AUTHOR

Edward Pearce LLP
Consulting Engineers
Old School House
35 Ewell Road
Surbiton
Surrey KT6 6AF

Tel: 020 8390 6244
Fax: 020 8390 1329
Web: www.eapearce.com
e-mail: post@eapearce.com

CLIENT

Wolff Architects
16 Lambton Place
Notting Hill
London
W11 2BH

PROJECT

Mechanical, Electrical and Sustainability Report for Planning at 85 Avenue Road, London NW1

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CONTENTS

1 INTRODUCTION

This report sets out the Engineering Services intended for this new house and the sustainability issues and targets intended, and the acoustics/noise level details in relation to the air source heat pumps.

2 SUSTAINABILITY

2.1 TARGET

It is the team's aim to achieve a sustainable homes code 3.

2.2 ENERGY AND CARBON DIOXIDE EMISSIONS

The scheme will be designed to limit the emission of carbon dioxide to the atmosphere arising from the operation of the dwelling

The emissions from lights and appliances make up about 43% of the total carbon dioxide emissions from the dwelling. This scheme will include energy efficient lighting and A-rated appliances, thus reducing the carbon dioxide emissions.

The use of Low or Zero Carbon sources leads to reduced emissions of greenhouse gases and other pollutants. This scheme will seek to balance the requirements of the conservation area with the use, where possible, of financially-viable renewable energy technology.

2.3 WATER

Water consumption is becoming an increasing problem with water becoming more scarce. This development will seek to use fixed fittings which reduce water use in WCs, taps and showers.

2.4 POLUTION

NOx are emitted from the burning of fossil fuels and contribute to both acid rain and to global warming in the upper atmosphere. We will utilise low-NOx condensing boilers within this scheme.

2.5 ECOLOGY

The scheme will seek to add to both the visual amenity of the gardens and improve the local microclimate and improve the biodiversity of the area. An annual maintenance visit by an ecologist would enable advice to be given to maintain a correct balance of species.

2.6 SUSTAINABLE DESIGN APPROACH

This scheme will seek to adopt a sustainable design approach by:

- Specifying environmentally friendly materials and disposal with associated waste management plan (Environmental Performance).
- Seeking public approval through consultation (Social Inclusion).
- Value engineering and whole life costing to seek best value (Economic Development).

2.7 RENEWABLE ENERGY PROVISION

With regard to the provision of renewable energy on this scheme the following have been considered:

2.7.1 Open and Closed Loop Boreholes/Ground Source Heat Pumps
These systems have been discounted on the basis that the energy provided is low grade and is extremely expensive.

We have however considered the use of air source heat pumps as below.

2.7.2 Air Source Heat Pumps
Part of this scheme includes the provision of condensing units to provide cooling/humidity control to the swimming pool. It has been decided to make these units reverse cycle heat pumps with COP (Coefficient of Performance) better than that of a ground source heat pump to provide heating in addition to cooling. These units will be used to supplement gas-fired heating to the pool area.

2.7.3 Solar Thermal Panels
Solar panels will be provided to provide a percentage of the hot water needed.

2.7.4 Photovoltaic Panels
Photovoltaic cells will be used where possible. Where spaces that have little or no visual impact are available PV cells will be provided.

The system could generate its own electrical energy which could be re-fed back into the main LV board and back to the local Utility Company Network if necessary. The system could comprise arrays of photovoltaic directed at an angle that will maximise the capture of the radiating solar system.

2.7.5 Lighting
The lighting installation will be designed with the aim of reducing the amount of energy consumed. The use of low energy lighting in appropriate locations within the house will be incorporated into the scheme to comply with the Building Regulations Part L and to contribute to the code for sustainable homes rating.

2.7.6 Wind Turbine
Wind turbines have been excluded on the basis of planning and aesthetics.

2.7.7 Wood Chip Boilers and CHP Units
Wood chip boilers are being considered for the scheme.

2.7.8 Structure Thermal Performance
It is the intention to construct the building to a standard better than the building regulations and hence not generate the need for the energy in the first instance.

