Hann Tucker Associates
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Our Ref: HT: 13898/AGJ

2 May 2008

Simon Kivotos
Harper Downie Ltd
Gate House
No.2 St John's Square
London
EC1M 4DH

By post and email to:
simon.kivotos@harperdownie.com

Dear Simon

RE: 2-6 SOUTHAMPTON ROW, LONDON ROOFTOP PLANT ATMOSPHERIC NOISE ASSESSMENT

Following receipt of information regarding proposed rooftop plant items received from Fulcrum Consulting on 29 April 2008, we provide our assessment of atmospheric noise emissions as follows.

1.0 EXTERNAL NOISE LEVELS

Our Environmental Noise Survey Report 13898/ENS1 dated 7 June 2007 details existing noise levels around the proposed development site. The background noise levels recorded during the survey have been used as the basis for our assessment.

2.0 ATMOSPHERIC PLANT NOISE EMISSIONS CRITERIA

Atmospheric noise emissions should be controlled to the Local Authority's noise regulations, and so as not to constitute a statutory noise nuisance.

2-6 Southampton Row lies within the London Borough of Camden. Based on Camden's Unitary Development Plan, as detailed in our Environmental Noise Survey Report 13898/ENS1, the following plant noise emissions should be achieved at 1 metre from the nearest noise sensitive façades based on the minimum measured L_{A90} noise levels.

Normal Operation Plant Noise Emission Limits to nearby Noise Sensitive Properties (dBA)	
Daytime (07:00 – 23:00 hours)	**Night time (23:00 – 07:00 hours)**
47	41

If the plant contains tonal or impulsive characteristics the above limits should be reduced by 5dBA.

It should be noted that the above criteria are subject to final approval by the Environmental Health Department of Camden Borough Council.

In addition, we comment that noise intrusion to hotel suites within the development should also be considered. As such, the above criteria should also be adopted for affected hotel bedroom windows.

3.0 PROJECT DATA

3.1 Drawings

All acoustic analyses reported herein, have been based upon the following drawings.

Issued By	Drawing No.	Title	Date
Fulcrum Consulting	3921/TU/56/07/01 A	Mechanical Roof Floor	April 2008
Harper Downie Ltd	A467GA06-010	Proposed Sixth Floor Plan	April 2008
Harper Downie Ltd	A467GA07-011	Proposed Seventh Floor Plan	April 2008
Harper Downie Ltd	A467GA-007	Proposed Third Floor Plan	April 2008
Harper Downie Ltd	A467GA08-012	Proposed Roof Plan	April 2008
Harper Downie Ltd	467L-00	Location Plan	August 2007

3.2 Proposed Items of Plant

We understand that the proposed external rooftop plant will comprise; 1No. extract fan on second floor roof level, 1No. extract fan on sixth floor roof level and 7No. condenser units on sixth floor roof level.

The enclosed Plant Noise Schedule 13898/PNS1 details noise data for the proposed items of rooftop plant. It has been based upon plant data received from unit manufacturers.

This data presents "maximum" sound power levels, which shall not, therefore, be exceeded. The sound power levels shown have been based upon manufacturer's data for the specific items of plant at their respective duties.

Based on a brief review of octave band spectra, we have assumed that none of the plant items will produce any noise of a tonal nature. We also assume no plant will contain noise of an irregular quality.

All calculations are based on manufacturer's noise data which we understand incorporate losses due to any unit casing. However, for extract fans, the manufacturer's data for the outlet noise does not represent in-duct sound power levels, and therefore empirical calculations are be used to obtain likely 'low frequency' noise for a worst-case assessment.

It is essential that we are apprised of any alterations or additions to this list. Should the selection of any item of plant differ from that shown on the schedule, provided their sound power levels are comparable to (or less than) those shown then it should not be necessary to make significant changes to our current attenuation recommendations.

3.3 Operational Hours

We understand that the new items of building services plant will operate continuously 24 hours-a-day. We assume condensers will run at 'night-time' duty between 23:00 and 07:00 hours.

3.4 Noise Sensitive Receptors

For the purposes of this assessment, a number of noise sensitive receptor locations have been used, as described in the Table below. The locations are illustrated on the enclosure Site Plan 13898/SP1.

Receptor	Description
A	Top floor window on building opposite the development across Catton Street.
B	Third floor window on building adjacent to development to the North-East (Catton Street).
C	Sixth floor window on building adjacent to the development to the South-East (High Holborn).
D	Third floor window of room 3.06 (East elevation).
E	Seventh floor window of room 7.04 (High Holborn elevation).

