WATERLOO ACOUSTICS

Unit 11, D2 Trading Estate, Castle Road, Sittingbourne Kent ME10 3RH
Tel: 01795 423623 Fax: 01795 423514
Email: sales@waterlooacoustics.com

ENVIRONMENTAL NOISE MEASUREMENT REPORT

Site Name:	**Reading Central T.E.**
Report Type:	**Pre-installation**
Site Address:	**British Telecom Reading Central T.E. 41 Minster Street Reading Berkshire RG1 2JB**
Edenaire Ref	**NCF015**
Date of Measurements:	**12th June 2013**
Client:	**Mr P. Williams Edenaire Limited Eaton Williams Group Fircroft Way Edenbridge Kent TN8 6EZ**
Report Author: Approved for Issue:	**A. Jowitt B.Costello B.E.**
Report No. Report Date:	**1785/01 13th June 2013**

WATERLOO ACOUSTICS
Tel: 01795 423623
Fax: 01795 423514

Contents

Section No		Page No
1	Introduction	3
2	Site Description	4
3	Instrumentation	5
4	Weather Conditions	5
5	Measurement Procedure	5
6	Results	6
7	Assessment	7
8	Observations	8
9	Recommendations	9
Appendix 1	Proposed Attenuation	10
Appendix 2	Definitions	11
Appendix 3	Manufacturer's Data	12
Appendix 4	Site Plan and Edenaire Drawing	13

WATERLOO ACOUSTICS
Tel: 01795 423623
Fax: 01795 423514

1 Introduction

1.1 This report was carried out on the instructions of Mr P. Williams of Edenaire to determine the environmental impact of noise emissions from the proposed installation of a new air handling unit at Reading Central Telephone Exchange comprising:

a) Two off Edenaire type eBTA200 Compact, fresh air units located internally on the ground floor of the exchange building.

1.2 The objectives of the survey are to:

a) Determine any critical locations that may be affected by the noise emissions from the proposed plant equipment.

b) Determine the night-time noise level at any critical location in accordance with BS4142: 1997 “Method for rating industrial noise affecting mixed residential and industrial areas”.

c) Suggest acceptable design criteria for noise emissions from the Exchange to minimise the likelihood of complaint when assessed to BS4142 and expected local authority requirements.

WATERLOO ACOUSTICS
Tel: 01795 423623
Fax: 01795 423514

2 Site Description

2.1 Reading Central telephone exchange is located on the southern side of Minster Street at the junction with Earley Place. The Oracle shopping centre lies to the south and east. The exchange itself is a four storey building along the length of Earley Place. The main entrance to the exchange is via Minster Street to the north east of the site. The exchange is bounded by commercial properties to the north, south and east with residential flats on the 1st to 3rd floors in Minster Court (see site plan).

2.2 The main source of background noise at the exchange was from existing plant noise emanating from the northern facade of the Oracle shopping centre (location C), the ground floor eastern facade of Minster Court (location B) and existing plant from the exchange itself. Occasional traffic noise on Minster Street and local roads also contributed to background noise levels at the boundary.

2.3 The proposed Air Handling Plant consists of :

Two off Edenaire type; eBTA200UF fresh air units, these will be located internally on the ground floor eastern facade of the exchange. The AHU (inlet air) will be ducted via an acoustically attenuated plenum to inlet air louvres on the facade overlooking Earley Place.

The PRV louvre (discharge air) will be located within the same room space and ducted to discharge air louvres also on the eastern facade via an acoustically lined and offset plenum. All locations generally as indicated on attached site plan.

2.4 It is understood that the units will be fully operational 24hrs per day although actual duties will depend upon the heat load in the exchange and external ambient temperatures.

2.5 The area is predominantly commercial with the exception of the residential flats on the upper floors of Minster Court.

2.6 The nearest affected noise sensitive locations to the exchange and the proposed installation are:-

i. The residential properties on the upper three floors of Minster Court, Minster Street on the southern and eastern facades overlooking Earley Place at a distance of approximately 10 metres from the unit's inlet air louvres and 22 metres from the PRV discharge air louvres (see site plan).

