will still be able to move around the site as before. The first tracking drawing shows that a large police van can exit the garage and reach the gate at the tightest point without multiple manouvres. The second drawing shows that the same size of vehicle can exit the parking spaces opposite the platfrom at its tightest point by coming out backing under the platform and exiting.





3.2.3 Cycle Parking

There will be no loss of cycle parking or restriction to access to parking locations as a result of the new development.

3.3 Floor Space Implications

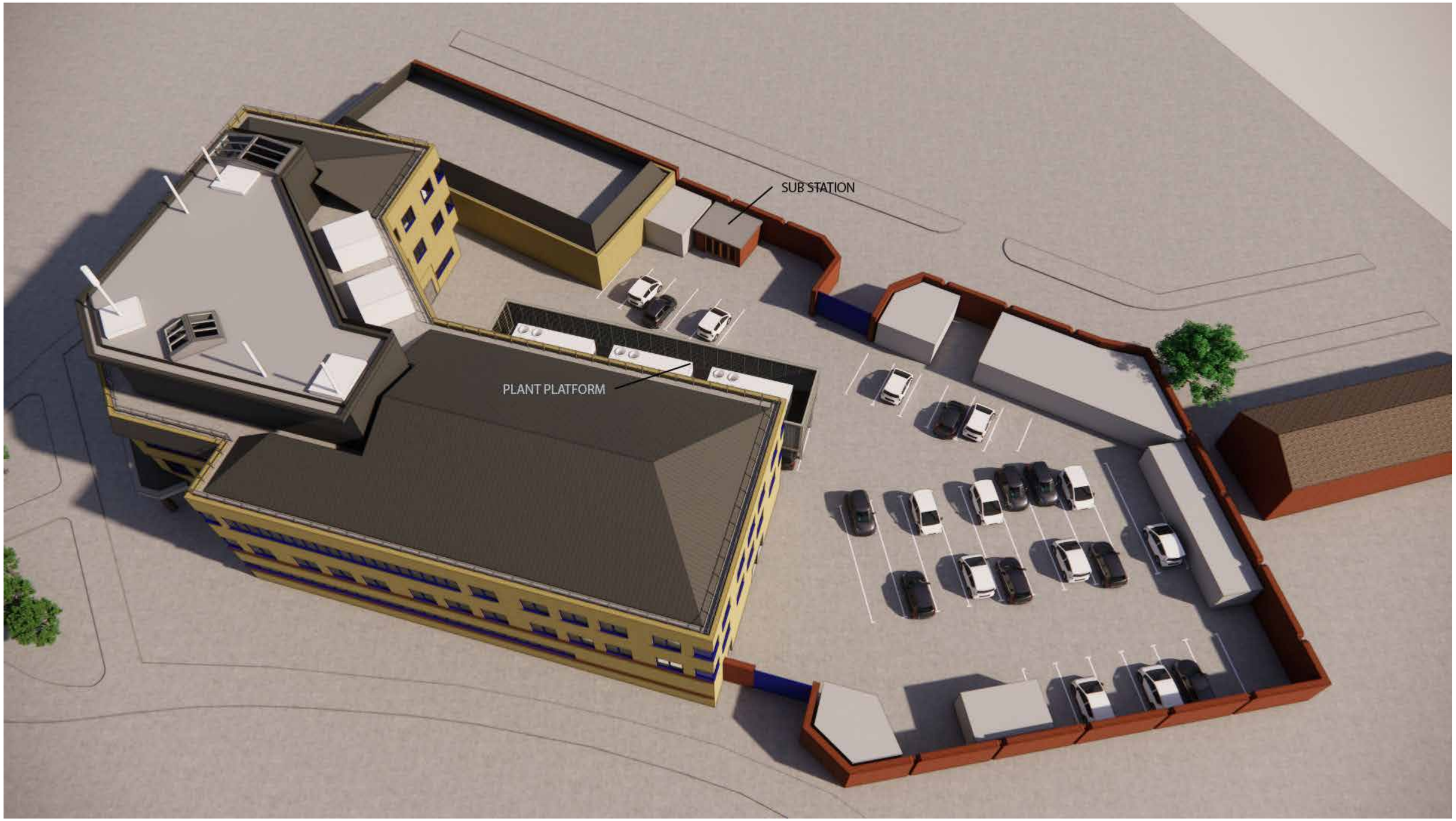
3.3.1 Plant Platform

No floor space will be created as a result of the construction of the plant platform.