4.0 ASSESSMENT

Where appropriate, distance loss, screening loss, and/or directional losses have been considered in respect of the proposed plant layout/orientation.

Our calculations indicate the following cumulative noise levels incident upon the various receptor locations during daytime and night-time operation, assuming all items running at full, normal duty during the daytime, with condensers running at a lower duty during night-time. The associated plant noise criterion is presented, together with an indication of the calculated exceedences, if any.

Receptor Location	Calculated Cumulative Daytime dB(A)	Daytime Criterion dB(A)	Exceed-ence dB(A)	Calculated Cumulative Daytime dB(A)	Night-time Criterion dB(A)	Exceed-ence dB(A)
A	46	47	-	36	41	-
B	41	47	-	39	41	-
C	55	47	+8	42	41	+1
D	32	47	-	32	41	-
E	63	47	+16	46	41	+5

With reference to the above Table, our calculations indicate that the cumulative noise levels due to atmospheric plant noise emissions exceed the criteria at Receptors C and E. As such, mitigation measures are required for the dominant condenser units, as well as small atmospheric silencers for extract fans.

5.0 MITIGATION MEASURES

5.1 Extract Fans - Atmospheric Silencers

The Atmospheric Silencer schedule 13898/SSA1 (enclosed) details the manufacturer's insertion loss performance figures for the extract fans.

It is essential that all silencers are manufactured in accordance with our "General Specification for Acoustic and Vibration Isolation Materials and Products" which is enclosed with this Report. This will ensure that silencers are both mechanically and aerodynamically suitable.

It should be noted that:

- All silencer selection dimensions are suggestions and could be altered in most instances.
- In the majority of cases it would be possible to reduce silencer length by increasing cross-sectional area, and vice-versa.
- In all cases it would be possible to alter silencer width and height providing the cross-sectional area is maintained and the width to height aspect ratio does not exceed 3:1.
- All alterations must be confirmed by ourselves.

5.2 Condensers – Acoustic Screening

An acoustic screen should be installed, which extends continuously around the 7No. condenser units. The screens should be an adequate height, extending approximately 1 metre from the highest point of the condensers. The Acoustic Specification for Acoustic Screening 13898/AS1 (enclosed) details the requirements of the screen.

6.0 ANTI-VIBRATION MOUNTS

It is essential that the plant items are fitted with the correct anti-vibration mounts to ensure that vibration is not transmitted into the building structure.

All items of building services plant should be fitted with vibration isolators to control the transmission of vibration to the building structure, as detailed on the enclosed Vibration Isolator Schedule 13898/VIS1.

It is important that all AVM's are manufactured in accordance with our "General Specification for Acoustic and Vibration Isolation Materials and Products".

The following provides a general description of isolator requirements and installation procedures.

6.1 Site Installation of Vibration Isolators

In order to provide trouble-free site installation, two single considerations will eliminate the most commonly occurring faults.

When raising equipment to its final position on vibration isolators, the isolators must be adjusted progressively.

Each isolator should be adjusted several turns at a time in sequence. The continued adjustment of a single mount will result only in the unit becoming coil bound and failure to lift the equipment.

6.2 Pipework Isolation

The use of flexible connectors as an interface between plant and associated pipework cannot be considered as adequate vibration isolation. Their use as thermal and shock compensators is well known, but even under nominal line pressures the connectors become acoustically rigid. It is, therefore, recommended that all active pipework should be isolated on resilient mountings/hangers up to the structural penetration adjacent to the service shaft, the first 100 pipe diameters or the first 10m of pipe run whichever is the greatest. Thereafter oversized brackets having neoprene inserts would be advisable, generally for larger "live" pipework, but also for smaller "live" pipework where friction losses exceed 280Pa/m.

If flexible connectors are also required they should be located in the horizontal plane and be of the double arched type.

6.3 Ductwork Flexible Connections

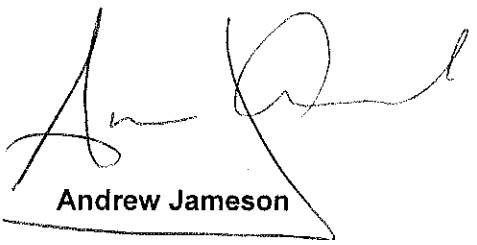
All ductwork connections to fans and air handling units should be flexible and at least 75mm long. These should be constructed from sound barrier mat having a minimum superficial density of at least 5kg/m^2. These connections should be straight but not rigid, with no offset, in order to prevent turbulence.