WATERLOO ACOUSTICS
Tel: 01795 423623
Fax: 01795 423514

3 Instrumentation

3.1 Cirrus Research plc Integrating Sound Level Meter:
Type: GR 821B Serial No: C19350FE
Compliance to IEC 61672-1: 2002 Class 1, IEC 60651: 1979 Type 1, IEC 60804: 2001 Type 1, IEC 61260: 1995 Class 1, IEC 60942:1997, IEC 61252:1993, ANSI S1.4-1983 and ANSI S1.43-1997

3.2 Cirrus Research plc Calibrator:
Type: GR 511E Serial No: 43553

4 Weather Conditions

4.1 Overcast mild night approximately 14^{0}C with a south easterly wind approximately 5-6mph. Road conditions were dry throughout the survey.

5 Measurement Procedure

5.1 Measurements were taken at various locations in the vicinity of the exchange building. These readings were taken in order to establish noise levels likely to be experienced at nearest affected noise sensitive properties and establish existing background noise levels within the vicinity of the exchange (see attached site plan for measurement locations).

5.2 Measurements were taken in accordance with the guide lines of BS 4142: 1997 “Method for rating industrial noise affecting mixed residential and industrial areas".

5.3 All measurements were taken between 00:00hrs and 01:00hrs on the 12/06/2013.

5.4 The results are utilised to assess the likelihood of complaint based upon the requirements of BS 4142. External L_{Aeq} and L_{A90} measurements were taken over minimum 5 minute measurement intervals.

5.5 The meter was calibrated before and after the survey period and no deviation noted. All measurements are quoted to the nearest whole decibel. The sound level meter used was tripod mounted at a height 1.5 metres a wind shield was used during all measurements.

WATERLOO ACOUSTICS
Tel: 01795 423623
Fax: 01795 423514

6 Results

6.1 The results of the noise measurements when assessed in accordance BS 4142: 1997 "Method for rating industrial noise affecting mixed residential and industrial areas", were as follows:

Background noise levels

Night-Time Noise Levels			
Location	**$L_{Aeq,5mins}$**	**$L_{A90,5mins}$**	**$L_{Amin,5mins}$**
A	51.4	50.3	49.6
A	51.6	50.4	49.8
A	51.3	50.4	49.6
B	53.4	52.3	51.6
C	55.0	53.4	52.4
Measurements for all sampling periods at each position were found to be consistent.			
The lowest recorded background noise level for the purpose of these assessments is an $L_{A90,\ 5mins}$ of 50dBA.			

Measurement positions below and as noted on site plan:

Location A: - To the east of the exchange in Earley Place adjacent to the nearest affected residential properties of Minster Court.

Location B: - At 2m from the plant louvres on the western facade ground floor of Minster Court.

Location C: - At 2m from the plant louvres on the northern facade ground floor of The Oracle shopping centre in Earley Place.

The predominant background noise during the survey was from the vicinity of the Oracle shopping centre to the south.

WATERLOO ACOUSTICS
Tel: 01795 423623
Fax: 01795 423514

7 Assessment

7.1 Assessment to nearest affected residential properties: - with acoustic plenum fitted.

Units: 2 off Edenaire type: eBTA200 units
System: Inlet air (eBTA200 units) & discharge air (PRV'S)
Location: Nearest affected residential properties
Minster Court, Minster Street (floors 1-3)