2.7.9 Drying Spaces
The house will be provided with internal drying spaces.

2.7.10 Eco Labels
All white goods, with the exclusion of tumble dryers and dishwashers, will where possible be A rated.

2.7.11 Cycle Storage
A space for cycles will be provided.

2.7.12 Home Office
A home office/study will be provided.

2.7.13 Building Materials
Where possible, building materials will be responsibly sourced.

2.7.14 Recycling
Where possible, provision shall be made to enable domestic recycling to take place.

2.7.15 Ecology
All steps will be taken to protect and enhance the ecology in relation to this site. This will include where possible, the provision of bat and bird boxes and sensitive planting materials.

3 MECHANICAL ENGINEERING SERVICES

3.1 HEATING

It is understood that a system of piped underfloor heating is the preferred method of providing space heating. Since the house will be built to the current Part L2 Building Regulations, heat losses should be low, and thus well suited to low temperature underfloor heating. The system will require the location of manifold units in several locations on each floor to facilitate the distribution of underfloor pipework and control. The overall floor make up will have to be agreed to ensure this type of heating and the necessary insulation can be accommodated.

It is proposed that the heating is gas fired and therefore the provision of gas-fired boilers should be made and these will require location in the basement plantroom, with their flue routes agreed.

3.1.1 Design Parameters

It is proposed that the system specification be set at :

Outside conditions: Winter –3°C db, 100% RH

Inside Conditions:

Living Areas	23°C db
Bedrooms	21°C db
Bathrooms/Showers	23°C db
Corridor/Ancillary Areas	21°C db
Swimming Pool Hall	28°C

Some of the temperatures are higher than normal. However, our experience in this field of development has been that many overseas occupants expect the heating to be able to provide higher than normal internal temperatures on cold days. The temperature of the swimming pool area will also need to be determined by the pool temperature but will by necessity be in the order of 28°C.

3.1.2 Plant Provision

The pumps, pressurisation vessels and the main control panel for the heating will be located in the basement plantroom. Suitable ventilation to the plantroom will need to be agreed and included in the scheme. Plant associated with heating/cooling air source heat pumps will be located at the end of the garden.

3.1.3 Control

It is recommended that each room is capable of being controlled individually for both a temperature and time periods. This will require the location of small 'bead' sensors to each space connected back to the central control panel.

It is further recommended that the control system is suitable for integration now or in the future to a Home Automation System, such as those produced by Crestron and AMX.

3.2 VENTILATION

A dedicated ventilation plant will be required to the pool hall and this should be located adjacent to the pool area.

All other basement areas will require forced ventilation.

Additionally all bathrooms will require forced ventilation to comply with Building Regulations. The roof space could be used to house the fans/AHUs/heat exchangers, and where possible will be heat sourcing type.

It is also recommended that a dedicated ventilation system be provided to the Media/Cinema Room and Gym.

The size of the house and number of bathrooms requires that the development employs heat recovery to ventilation in order to comply with Building Regulations.

A 'whole house' ventilation system may prove a suitable option provided suitable plant space and duct routes can be established.

3.2.1 Design Parameters

It is proposed that the system specification be set at:

Bathrooms	10 ac/hr
Kitchens	Dependent on equipment load
Media/Cinema Room	15 litres/sec/per person
Pool Hall/Gym	TBA with pool specialist
Changing Rooms	10 ac/hr

3.3 COMFORT COOLING

The extent to which comfort cooling is to be provided to the building will need to be established. It should also be noted that it is anticipated that comfort cooling will be provided and not air conditioning since the latter requires full treatment of the air including humidification/de-humidification.

It is suggested that the following areas be provided with comfort cooling:

Basement

- Pool areas

Ground Floor

- None at present

First Floor

- None at present

Second Floor

- None at present

3.3.1 Cooling Equipment/Heat Pumps

Provided to pool area only with internal condenser.

3.3.2 Design Parameters

It is proposed that the comfort cooling system specification be set at:

Outside conditions: Summer (maximum) 30°C db, 60% RH

Inside Conditions: Summer 21°C db +/- 2°C

3.3.3 Control

It is recommended that each space be provided with individual control for both temperature settings and time periods.

These controls should be suitable now or in the future for integration into Home Automation systems such as manufactured by Crestron or AMX.

It is proposed that cabling to enable their later inclusion is installed as part of the development.

3.4 HOT WATER

It is anticipated that high pressure, high volume shower heads will be installed to each bathroom. Thus the demand for hot water will be great requiring significant storage and high heat recovery. The vessels to contain this, along with pumps to deliver it will require considerable space and should be primarily housed in the basement plantroom.