6.4 Electrical Connections

It is important that isolated equipment is not mechanically shorted by the installation of conduit or cable trays, etc., which are rigidly connected to the structure. Electrical connections to plant should, therefore, be made via a looped flexible conduit. The loop should form a diameter of 300mm or more.

We trust the above is clear and of assistance. However, should you require any further information, please do not hesitate to contact us.

Yours sincerely
for HANN TUCKER ASSOCIATES



Andrew Jameson

Att.

cc Eliza Borek (Fulcrum Consulting) - Eliza.Borek@FulcrumFirst.com
Jeff Anderson (Fulcrum Consulting) - Jeff.Anderson@FulcrumFirst.com

PLANT NOISE SCHEDULE

2-6 SOUTHAMPTON ROW, LONDON

Hann Tucker Associates

Woking (Head Office)
Tel: 01483 770595

Manchester (Northern Office)
Tel: 0161 832 7041

REF: HT: 13898/PNS1

Revision: 0		Date: 2 May 2008	Comments: None												
No. of	Plant Description	Location	Plant Type	Duty		Data: mfr/empir. Lw/Lp		Sound Level (dB) at Octave Band Centre Frequency (Hz)							
				m^3/s	Pa			63	125	250	500	1k	2k	4k	8k
1	Extract Fan 1 QPTW100B	External – second floor roof	Centrifugal in-line twin fan	0.048	50	Mfr Lw	Inlet	55	63	47	45	45	43	42	31
							Outlet	49	63	53	55	50	47	45	40
						Mfr Lp 3m	B'out	50	58	45	39	34	20	20	20
1	Extract Fan 2 QPTW500B	External – sixth floor roof	Centrifugal in-line twin fan	0.768	200	Mfr Lw	Inlet	70	73	67	62	61	63	60	54
							Outlet	60	70	69	70	71	70	67	61
						Mfr Lp 3m	B'out	77	75	69	64	59	59	56	47
7	Condenser PURY-EP500YSHM-A	External – sixth floor roof	External Condenser	-	-	Mfr Lp @ 1m	Stand	73	67	64	69	57	62	48	42
							Night	58	54	50	45	44	45	43	39

ATMOSPHERIC SILENCER SCHEDULE

2-6 SOUTHAMPTON ROW, LONDON

Hann Tucker Associates

Woking (Head Office)
Tel: 01483 770595

Manchester (Northern Office)
Tel: 0161 832 7041

REF: HT: 13898/SSA1

Revision: 0	Date: 2 May 2008	Comments: None													
Silencer Ref.	Description	No. Off	Dimensions (mm)			Vol. m^3/s	Max PD Pa	Minimum Insertion Loss (dB) at Octave Band Centre Frequency (Hz)							
			W	H	L			63	125	250	500	1k	2k	4k	8k
	Extract Fan 1	1	Face velocity not to exceed 5.0m/s		900	0.048	50	4	7	13	19	23	23	16	13
	Extract Fan 2	1	Face velocity not to exceed 5.0m/s		900	0.768	50	4	7	13	19	23	23	16	13

All silencers must comply with Hann Tucker Associates General Specification for Acoustic and Vibration Isolation Materials and Products (copy available upon request if not supplied).

VIBRATION ISOLATOR SCHEDULE

2-6 SOUTHAMPTON ROW

Hann Tucker Associates

Woking (Head Office)
Tel: 01483 770595

Manchester (Northern Office)
Tel: 0161 832 7041

REF: HT: 13898/VIS1

Revision: 0	Date: 2 May 2008	Comments: None					
AVM Ref.	Plant Ref	System Description	Location	Power (kW)	Base Code	Isolator Code	Static Deflection (mm)
	QPTW100B	Extract Unit 1	Floor slab up to 9m span	0.084	See Note 2	NIS or HNT	4
	QPTW500B	Extract Unit 2	Floor slab up to 9m span	1.320	See Note 2	NIS or HNT	4
	PURY-EP500YSHM-A	7 x Condenser Units	Suspended floor slab	-	-	OSS/R	25

Base Code and Description	HTA Spec Ref
AVR : A V Rails	4.7.1
SFB : Steel frame base	4.7.2
CIB : Concrete inertia base	4.7.3
CSP : Concrete split plinth	4.7.4

Isolator Code & Description	HTA Spec. Ref.
NP : Neoprene Pads	-
CSS : Caged steel spring	4.2
OSS : Open steel spring	4.3
NIS : Neoprene-in-shear	4.4

Isolator Code & Description	HTA Spec. Ref.
HSS : Hangers with steel springs	4.5
HNT : Hangers with neoprene turrets	4.6
_/R : Restraining or positioning device	4.1.1

Note 1 : To be read in conjunction with HTA's General Specification for Acoustic & Vibration Isolation Materials and Products (available upon request if not supplied).