Comments			BS4142 clauses & comments
Lowest Background $L_{A90,\ 5mins}$		50 dBA	*7.2*
Noise via AHU Inlet Air Louvres			
(eBTA200 unit inlet air on full duty)	52 dBA		*Manufacturers' Data*
Correction for 2 units	+ 3 dBA		
Site correction Factor	+ 3 dBA		
Distance & directivity from 2m to 9m	- 13 dBA		
Insertion loss of attenuated plenum	- 6 dBA		
Specific Noise @ nearest office windows due to inlet air		**39 dBA**	***A***
Noise via PRV Discharge Air Louvre			
Internal Noise Level (NR65)	72 dBA		*Assumed BT internal noise level.*
20Log(r) where (r =21m) @ 45^0	- 27 dBA		**** empirical formulae*
Site correction factor	+ 3 dBA		
10Log(S) where (S=1.94m x 1.15m)	+ 3 dBA		**** empirical formulae*
Formula factor	- 14 dBA		
Specific Noise @ nearest office windows due to discharge air		**37 dBA**	***B***
Combined Specific Noise @ nearest office windows		**41 dBA**	***A+B***
Tonal Qualities		0 dBA	*8.2*
Rating Level		**41 dBA**	*3.6*
Excess of Rating over Background		**- 9 dBA**	*9*
BS 4142 Assessment:	**Complaints unlikely**		*9*
Subjective Comments:	**Complaints not anticipated**		

*** Noise to atmosphere has been calculated from the following empirical formulae:-

$$SPL_{ext} = SPL_s - SRI - 20\log(r) + 10\log(S) - 14$$

Where:-

SPL_{ext} = *external sound pressure level at distance r from wall/roof*
SPL_s = *sound pressure level in source room (dB)*
S = *area of louvre radiating to outside*

WATERLOO ACOUSTICS
Tel: 01795 423623
Fax: 01795 423514

8 Observations

8.1 In order to assess the acceptability of the proposed installation it is necessary to compare the plant noise level with the background noise at any critical location. Detailed guidance on the assessment procedure is given in BS 4142: 1997.

8.2 Should the specific noise contain any distinguishable characteristics, e.g. whine, hiss, clicks, bangs, etc, or be of cyclic nature, 5dB should be added to the specific noise prior to the assessment. In this instance the correction factor has not been added as the tonal qualities of the proposed units are similar or less than the existing plant on this and other sites in the vicinity and internal noise to atmosphere is of a steady state and not tonal in character.

8.3 We would normally expect that the likelihood of complaint should be minimised provided that the noise emissions from the units at the nearest affected residential property are at least 5dB below background. Typically, we would expect that the local authority may specify this noise limit at 1 metre from the facade of the nearest affected residential property.

8.4 BS4142 requires a comparison to be made between the specific noise (i.e. plant noise under consideration) when measured in L_{Aeq} mode and the background noise when measured in the L_{A90} mode. The reference time interval (T) being 1 hour during the day and 5 minutes during the night. However, BS4142 is not a suitable method of assessment when ambient and background noise levels are low (i.e. "*background noise levels below about 30dB and rating levels below about 35dB are considered very low*").

8.5 Further guidance on suitable criteria can be found in the World Health Organisation guidelines as referenced in BS8233:1999. BS8233 table 5 identifies states a good design range for bedrooms as 30dBA. Assuming a 10-15dBA reduction via a partially open window (BS8233), we can derive that for external noise levels up to 40-45dBA for residential properties and 45-50dBA for commercial office space would be a good external design criteria when measured at 1 metre from the facade of the nearest affected windows.

Extract from Table 5 of BS8233: 1999

Criterion	Typical Situation	Design Range $L_{Aeq,T}$	
		Good	Reasonable
Reasonable conditions for study and work requiring concentration	Library, cellular office museum	40	50
	Staff Room	35	45
	Meeting Room, executive office	35	40
Reasonable resting/sleeping conditions	Living rooms	30	40
	Bedrooms	30	35

8.6 The inlet/discharge louvres should be correctly sized to ensure that regenerated air noise across the louvre does not compromise the criteria (generally we would expect that the face velocity across the "active section" of each double banked acoustic louvre should not exceed 1.25m/s or 1.5m/s for a single banked acoustic louvre). The building fabric itself should also be considered (i.e. open windows, doors single glazing, pressure relief dampers, etc.) to ensure that the specified criterion is not compromised by breakout noise from within the exchange.