To avoid long 'dead legs' and to ensure fast delivery of hot water a hot water circulation system will be required or alternatively trace heating of the hot water pipework.

Solar thermal heating to hot water services to supplement the heating input from the boilers will be provided. This will be provided by solar panels mounted on the roof and connected to a second set of coils in the hot water calorifiers.

3.5 COLD WATER

To ensure good and even pressure at all water outlets the inclusion of a cold water booster set and associated storage/break tank is essential. In common with much of the other equipment discussed in this document the tank and booster set require some space and would be located in the basement plant area.

A new cold water main would need to be provided to the booster set tank.

3.6 DRINKING WATER

Potable water will of course need to be available and the outlets to which this is to be piped will need to be agreed. This would of course include the

kitchens, but could include the master bedroom suite and any bar areas that are established.

3.7 WATER TREATMENT

As the project is in a hard water area we propose the inclusion of a electromagnetic particle alignment unit to the mains water supply to assist in the prevention of scaling.

Water softening plant will be provided as part of the development.

3.8 WATER CONSERVATION

3.8.1 Rainwater Harvesting

It is proposed to include a rainwater harvesting system for the house for the purpose of collecting rainwater for garden watering.

Rainwater from part of the roofed areas will be piped by gravity to a collection tank sited at a convenient position below ground level. The tank will incorporate a pump system for the distribution of the collected water and an access cover at ground level. An overflow from the tank will be connected to the surface water drainage system.

The use of rainwater harvesting for garden watering is environmentally beneficial as it assists in providing for a sustainable urban drainage system by reducing the amount of water discharging to the public sewer and returns rainwater to the ground. It also reduces the requirement to draw water from the mains water system, particularly in periods of dry weather.

3.8.2 Grey Water

Grey water is the term used to describe the waste water that comes from washbasins, showers and baths.

Grey water collection systems are being considered for the house. The water would be used for flushing WCs. Separate piped drainage systems will be required from washbasins, showers and baths and the effluent will be piped by gravity to a collection tank sited at a convenient position below ground level. An access cover would be fitted at ground level.

Bath and shower water inevitably contains relatively small amounts of soap and other chemicals, as well as pathogenic micro-organisms including E-coli and is relatively nutrient rich. It is important therefore that the system is well designed and incorporates an appropriate level of filtration and treatment. Pumps and automatic equipment will be installed to distributed the water through a separate piped system. There will be an automatic facility to draw from the mains water supply if needed.

The use of grey water harvesting is environmentally beneficial as it assists in providing for a sustainable urban drainage system by reducing the amount of water discharging to the public sewer and reduces the requirement to draw water from the mains water system.

4 ELECTRICAL ENGINEERING SERVICES

4.1 ELECTRICAL INTAKE

The house will require a quite substantial electrical intake. Our initial estimate would be for a 200A TP&N service. The metering of this service will require a CT chamber along with the meter, which in turn will connect to a main distribution board and several sub-distribution boards.

To house this equipment it is recommended that a dedicated electrical intake room is created within the basement plant area.

It is proposed the electrical supply cable would terminate direct to this room via an underground duct.

Whilst much of the basement and ground floor final circuit distribution boards could be housed in this area some distribution boards and lighting control units will need to be located on either or both the first or second floor.

The riser provision needs to be developed to contain these.

4.2 LIGHTING

The house warrants a carefully designed lighting installation to ensure that the interiors are displayed and illuminated to their best advantage.

High quality lighting scene control is recommended based on Lutron Homeworks or Leax Lightscene systems. These systems allow pre-programmed light scenes to be stored and retrieved by the operation of simple control plates within the room. These systems are extremely adaptable in use and quite appropriate to this project.