Note 2 : All cased fans shall have the above specified isolators internally beneath fan/motor frame, and be additionally isolated externally with neoprene pads having 2 mm (min) deflection.

Note 3 : All pipework to be isolated between the plant and the first structural penetration using AV hangers/mounts with the above specified static deflection, and thereafter with brackets having neoprene inserts. CW booster pipework to be isolated on AV hangers throughout.

VIBRATION ISOLATOR SCHEDULE

2-6 SOUTHAMPTON ROW

Pipework

Hann Tucker Associates

Woking (Head Office)
Tel: 01483 770595

Manchester (Northern Office)
Tel: 0161 832 7041

REF: HT: 13898/VIS1/PIPES

Revision: 0	Date: 2 May 2008	Comments: None		
System Description		Location	Isolator Code	Static Deflection (mm)
Pipework to Extract Fans		First 20 pipe diameters or up to structural penetration. See Note 3.	To suit AHU isolators	As per AHU external isolators
Pipework to Condensers		First 100 pipe diameters or up to structural penetration. See Note 3.	HNT or HSS/R	As per plant

Base Code and Description	HTA Spec Ref
AVR : A V Rails	4.7.1
SFB : Steel frame base	4.7.2
CIB : Concrete inertia base	4.7.3
CSP : Concrete split plinth	4.7.4

Isolator Code & Description	HTA Spec. Ref.
NP : Neoprene Pads	-
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Isolator Code & Description	HTA Spec. Ref.
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Note 2 : All cased fans shall have the above specified isolators internally beneath fan/motor frame, and be additionally isolated externally with neoprene pads having 2 mm (min) deflection.

Note 3 : All pipework to be isolated between the plant and the first structural penetration using AV hangers/mounts with the above specified static deflection, and thereafter with brackets having neoprene inserts. CW booster pipework to be isolated on AV hangers throughout.

HT: 13898/AS1 2 May 2008

2-6 SOUTHAMPTON ROW, LONDON

ACOUSTIC SPECIFICATION FOR ACOUSTIC SCREENING

Acoustic screening shall extend:

- continuously around the sixth floor roof 7No. condenser units
- from the roof up to a height of 1000 mm above the highest part of the condenser units.

Performance

The acoustic screen shall provide in its as-installed condition the following minimum combined sound reduction indices (SRI's)/Transmission Losses when tested in accordance with BS EN ISO 140-3: 1995:

Minimum Sound Reduction Index (dB) at Octave Band Centre Frequency (Hz)							
63	125	250	500	1k	2k	4k	8k
20	21	27	37	44	46	51	49

The internal surface of the acoustic screen shall provide in its as-installed condition the following minimum absorption coefficients:

Minimum Absorption Coefficients (α) at Octave Band Centre Frequency (Hz)							
63	125	250	500	1k	2k	4k	8k
-	0.85	0.95	0.95	0.95	0.95	0.9	0.8

Construction

The acoustic panels shall comprise 100mm thick mineral wool retained between galvanised mild steel sheet – perforated on the plant side with a free area of at least 25%. The outer panels shall be constructed from galvanised sheet steel having a minimum thickness of 1.2mm (16 swg) and fixed at 300mm (max) centres. The inner panels shall be constructed from perforated galvanized sheet steel (not "expanet" or similar derivative) having a minimum thickness of 0.8mm (20 swg) and fixed at 300mm (max) centres.

The inert, rot and vermin proof, non-hygroscopic and non-combustible mineral wool or glass fibre acoustic medium shall be packed to a density of not less than 45kg/m^3. This shall be faced with a glass fibre cloth, or other approved infill protection membrane. Panels shall be constructed and assembled so that no egress of the acoustic medium will occur under the operating conditions.

