

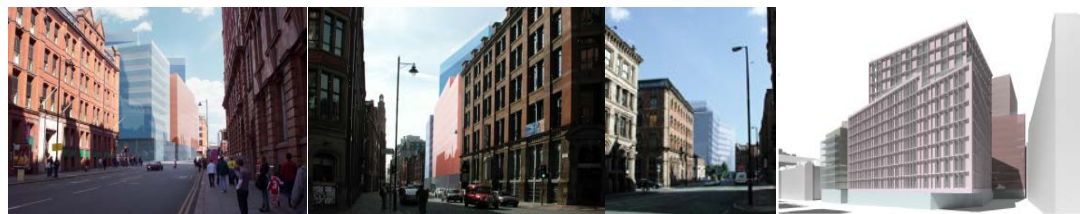
Intended for
Urban & Civic (Princess Street) Ltd.

Project no.
1620000466

Date
17 July 2017

PRINCESS STREET / WHITWORTH STREET

VENTILATION / EXTRACT STATEMENT



Revision History

Revision	Date	Purpose / Status	Document Ref.	Comments
A	13/09/15	Final Issue	1620000466-RAM-DOC-400-VENT	RIBA Stage 2 Input
B	01/10/15	For Planning	1620000466-RAM-DOC-400-VENT	Design amendments incorporated
C	17/11/16	For Planning	1620000466-RAM-DOC-400-VENT	Updated to reflect revised scheme
D	23/03/17	Stage 4	1620000466-RAM-DOC-400-VENT	Performance specification & enhanced detail added to smoke extract systems
E	17/07/2017	Stage 4	1620000466-RAM-DOC-400-VENT	Supplementary information added for purge ventilation

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INTRODUCTION

1.1 Introduction

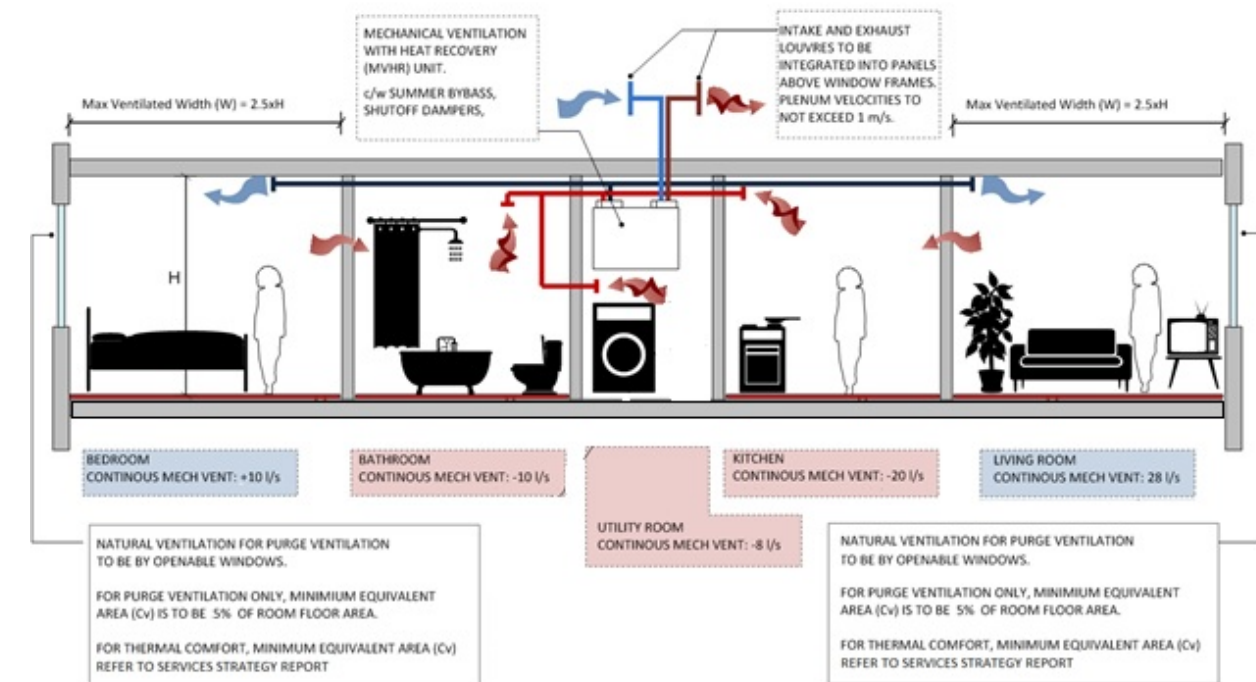
- 1.1.1 This document outlines the ventilation and extract philosophy currently being proposed for the development at Princess Street in Manchester. Presently a mixture of natural and mechanical ventilation is being considered for the residential apartments, the ground floor commercial units are to be constructed as shell only, and the individual tenants will be responsible for providing suitable ventilation. A high level louvered band is to be provided to allow access to external for intake and exhaust air mechanical ventilation connections. Commercial kitchen extract is to be routed to roof level where it will discharge vertically.
- 1.1.2 This document has been prepared in conjunction with the outline brief presented by the client to the design team indicating their desires for this scheme and the requirements of Approved Document F. This document also incorporates the requirements of Manchester City Council document “GD03” Public Protection Information For Developers; Version 1.01 “City Wide Support – Environmental and Public Protection, February 2014”
- 1.1.3 It is intended that the development shall be designed for a 25 year life span; MEP systems will be subject to typical maintenance and replacement cycles within this design life. Ramboll propose to follow the guidance set out within the CIBSE Guides in terms of MEP plant and equipment life spans.
- 1.1.4 The focus is to provide functional mechanical and electrical systems which are simple for the occupants to use and control, offering neat and well considered design principles.
- 1.1.5 This report will cover all aspects of ventilation throughout the development including Fire/smoke & basement car park ventilation, ventilation to residential apartments and commercial offerings.
- 1.1.6 Consideration has been given to the neighbouring properties both in terms of air quality & acoustics. This is discussed further within this report.