Furthermore they can be integrated now or in the future into Home Automation Systems such as those marketed by Crestron or AMX.
The lighting control system can be extended to the whole house including external landscape lighting. We would recommend that they be extended to the following areas as a minimum:-

Basement
- Pool Hall, Gym and Home Cinema/Media Room
- Stair and Lobby

Ground Floor
- Kitchen
- Dining Room
- Entrance Hall
- Reception Room
- Library/Study

First Floor
- Stairway Gallery
- Family Lounge

- Master Suite, Dressing Rooms and Bathrooms
- Sitting Room
- Bedroom 2, En-Suite and Dressing Room

Second Floor
- Bedroom 3, En-Suite and Dressing Room
- Bedroom 4, En-Suite and Dressing Room
- Bedroom 5, En-Suite and Dressing Room
- Bedroom 6, En-Suite and Dressing Room
- Stairway Gallery

The current Building Regulations L1 requires that the development includes a high provision of low energy lighting (those with an efficacy of 40 lumens/watt or greater). In general this requires the inclusion of miniature fluorescent and fluorescent lighting and in order to satisfy the regulation it will need to be demonstrated that 30% of lighting is low energy.

4.3 EMERGENCY LIGHTING

Although not a requirement by the Building Regulations, we would recommend that emergency lights are incorporated to the main escape routes. This can often be achieved quite discretely by providing battery/ inverter units to back up standard low voltage downlights.

4.4 SMALL POWER

Small power outlets comprising 13A switched socket outlets will be required throughout the house for the connection of domestic appliances.

In addition various radial circuits will be required to serve fixed kitchen equipment, gym equipment and consumer electronics.
The finish to outlets will be chosen to match the substrate or wall finish to which they are fixed.

4.5 FIRE ALARMS

Houses of this size require a complete fire alarm system to BS 5839 Part 1 to comply with Building Regulations.

Normally this would require the installation of conventional smoke detectors to most areas along with fire alarm sounders. Their inclusion is often unpopular due to their appearance. An alternative is to install an aspirating system, which samples the air from each space and draws it into a detection chamber. The system can provide a very high level of sensitivity or that equal to a standard detector. The great aesthetic advantage of the system is that it requires no detectors in each room but only a small disc approximately 20mm in diameter with a 6mm hole to be fixed to the ceiling. A system of 28mm pipes is then routed through the ceiling void back to the main detection units.

Whilst this system is more expensive than a conventional fire alarm system, we would recommend it is installed to the principal rooms and bedrooms, with conventional detection provided to ancillary spaces.

4.6 INTEGRATED RECEPTION SYSTEM

It is envisaged that the house will be provided with a TV/FM/SAT distribution system or more correctly an Integrated Reception System (IRS). In order to collect the signals an array of aerials will need to be erected upon the roof. This array would consist of:

- a VHF aerial for terrestrial TV services both analogue and digital.
- an FM uni-directional aerial for FM radio.
- a DAB aerial for digital radio reception.
- a satellite dish for the reception of satellite TV and radio broadcasts.

This array could be subject to planning permission and this should be checked with the planning authority at an early stage.

The signals from the aerial will be taken to amplifier/distribution units which would in turn serve outlets throughout the house. The distribution system would include RF return cables to allow distribution of the output from satellite decoders, PVRs/VCRs and DVD players (via a modulator) to all areas of the house.

A location for the distribution amplifiers will need to be found. This could be the roof space, provided safe access is available, or within a general A/V cupboard that could be introduced to the basement.

Ducts to facilitate the connection of any local cable TV distribution system will also be proposed.

4.7 STRUCTURED WIRING

A system of structured wiring or Home network based on a star wired category 5e system comprising 4-pair UTP cable is recommended. This system will then form the backbone of any future telephone system, internet/ broadband, distribution system, PC networking, along with connection of broadband enabled equipment such as PVRs, hard drive audio devices and kitchen equipment.

The system requires a space to house the 'hub' of the system comprising a patch panel, telephone processor, modem/routers etc.

It is recommended that a cupboard/closet be created to house this in the basement adjacent to the Cinema/Media Room.

4.8 INTRUDER ALARMS

It is envisaged that a system of electrically-operated intruder alarms will be installed to the house. The system would comprise a microprocessor-based main control panel, door contacts, vibration detectors to windows, dual tech passive infrared units, internal and external sounders.

The system would require to be installed and commissioned by an NSI/ NACOSS approved contractor.

Volt-free outputs from the intruder alarm can be used to activate security lights, and via the light scene controllers internal lights if required.

Subject to the provision of a telephone line the alarm system can also be monitored remotely via a Redcare line and subscription to a monitoring service.

4.9 CCTV

A system of CCTV cameras should be considered to monitor the boundaries of the site. The images can be recorded onto a hard drive type recorder, and by interlinking with the IRS system, be viewable on any TV display in the house, or if included, any Crestron/AMX type touch screen.