8.7 This report can only deal with the sources under investigation and cannot account for the variable impact from other noise sources within the exchange. We would suggest that an overall strategic approach to the entire noise climate in the vicinity of the exchange be considered and where necessary be co-ordinated with other licensed operators.

WATERLOO ACOUSTICS
Tel: 01795 423623
Fax: 01795 423514

9 Recommendations

9.1 In line with BS4142: 1997 and expected local authority requirements it is recommended that the noise emissions from the proposed plant should not exceed a specific noise level of 45dBA i.e. background minus 5dBA when measured at 1 metre from the facade of the nearest affected noise sensitive properties.

9.2 The Assessment indicates a Rating level of 41dBA via the inlet air and discharge air at 1m from the facade of the nearest affected noise sensitive properties. This is 9dBA below the lowest background noise measured during the survey period. In accordance with BS4142: 1997 this is an indication that complaints are unlikely.

9.3 We would consider that this installation with attenuation as proposed would be acceptable to the local authority.

9.4 We are not aware of any specific local authority requirements but all design parameters should be agreed as necessary with the relevant local authority prior to installation.

9.5 Summary of assessments to the nearest affected noise sensitive properties.

Unit	Rating Level	Excess over Background	BS4142 Assessment Result	Comments
2 off eBTA200 units: inlet air & 1 off discharge air PRV unit Affecting the residential properties of Minster Court	41dBA	- 9dBA	Complaints unlikely	complaints not anticipated with attenuation as proposed and as noted in appendix 1

Warnings:

Please ensure acceptance criteria are agreed as necessary with the relevant local authority.

"Compliance with a British Standard does not of itself confer immunity from legal obligations".

WATERLOO ACOUSTICS
Tel: 01795 423623
Fax: 01795 423514

Appendix 1 : Proposed Attenuation

Scheme consisting of 2 off eBTA200 units;

Inlet Air;

Attenuators within the plenum section and lined ductwork as proposed.

PRV discharge air;

No further attenuation recommended

The attenuation options above are indicative selections for the atmosphere side ducted inlet & discharge air. These selections are based on reducing the 'ductborne noise' from the proposed unit to at least 41dBA at 1m from the facade of the nearest affected properties.

It is important that the building fabric itself should also be considered (i.e. open windows, doors single glazing, pressure relief dampers, etc.) to ensure that the specified criterion is not compromised by breakout noise from within the exchange.

Nominal equipment selections are based upon "Waterloo Acoustics Ltd's" standard product range performance data.

WATERLOO ACOUSTICS
Tel: 01795 423623
Fax: 01795 423514

Appendix 2 : Definitions

Equivalent Continuous Sound Pressure Level - (L_{Aeq})

The equivalent continuous A-weighted sound pressure level in decibels at the measurement position over a given reference time interval. This is used to provide an equivalent steady state noise level when a fluctuating noise is measured. L_{Aeq} is quoted to the nearest whole number of decibels.

Background Sound Pressure Level - (L_{A90})

The A-weighted sound pressure level of the residual noise in decibels exceeded for 90% of a given time interval. L_{A90} is quoted to the nearest whole number of decibels.

Specific Noise Level - ($L_{Aeq, Tr}$)

The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval.

Rating Level

The specific noise level plus any adjustment for the character of the noise

Specific Noise Level - $L_{Aeq,Tr}$ **

The equivalent continuous A-weighted sound pressure level in decibels at the measurement position produced by the specific noise source over a given reference time interval. The specific noise level is quoted to the nearest whole number of decibels.

Ambient Noise

Total encompassing sound in a given situation at a given time usually composed of sound from many sources near and far.

Residual Noise

The ambient noise remaining at a given position in a given situation when the specific noise source is suppressed to a degree such that it does not contribute to the ambient noise. Usually expressed as the equivalent continuous A-weighted sound pressure level of the residual noise.