2. GENERAL VENTILATION

2.1 Residential Apartments

- 2.1.1 A combination of natural and mechanical ventilation methods are employed to serve the residential apartments. The requirements are dependent on the criteria determined by specialist air quality and acoustic studies, carried out by the air quality consultant and acoustician; in compliance with both Approved Document F and the planning conditions imposed by Manchester City Council.
- 2.1.2 Ramboll have undertaken a study for both compliance and overheating as required by the building regulations. Both of these demonstrate that a naturally ventilated solution with mechanical extract to wet rooms/ sanitary accommodation is capable of achieving compliance; this would be the preferred engineering solution.
- 2.1.3 However the acoustic criteria of the planning conditions have dictated that this is not acceptable, and as such a mechanical ventilation solution must be employed to provide fresh air. All apartments throughout the development are to have continuous mechanical supply & extract ventilation with heat recovery (MVHR); defined as "System 4" in Approved Document F.
- 2.1.4 The requirements for filtration & attenuation as part of these installations will be assessed as part of the acoustic & air quality studies. Due to the location of the development it has been determined that some acoustic treatment will be required. This is detailed in the reports produced by the acoustic consultant.
- 2.1.5 The MVHR system will supply fresh air to the occupied rooms and draw exhaust air from the bathrooms and kitchen. The systems shall be sized to match the requirements of the Approved Document F, and shall be capable of achieving a nominal air change rate, however to achieve 4 ach/hr. for purge ventilation openable windows is deemed acceptable.
- 2.1.6 Environmental health have confirmed that openable windows cannot be used to provide control of overheating. Ramboll have generated a separate report, which can be found in appendix B and provides greater detail on the proposed methodology for ventilating the apartments.
- 2.1.7 Special consideration shall be given to the MVHR serving the apartments to mitigate any overheating while still maintaining the acoustic requirements of the apartment. The EHO has confirmed that it is acceptable to utilise opening windows to provide purge ventilation, however the same strategy cannot be adopted for overheating. A strategy to provide additional mechanical ventilation to control overheating will be provided via boost functions on the central MVHR unit in each apartment.
- 2.1.8 The MVHR unit shall be mounted at high level within the dedicated services cupboard.
- 2.1.9 Air is drawn and exhausted via the façade through louvres/airbricks or architectural openings.

- 2.1.10 Horizontal ducts within the apartment ceilings will be in self-extinguishing flat plastic. Grilles will be ceiling mounted in each living room, bedroom, kitchen and bathroom. It will be necessary to provide attenuators (or acoustically lined plenum boxes) in the inlet and exhaust ducts.
- 2.1.11 In the apartments equipped with whole house ventilation systems, the kitchen extract hoods (specified by the architect) shall be a type which re-circulates rather than discharging to atmosphere.
- 2.1.12 The diagram below illustrates the principals of a typical HVAC strategy for a standard apartment utilising a MVHR system. This illustrates the general strategy to be adopted for the Princess Street development



2.2 Commercial Units

- 2.2.1 The commercial/retail units are designed as shell and core only. No mechanical ventilation is provided initially, this will be installed by the tenant as part of their fit out. A band of louvres 750mm high will be provided at high level ground floor, to permit the future tenant to install general ventilation fans and systems as required. It is envisaged that all general ventilation can be achieved through the façade.
- 2.2.2 If any future tenant is to install kitchen ventilation then the tenant may be required to incorporate an ultra violet (UV-C) system, and carbon filters as required in the extract duct to provide grease removal and odour filtration. This will be particularly important if discharging through the retail unit façade high level louvres at street level. This approach has been discussed with the environmental health officer (EHO) who has confirmed that

this strategy will not be acceptable and that all kitchen extract must be discharged at roof level. Any deviation from this must be agreed with the EHO prior to install.

- 2.2.3 Any commercial kitchen ventilation systems installed will take due cognisance of the details provided in Manchester City Council document "GD03" Public Protection Information For Developers; Version 1.01 "City Wide Support – Environmental and Public Protection, February 2014" and be installed in compliance with the recommendations of this document.
- 2.2.4 Ventilation to the kitchen will be based on the catering equipment, with extract via the canopies and makeup air provided as required at 85% of extract rate. This will be provided to the canopies and preparation areas.
- 2.2.5 Sanitary accommodation will be provided with suitable extract ventilation with fresh air makeup via the individual plant serving each unit.