4.10 CONTROLLED ACCESS

Controlled access in the form of a video entry system would be proposed to assist in securing access to the site. Such as system would normally control access gates to the site rather than the entrance doors to the house. Within the house receiver units comprising miniature LCD TV screens, speakers and microphones would be strategically located.
A link to the TV distribution system would also be provided to enable the video picture to be brought up on any TV display in the house.

4.11 A/V INSTALLATION

The A/V installation is an area where a great deal of choice exists as to the extent of any systems that could be installed as part of a speculative development since the end users requirements are not known. However, potential purchasers of such properties are increasing expectant that good A/V provisions have been made since their later inclusion is very disruptive.

4.11.1 Cinema

Clearly the scheme currently includes a dedicated Cinema Room so it would seem appropriate to ensure the room is at least cabled to allow this facility to be installed without undue difficulty.

Our recommendation for this room would be to ensure it is cabled to support the following equipment:

- A motorised screen.

- A high quality projector on a lift mechanism. (If sufficient ceiling void exists)
- A plasma flat screen display for everyday viewing.
- 7.1 surround sound system.
- Crestron/AMX control
- A central A/V hub or rack to accommodate source devices such as DVD, PRVs, VCR or hard drive devices.

It is suggested that a closet to house the rack is built into the loft space adjacent to the cinema room, with access doors from the cinema room.

4.11.2 Audio Distribution

A system of audio distribution is recommended throughout the house to all bedrooms, principal rooms, kitchens and pool hall/gym.

The audio sources would include FM/DAB radio and a hard drive type music library such as those made by Revox, Imege, Request or Cyrus. These systems are capable of giving an individual output to different rooms with the music or source selected by means of wall mounted control pads, which function in much the same way as the popular i.pod personal music players. Therefore the room occupant is able to select the music they wish to have in the specific room they are in and the others can do the same in other rooms yet obtain the music from the same source.

It is proposed that provision for the music library hard drive and cold running amplifiers for this system would be located in the Cinema Room hub closet.

The loudspeakers for the system would generally be ceiling mounted but we would also recommend the inclusion of line level inputs in the rooms to facilitate the connection of local audio devices along with loudspeaker outlets for the connection of floor standing speakers if required.

4.11.3 Home Automation

Crestron and AMX, along with others, manufacture tablet or wall-mounted touch screens that can be programmed to give commands to most systems that have a control function, for example:

- AV equipment
- Light scene control
- Comfort cooling
- Heating (provided a compatible control system is used)
- Curtains
- CCTV

Inclusion of such Crestron/AMX units into spaces would allow the occupants to control all equipment in that space, allow access to video door entry images and CCTV. Such systems are extremely expensive and we would anticipate that the project requirement would be to cable only for these to allow the future inclusion of the hardware by any future owner.

The inclusion of wiring provision for Crestron/AMX control may be viewed by prospective purchasers as a desirable feature and can be left behind the lighting control plates ready for future use.

4.11.4 Flat Screen Displays

Flat screen displays (FSDs) include plasma and LCD technology and we anticipate that locations will require to be wired throughout the building ready to receive these.

We would recommend that the wiring installation includes for provision to connect FSD by HDMI cables as well as component video to the remote source equipment in the A/V hub located in the cinema room. This will ensure the best possible picture quality at each location. These locations should include each bedroom, each principal room, the play room and pool hall/gym.

In addition we would recommend inclusion of Tilevision type flat screen TVs into each of the bathrooms in a location viewable from the bath.

4.11.5 Video Sources & Distribution

Facilities should be provided at each FSD location for the connection of local video sources such as DVD players, PVRs, Digital satellite Decoders etc. Local connections tend to offer the best quality connections. However, it is possible to locate much of this equipment centrally (in the A/V closet) if required if an interior finish is required where such things are hidden. Centralisation also allows these resources to be shared provided they are interconnected with some form of control system.

Our recommendation would be to ensure that the house is cabled for both eventualities and for the connection of a Hard Drive Video Library such as is made by Kalidoscape or AMX. In a similar manner to an audio hard drive these units allow DVD's to be downloaded and then recalled and played with out the need to change discs. Such systems are ideally centralised as in common with the audio version, the content can be accessed from different locations and different content can be viewed consecutively.