** Definitions as noted in BS4142

Appendix 3 : Manufacturer's Noise Data

eBTA Compact

Unit Technical Data / InvictaNET Controller

Quick Technical Reference Guide

A summary of the key technical data is given in the table below. For additional or more detailed data please refer to the eBTA Installation and Operating manual.

Quick Reference Guide			200 UF	400 UF	600 UF	200 DF	400 DF
Net Cooling Capacity @ 5°C Δt		kw	15.40	30.80	38.20	10.25	22.20
Airflow		m³/s	2.6	5.2	6.6	2.6	5.2
Dimensions	Width	mm	920	1800	2300	1800	1800
	Height	mm	1800	1800	1800	1800	1800
	Depth	mm	857	857	1057	857	857
Weights	Module 1 (see pg 3)	kg (pallet kg)	220 (15)*	303 (18)*	400 (37)*	227 (17)*	310 (18)*
External Pressure		Pa	80	80	80	80	80
Louvre Area Required (Per Unit)	Inlet	m²	0.80	1.60	2.40	0.80	1.60
	PRV	m²	0.80	1.60	2.40	0.80	1.60
No. of Fans			1	2	2	1	2
Filter Type			G4	G4	G4	G4	G4
Controller			EW InvictaNET				
Electrical Supply		V / Ph / Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
Full Load Current		amps	1.85	3.65	7.10	1.85	3.65
Starting Current		amps	4.8	9.6	10.40*	4.8	9.6
Recommended Fuse Rating (HRC)		amps	10	10	16	10	10
External Noise With Standard Louvre		dB(A) @ 2 m	51.5	54.5	57.5*	52.5	54.5
External Noise With Acoustic Louvre		dB(A) @ 2 m	41.5	44.5	47.5*	42.5	54.5
Unit Colour		Finish - Self	Galv	Galv	Galv	Galv	Galv