2.3 Refuse store

- 2.3.1 Each refuse store shall be naturally ventilated with louvered doors

2.4 Plant rooms

- 2.4.1 Ventilation of the plantrooms will be achieved via the general basement extract system.

3. SMOKE EXTRACT AND BASEMENT VENTILATION

3.1 Basement Stairs

- 3.1.1 The basement stairs to blocks 2 & 3 are considered fire fighting shafts and as such must be appropriately ventilated. BS9991: 2001 recommends that fire-fighting shafts 30m above grade and 10m below grade are provided with a pressure differential system.
- 3.1.2 The fire-strategy justifies the provision of a natural ventilation system as opposed to pressure differential systems for levels above grade.
- 3.1.3 The provision of a mechanical ventilation system is recommended to serve the fire-fighting shafts below ground as in reality pressurisation systems are:
- Difficult to design
 - Difficult to commission
 - Performance decreases with age
- 3.1.4 The mechanical extract system will be designed to keep the stair relatively free from smoke during the course of fire-fighting operations.
- 3.1.5 Should it be necessary, the performance of the mechanical system would usually be demonstrated via a CFD analysis produced by the designer of the mechanical extract system with the input parameters agreed with Ramboll and the Fire Service.

3.2 Smoke Control Ventilation Corridor / Fire Fighting Shaft Ventilation

- 3.2.1 Smoke ventilation to the common areas will be provided by a mixture of natural and mechanical means. The current fire strategy identifies that the fire fighting shafts off the residential corridors will be naturally ventilated, with mechanical ventilation provided to the fire fighting lobbies at basement levels only.
- 3.2.2 The passive extract system will comprise of an automated fire damper on each floor on the face of a fire rated shaft. An Automatic Opening Vent (AOV) will be installed at the top of the fire fighting shaft to allow exhaust of smoke. The mechanical extract to the basement levels will comprise a twin smoke rated extract fan (duty/standby).
- 3.2.3 A mechanical extract system has been recommended to serve the fire-fighting shafts below ground in lieu of the pressurisation method outlined in BS 9999. This is deemed preferable due to the following concerns with a pressurisation system :
- Difficult to design
 - Difficult to commission
 - Prone to performance decreases with age
- 3.2.4 Full details of the philosophy for smoke control ventilation can be found in the Ramboll fire strategy report.



Typical duty and standby smoke extract fan



Typical smoke ventilation grille

3.3 Basement Car Park Ventilation

- 3.3.1 Ventilation to the basement car parks will be provided via a combination of natural and mechanical ventilation. Extract air will be exhausted from the four basement levels via duty and standby extract fans located at level B-1. Air will be drawn into the exhaust chamber through louvres on the face of the plenum at each level. The extract of fumes, and in the case of a fire, smoke, will be further assisted by impulse fans located at high level of the car park to ensure adequate smoke clearance from all parts and to meet the air change rate.
- 3.3.2 The ventilation plant serving the four levels of basement is split into two distinct systems:
- There is a main extract system which serves to provide ventilation in accordance with Approved Document F for general ventilation and removal of vehicle exhaust fumes, this system also provides ventilation in accordance with Approved Document B in the event of a fire situation.
 - The second ventilation installation serving the basement levels comprises a separate duty and standby fan arrangement serving each stair core to provide mechanical extract ventilation. This second system serves the basement levels only. This is illustrated diagrammatically on the schematic diagram included as Appendix C. The ventilation shaft serves each stair core and exhausts discharge at ground floor level.
- 3.3.3 The ventilation to the basement car park will be provided in accordance with Approved documents B & F, Code of Practice for ground floor, multi storey & underground car parks and CIBSE Guide B.