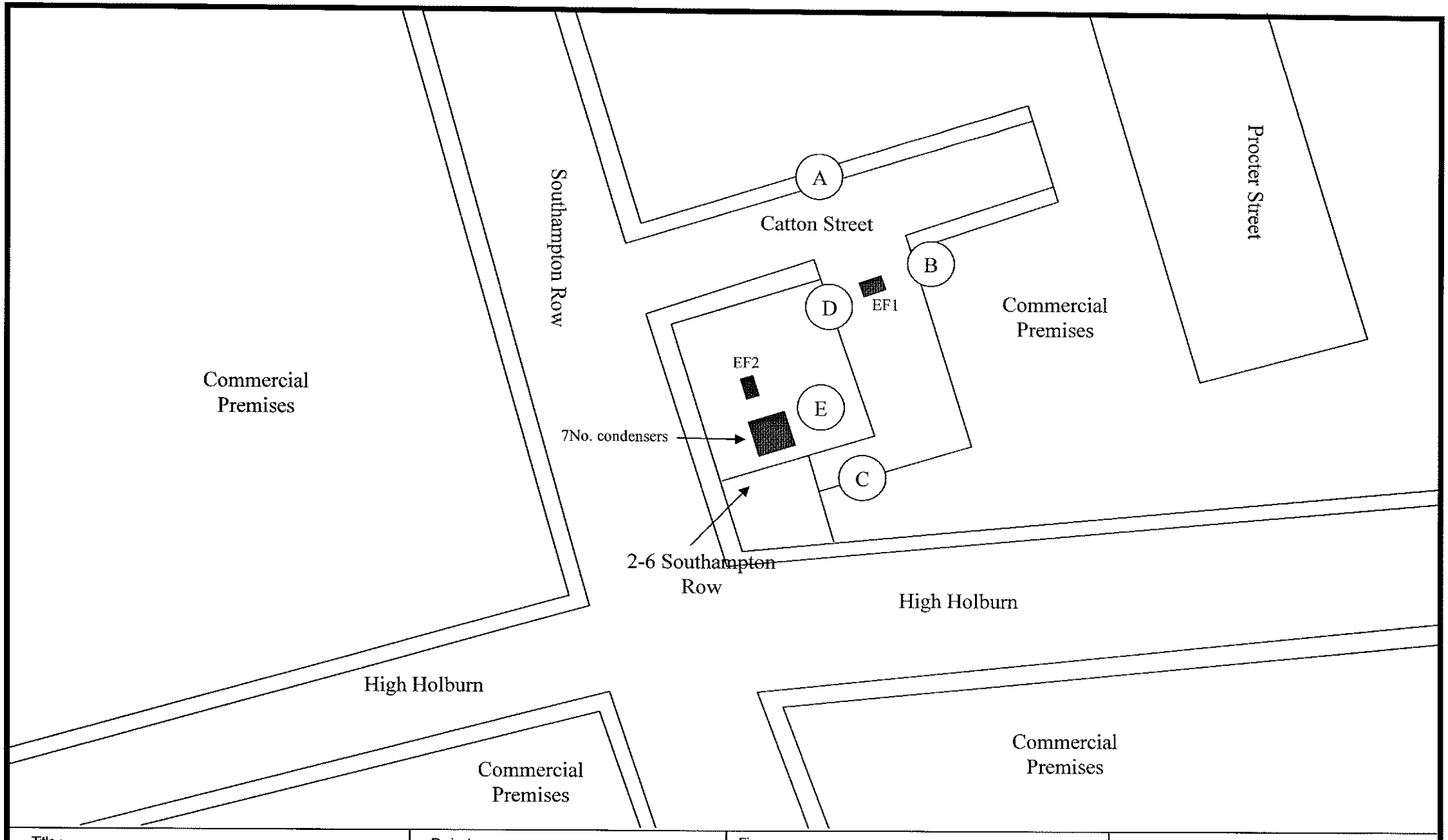
The complete structure shall be inert, rot and vermin proof, and wind resistant to standards agreed with the Client.

The acoustic media shall not comprise materials which are generally composed of mineral fibres, either man made or naturally occurring, which have a diameter of 3 microns or less and a length of 200 microns or less or which contain any fibres not sealed or otherwise stabilised to ensure fibre migration is prevented.

Doors, access panels and service penetrations shall be treated so as to maintain the acoustic performance of the assembled screen.

All junctions between the acoustic screen and adjacent structures shall be made good and sealed with a heavy grout and/or dense non-hardening mastic.

The exact design and technical specification for the screen will be agreed with and approved by Hann Tucker Associates.



Title : Site plan showing approximate location of plant and receptors	Project : 2-6 Southampton Row, London	Figure : 13898/SP1	Hann Tucker Associates Consultants in Acoustics Noise and Vibration Control
		Date : 02/05/2008 / Scale : N.T.S	Duke House 1-2 Duke Street Woking Surrey GU21 5BA Telephone Woking (01483) 770595 Facsimile Woking (01483) 729565