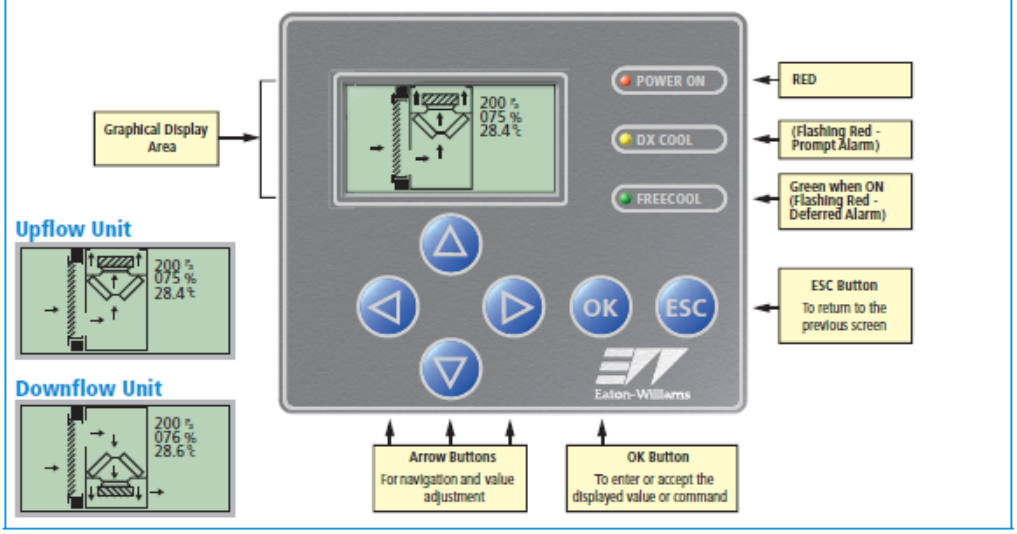
* to be confirmed

InvictaNET Controller

Graphical Display and Keypad

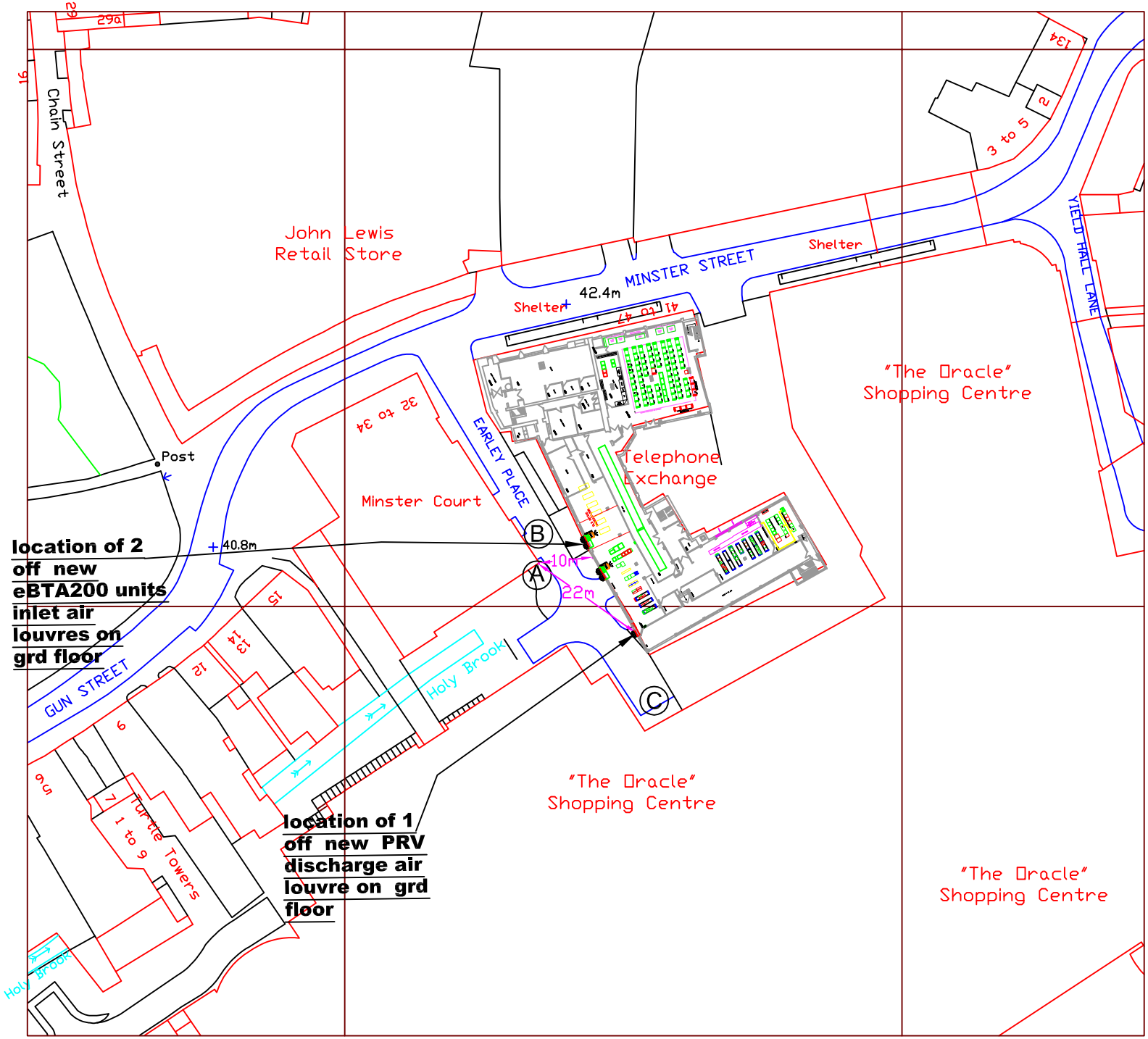
The E-W Microprocessor Controller provides full control and monitoring facilities. Local monitoring and adjustment facilities are provided via a graphical display screen as detailed below