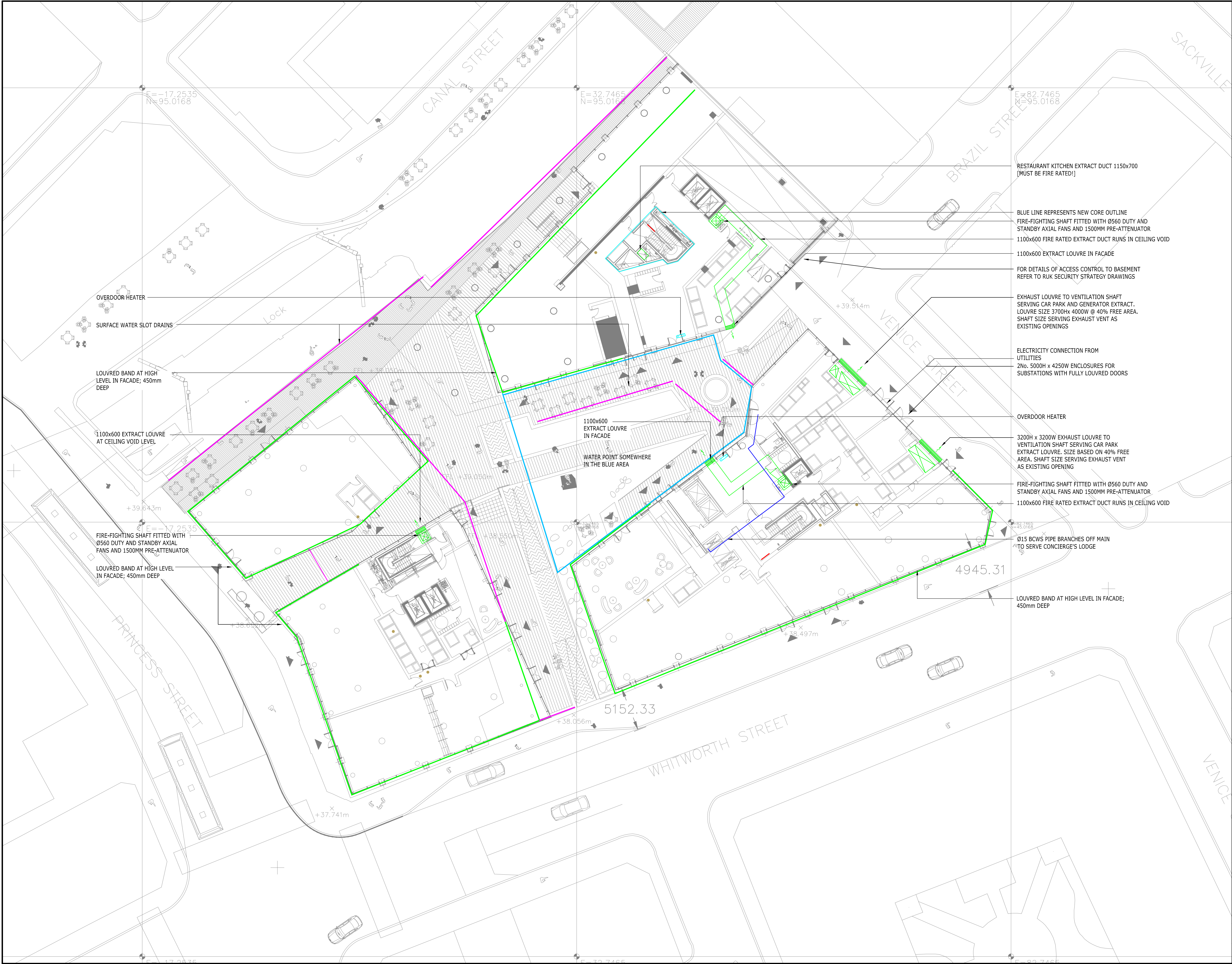
3.4 Smoke Control Ventilation – Performance Specification

- 3.4.1 Appendix D of this document has been included as part of this report to provide the details of the performance specification related to the smoke control elements of the proposed scheme, please refer to this section for further details.

4. **APPENDIX A**

4.1 **Ground Floor Ventilation**

- 4.1.1 The attached drawing No. RAM-XX-XX-DR-ME-100 illustrates the size and location of the ventilation openings (Louvres etc.) proposed for the ground floor. This incorporates the basement ventilation and ground floor commercial spaces.



Notes

GENERAL NOTES

- DO NOT SCALE FROM THIS DRAWING.
- ALL DIMENSIONS ARE MILLIMETRES U.N.O.
- ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM U.N.O.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.

SURFACE WATER LEGEND

— SLOT DRAIN

DRAINAGE LEGEND

○ SOIL STACK
● TENANT STUB STACK

GROUND FLOOR HEATING LEGEND

— OVERDOOR HEATER
— RADIATOR

RESTAURANT KITCHEN EXTRACT DUCT 1150x700 [MUST BE FIRE RATED!]

BLUE LINE REPRESENTS NEW CORE OUTLINE

FIRE-FIGHTING SHAFT FITTED WITH Ø560 DUTY AND STANDBY AXIAL FANS AND 1500MM PRE-ATTENUATOR

1100x600 FIRE RATED EXTRACT DUCT RUNS IN CEILING VOID

1100x600 EXTRACT LOUVRE IN FACADE

FOR DETAILS OF ACCESS CONTROL TO BASEMENT REFER TO RUK SECURITY STRATEGY DRAWINGS

EXHAUST LOUVRE TO VENTILATION SHAFT SERVING CAR PARK AND GENERATOR EXTRACT. LOUVRE SIZE 3700Hx 4000W @ 40% FREE AREA. SHAFT SIZE SERVING EXHAUST VENT AS EXISTING OPENINGS

ELECTRICITY CONNECTION FROM UTILITIES

2No. 5000H x 4250W ENCLOSURES FOR SUBSTATIONS WITH FULLY LOUVRED DOORS

OVERDOOR HEATER

3200H x 3200W EXHAUST LOUVRE TO VENTILATION SHAFT SERVING CAR PARK EXTRACT LOUVRE. SIZE BASED ON 40% FREE AREA. SHAFT SIZE SERVING EXHAUST VENT AS EXISTING OPENING