3.3.2 Proposed Sub Station

The new electricity sub station will create 15m2 of floor area.

Proposed View 1 *aerial view from north east*



Proposed View 2 *aerial view from south*

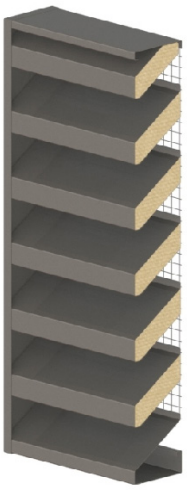
Appendix A: Product Brochures

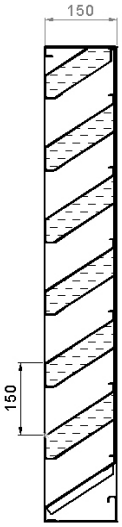
Louvre Type WA-ACL-150SB

150mm deep single bank louvre

Specification: Single bank acoustic louvre 150mm deep, manufactured with horizontally mounted blades on a 150mm pitch, housed in an outer casing.

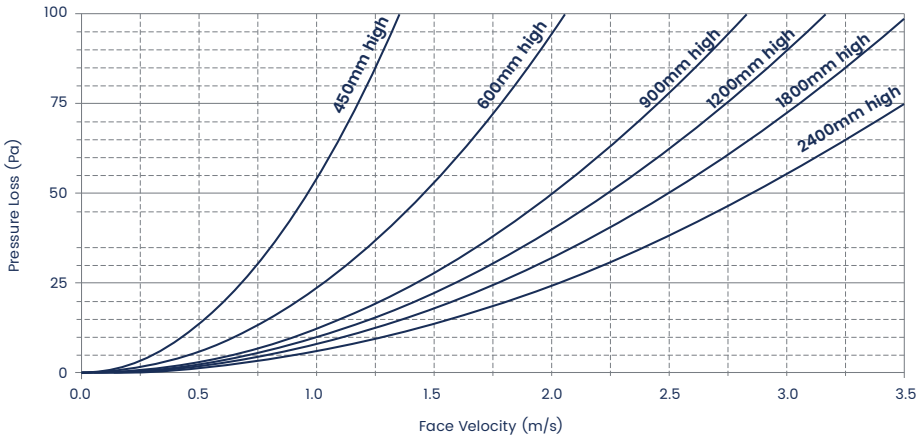
Louvre supplied with birdguard and polyester powder paint finish to a standard RAL / BS colour





Louvre			Sound Reduction (dB) at Octave Band Centre Frequency (Hz)							
Depth	**Style**	**Product Code**	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
150mm	Single Bank	WA-ACL-150SB	4	4	6	8	10	11	11	10

Pressure Loss Details



Pressure loss correction factors based upon installation conditions are given below:

Fresh air intake, ducted to rear	+0%
Exhaust air to atmosphere, ducted to rear	+10%
Non-ducted	+50%

Weight	Height	Free Area
56kg/m2 Approx	450	33%
	600	38%
	900	42%
	1200	44%
	1500	46%
	1800	46%
	2100	46%
	2400	47%

Options Available

- + Birdguard (BG)
- + Powder Coat finish (PC)
- + Pre-coated steel (CS)
- + Externally Flanged (F)
- + Support Frame (SF)

Coding Example: WA-ACL-150-SB/BG/PC/F

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