Graphical Display and Keypad



WATERLOO ACOUSTICS
Tel: 01795 423623
Fax: 01795 423514

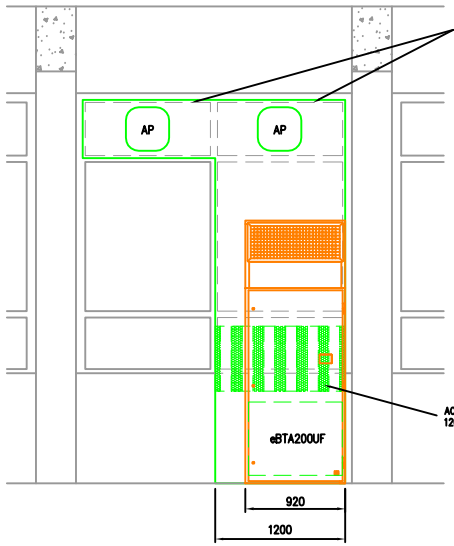
Appendix 4 : Site Plan & Edenaire drawing



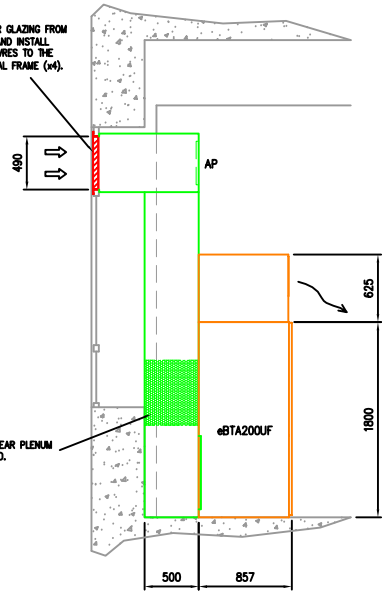
BT Reading Central Telephone Exchange
Noise Measuring Position A, B & C