FIRE-FIGHTING SHAFT FITTED WITH Ø560 DUTY AND STANDBY AXIAL FANS AND 1500MM PRE-ATTENUATOR

1100x600 FIRE RATED EXTRACT DUCT RUNS IN CEILING VOID

Ø15 BCWS PIPE BRANCHES OFF MAIN TO SERVE CONCIERGE'S LODGE

LOUVRED BAND AT HIGH LEVEL IN FACADE; 450mm DEEP

1100x600 EXTRACT LOUVRE AT CEILING VOID LEVEL

LOUVRED BAND AT HIGH LEVEL IN FACADE; 450mm DEEP

1100x600 EXTRACT LOUVRE IN FACADE

WATER POINT SOMEWHERE IN THE BLUE AREA

OVERDOOR HEATER

SURFACE WATER SLOT DRAINS

OVERDOOR HEATER

LOCK

PRINCESS STREET

CANAL STREET

VENICE STREET

WHITWORTH STREET

SACKVILLE STREET

4945.31

5152.33

+39.643m

+39.050m

+38.950m

+38.497m

+37.741m

+38.056m

E=-17.2535
N=95.0168

E=32.7465
N=95.0168

E=82.7465
N=95.0168

E=-17.2535
N=95.0168

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E=82.7465
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P05	STAGE 3a ISSUE	31/10 2016	?	MB
P04	INTERIM STAGE 3a ISSUE	14/10 2016	SM	MB
P03	STAGE 3a ISSUE	18/12 2015	AD	MB
P02	PRELIMINARY ISSUE GAS, WATER & ELECTRICITY SUPPLIES ADDED	22/10 2015	AW MS	MB
P01	PRELIMINARY ISSUE	03/07 2015	AW SPM	MB
Rev	Description	Date	By Chk	App

STAGE 3A

**PRINCESS STREET
RESIDENTIAL PROJECT**

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**M&E SERVICES
WHOLE SITE
GROUND FLOOR AND
EXTERNAL ARRANGEMENTS**

Project No:	Scale (øA1):	Drawn:	Date:
1620000466	1:200	AD	26/06/15
Drawing No.:	Rev:		
RAM-XX-XX-DR-ME-100	P05		

5. APPENDIX B

5.1 Ventilation services design statement

- 5.1.1 The appended report describes the development of the ventilation strategy for the residential apartments. This document outlines the proposed strategy and defines how this is proposed to satisfy the requirements of the building regulations to provide adequate ventilation to each apartment.

Intended for
Building Control

Document type
Report

Date
July, 2017

PRINCESS STREET RESIDENTIAL DEVELOPMENT VENTILATION SERVICES DESIGN STATEMENT

PRINCESS STREET RESIDENTIAL DEVELOPMENT VENTILATION SERVICES DESIGN STATEMENT

Revision **A**
Date **17/07/2017**
Made by **SP**
Checked by **SM**
Approved by **SPM**

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2.	PREVIOUS SYSTEM	2
3.	PROPOSED SYSTEM	3
4.	CONCLUSION	6

Revision History

Revision	Date	Purpose / Status	Document Ref.	Comments
-	11/10/2016	Stage 3	1620000466-RUK-DOC-M-100B	Stage 3 redesign
A	17/07/2017	Stage 4	1620000466-RUK-DOC-M-100B	Additional explanation for purge vent added

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Approved By

**Simon Mackenzie**

Associate

1. INTRODUCTION

Ramboll have been commissioned to complete a re-design of the Stage 2/3 services strategy for Princess Street Residential Development. The re-design is to review the ventilation design with respect to achieving the SAP thermal comfort criteria.

This report looks at the changes to the proposed Ventilation system. The previous scheme was designed to include a 2 speed Mechanical Ventilation with Heat Recovery (MVHR) unit with acoustic attenuators, as well as a separate extract boost system. The new proposal includes a high performing 6 speed MVHR unit, simplifying the system to a single ventilation unit has also resulted in fewer attenuators. This solution delivers an affordable option both in terms of purchase of the equipment, installation and running costs for the home owner/tenant while still complying with the requirements in term of noise attenuation and overheating requirements.

2. PREVIOUS SYSTEM

The initial system proposed in order to serve the residential apartments was a combination of natural and mechanical ventilation. Mechanical ventilation was being used to supply air into the occupied rooms and for the extraction of stale air through the wet rooms/sanitary accommodation. The design relied on air being supplied and exhausted via the façade through louvres/airbricks.

The system complied with the SAP overheating requirements and a study undertaken by Ramboll demonstrated that the naturally ventilated solution with mechanical supply and extract was capable of achieving compliance for air quality and overheating criteria.

However, the acoustic requirements, due to the building location were that natural ventilation for control of overheating was not acceptable. The initial solution was to incorporate mechanical supply and extract ventilation with heat recovery (MVHR), including attenuators (or acoustically lined plenum boxes) in the inlet and exhaust ducts for noise control, therefore removing the reliance on natural ventilation.

This mechanical system was designed with a 2 speed MVHR. The air was supplied to the living room and bedrooms, and extracted through the kitchen and bathrooms. For the purpose of overheating risk control, a purge ventilation system using an additional fan and extra air supply diffusers in the bedrooms to reach 4 ACH^{-1} had been included.

However, this solution required the use of non-standard ductwork, additional openings in the façade and the extra cost of an additional extract fan, motorised dampers and controls which would be undesirable to both the developer and home owner. This also required maintenance access over bedrooms and living spaces. Additionally, further calculation indicated that 4 ACH^{-1} was unachievable with the current system and window openings couldn't be considered an adaptive measure due to the important noise disruption coming from the site surroundings.

As this option does not appear to be an appropriate solution an alternative is now being proposed as explained in the next section of this report.

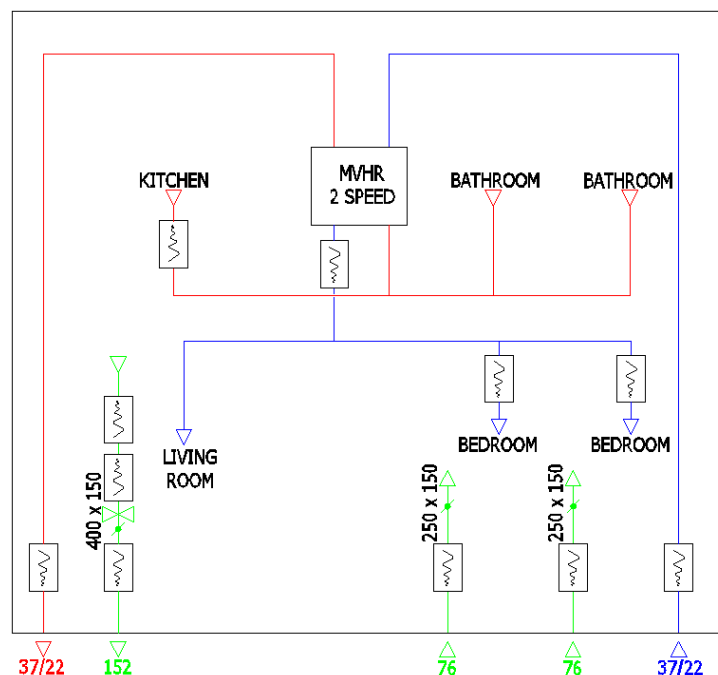


Figure 1 - Previous Ventilation System

3. PROPOSED SYSTEM

The proposed system for the Princess Street residential development is now a mechanical ventilation system with a 6 speed MVHR unit including summer bypass, complete with acoustic attenuators to control noise.

The concept is relatively similar to the previous system but has been simplified. The air in the apartments supplied through the living room and the bedrooms with extract via the kitchen and the bathrooms. This solution uses a more efficient MVHR unit which can provide a ventilation rate up to 2 ACH⁻¹. While this does not mechanically achieve the Building Regulations Part F requirement of 4 ACH⁻¹ for purge ventilation, it can be shown to satisfy the overheating criteria of Part L. Ramboll have completed a study of the ventilation proposal through SAP analysis, this shows that the system complies with the Overheating criteria for each apartment, demonstrating the viability of this system. The worst case apartments achieve a medium overheating risk, which is still compliant under SAP.

Although providing 4 ACH⁻¹ is not achievable via mechanical ventilation, additional ventilation can be provided via opening windows. Part F of the Building Regulations has specific requirements for natural purge ventilation. These requirements outline the window opening types and the necessary window opening area in m², given as a ratio of the dwelling floor area. The table below details the necessary rates and opening types needed to achieve Part F 4ACH⁻¹ and our interpolated figures to achieve 2ACH⁻¹.

The interpolated figures, to provide a ventilation rate of 2ACH⁻¹ through opening windows, has been based on the rationale that area, velocity and volume flow rate are all proportional. For a given area of opening, a given volume flow rate will pass thorough the opening at a relative velocity. Reducing the area of the opening, while maintaining the velocity will reduce the volume flow of air proportionally. This can be demonstrated by example:

Open area = 0.5m²

Required volume = 0.95m³/s

Calculated velocity =V, where:

$$V = \frac{\text{air vol (m3/s)}}{\text{area (m2)}} \quad V = \frac{0.95}{0.5}$$

Velocity = 1.9

If the open area is then halved, but the velocity is to remain the same at 1.9m/s, the resultant air volume can be calculated by transposing the above formula:

$$\text{Air Volume (m3/s)} = \text{Velocity (m/s)} \times \text{Area(m2)}$$

$$\text{Air Volume (m3/s)} = 1.9 \times 0.25$$

$$\text{Resultant Air Volume} = 0.475\text{m}^3/\text{s}$$

In the table below, the open area at 2ACH⁻¹ has been halved relative to the open area at 4ACH⁻¹. Following the example above, if the velocity remains the same in both circumstances, the air flow will also halve as has been demonstrated. Therefore it is reasonable to interpolate the figures in the table demonstrating that the requisite flow rate can be achieved by a combination of mechanical and natural ventilation.