IF IN DOUBT ASK

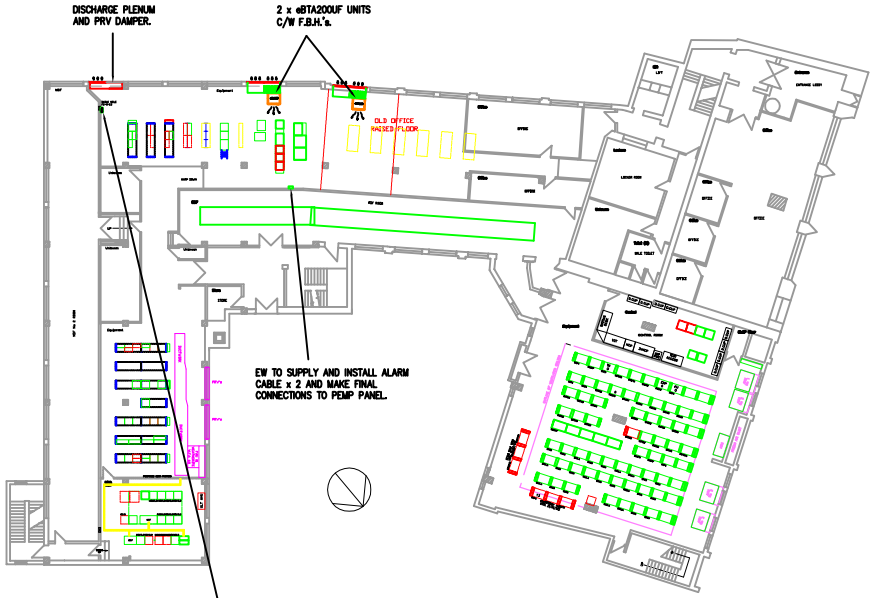
3RD ANGLE PROJECTION



FRONT ELEVATION OF UNIT @ SCALE 1:25



SIDE ELEVATION OF UNIT @ SCALE 1:25

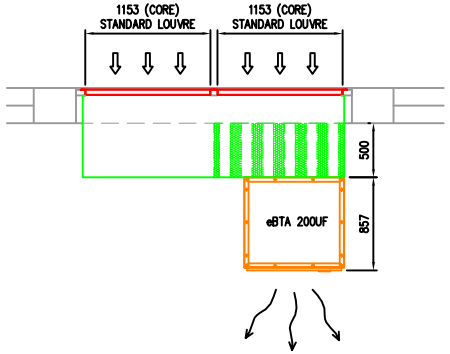


PLAN VIEW @ SCALE 1:200

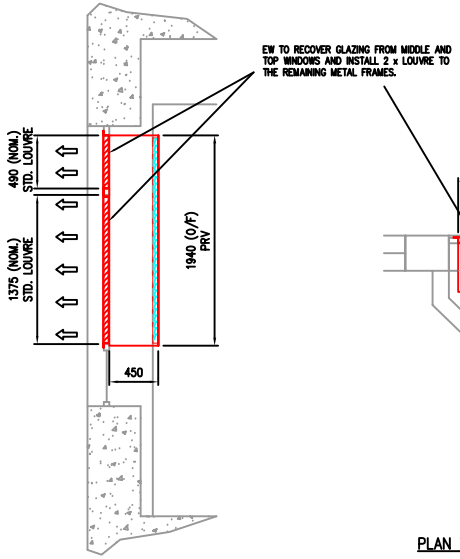
EW TO SUPPLY AND INSTALL 2 x TPN ELECTRICAL CABLES FROM ISOLATOR AND MAKE FINAL CONNECTIONS TO UNITS.

EW TO SUPPLY AND INSTALL REMOTE ROOM SENSORS ONE PER UNIT.

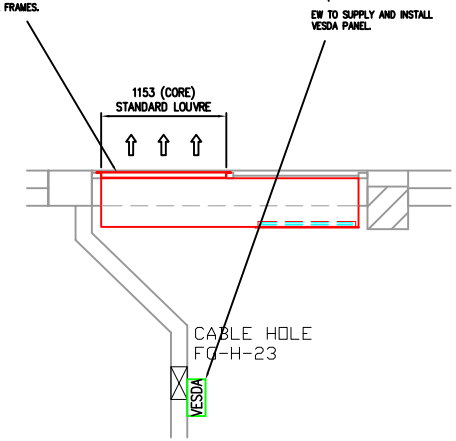
BT TO PROVIDE ISOLATORS FOR UNITS AND VESDA SPUR AND REPOSITION LIGHT FITTINGS.



PLAN VIEW OF UNIT & LOUVRE @ SCALE 1:25



SIDE ELEVATION OF DISCHARGE PLENUM & PRV @ SCALE 1:25



PLAN VIEW OF DISCHARGE PLENUM & PRV @ SCALE 1:25

NOTES
1) RETURN AIR GRILLES ON OUR UNITS ARE NOT TO BE OBSTRUCTED.
2) ACCESS PANELS ON OUR UNITS ARE NOT TO BE COVERED OR ACCESS RESTRICTED.
3) ALL RADIATORS TO BE REMOVED BY OTHERS.
4) WEIGHT OF UNITS: –
5) LOUVRE TYPE: STANDARD LOUVRE COLOUR: T.B.C.

PROVISIONAL

ISSUE	CHANGE DESCRIPTION	MOD BY	DATE

Eaton-Williams Ltd.
FIRCROFT WAY EDENBRIDGE, TN8 6EZ. Tel 01732 866066
BT

DRAWN	PL	TITLE	READING CENTRAL TE GROUND FLOOR WBC PROPOSED AIR CONDITIONING SOLUTION 2 x eBTA200UF UNITS
CHECKED	NC		
DATE	07.03.13		
SCALE: SEE DWG	DWG. No.: A1	NCF015–Q01	ISSUE: –

All dimensions are in mm unless otherwise stated. This drawing is for proposal purposes only therefore all dimensions should be checked prior to manufacture

DO NOT SCALE THIS PRINT