Window Type/Opening	Part F Requirements for 4ACH ⁻¹	Requirements for 2 ACH ⁻¹
Hinged/Pivot Window opens 30° or more	Window Opening Area (H x W) = 1/20 th of floor area	Window Opening Area (H x W) = 1/40 th of floor area
Hinged/Pivot Window opens 15° - 30°	Window Opening Area (H x W) = 1/10 th of floor area	Window Opening Area (H x W) = 1/20 th of floor area
Any window type that opens less than 15°	Not suitable for purge ventilation	Not suitable for purge ventilation

Figures from Appendix B of Building Regulation Part F

The current architectural plans show windows that are sufficient in type and area to achieve a natural ventilation rate equivalent to 2ACH⁻¹, in line with the specification identified in the above table. This is in addition to the mechanical ventilation, which can be run continually and increased to boost mode to provide a further 2ACH⁻¹. This is considered to be enough for daytime purging in order to dissipate odours and other contaminants by providing a total of 4ACH⁻¹ when the windows are open and the mechanical ventilation is running in boost.

SAP analysis has confirmed that a mechanical ventilation rate of 2ACH⁻¹ is sufficient to eliminate overheating risks within the apartments. This can be run with the windows closed which is a requirement identified by the Environmental Health Officer for night time ventilation, due to the close proximity to the adjacent clubs and bars of Canal Street.

Each apartment type will have the same MVHR unit to achieve 2 ACH⁻¹ but the number of attenuators in each apartment is different to account for the different number of rooms to supply.

Apartment type	MVHR Unit	Acoustic attenuation
1 bed apartment	VENT-AXIA Sentinel Kinetic Advance S	8 Caice house attenuators
2 bed apartment		9 Caice house attenuators
3 bed apartment		10 Caice house attenuators

The advantages of this proposed system are multiple:

- The maintenance access will be limited to the utility room, access hatches can be omitted.
- The presence of only two ventilation connections to the external wall reduces the acoustic compromise to the façade.
- The removal of direct duct connection from the exterior to the living spaces, eliminating any possibility of thermal discomfort.
- The use of standard ductwork and fewer acoustic attenuators.
- An easier coordination and installation of the full system.
- Reduced operating costs by omission of secondary fan.

Ramboll have completed a SAP analysis to understand the performance of the design at RIBA stage 3a and have concluded that the scheme is compliant under SAP 2012 regulations.

The proposed ventilation system is displayed below in figure 2.

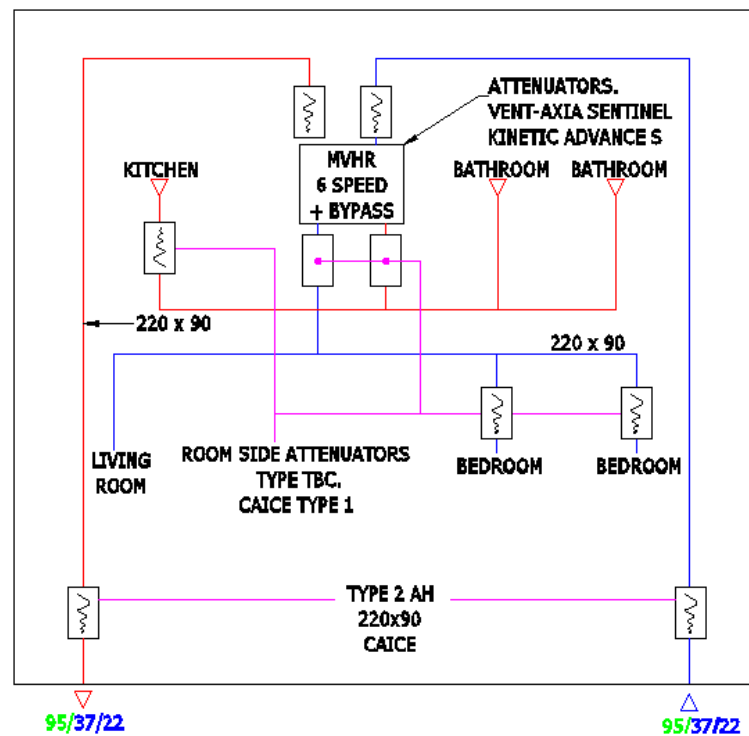


Figure 2 - Proposed Ventilation System

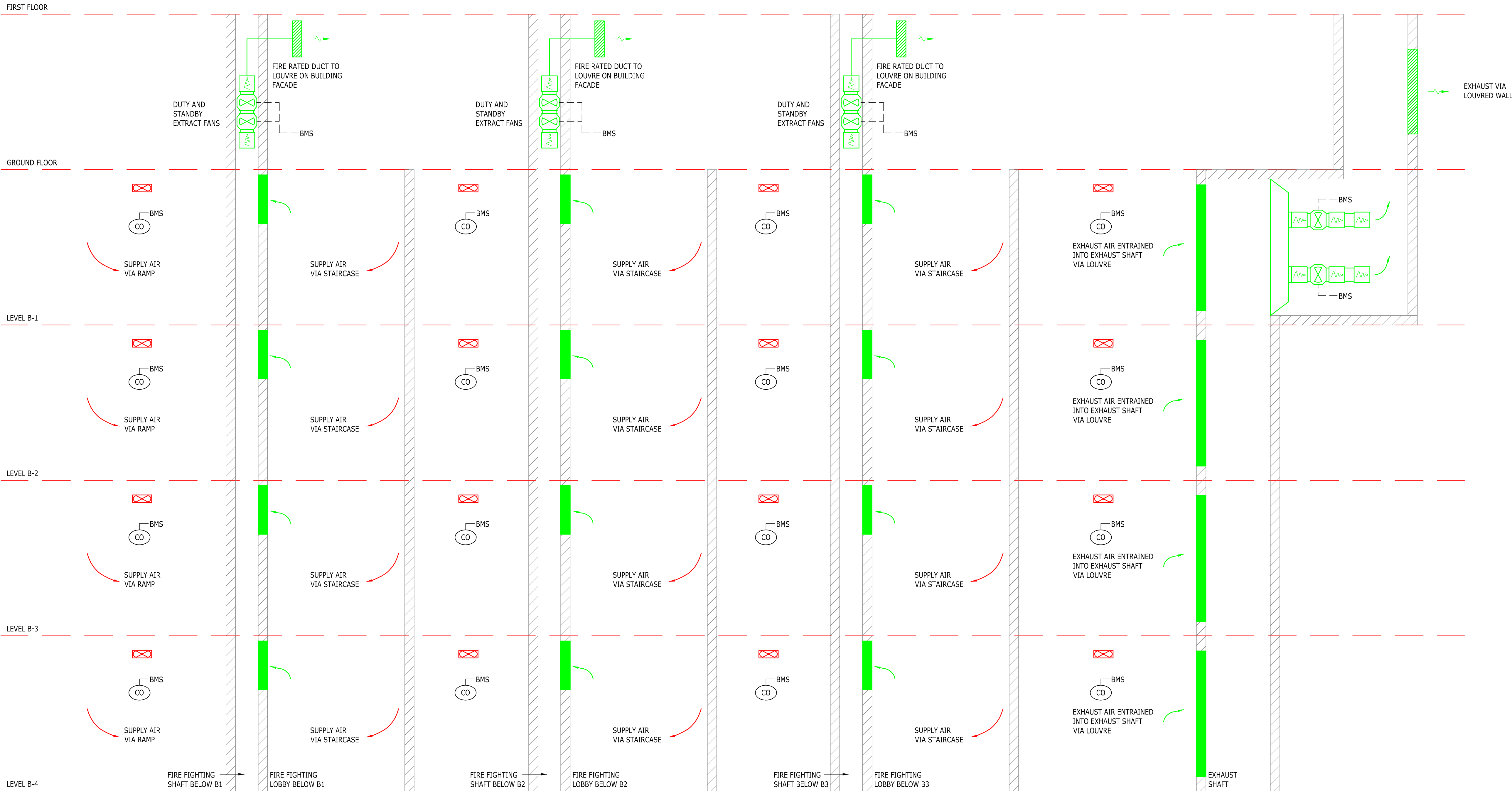
4. CONCLUSION

This report has outlined the issues with the previously proposed MVHR system and the reasons why it is no longer viable. The compliance with the overheating criteria demonstrated the viability of the newly proposed system and the resulting benefits.

6. APPENDIX C

6.1 Basement Ventilation Schematic

- 6.1.1 The attached drawing No. RAM-XX-XX-SK-M-550 illustrates the strategy for basement mechanical extract. This shows the extract proposed for each firefighting lobby, and also the main basement extract for removal of vehicle fumes and smoke extract in the event of a fire.



Notes

GENERAL NOTES

- DO NOT SCALE FROM THIS DRAWING.
- ALL DIMENSIONS ARE MILLIMETRES U.N.O.
- ALL LEVELS ARE IN METRES ABOVE ORDINANCE DATUM U.N.O.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.

VENTILATION LEGEND - BASEMENT

- EXHAUST DUCTWORK
- LOUVRE
- EXTRACT FAN
- MOTORISED SMOKE DAMPER
- CAR PARK AIR / SMOKE ENTRAINED INTO EXTRACT SHAFT THROUGH LOUVRE
- ATTENUATOR
- IMPULSE FAN
- BMS
- CARBON MONOXIDE SENSOR WITH BMS LINK

NOTE:
MAIN BASEMENT EXTRACT FANS ARE INVERTER DRIVEN TO OFFER SET BACK EXTRACT RATE AT 3ACH, NORMAL OPERATION AT 6ACH, FIRE CONDITION AT 10ACH. ALL FANS LINKED TO CENTRAL CONTROLLER PROVIDED AS PART OF THE SMOKE/ CO VENTILATION PACKAGE. FANS TO OPERATE AT 3ACH WHEN CO CONCENTRATION IS BELOW 35PPM, INCREASING TO 6ACH ABOVE THIS VALUE ON THE AFFECTED FLOOR. IN THE CASE OF A FIRE ONLY THE AFFECTED FLOOR IS ACTIVE, MOTORISED DAMPERS ISOLATE ALL OTHER FLOORS, FANS PROVIDE 10ACH EXTRACT ON 'FIRE FLOOR'. BASEMENT EXTRACT SYSTEMS ALL LINKED TO FIRE ALARM INSTALLATION. REFER TO RUK SPECIFICATION FOR FURTHER DETAILS.

P04	STAGE 3a ISSUE	31/10/2016	?	SPM	MB
P03	INTERIM STAGE 3a ISSUE	14/10/2016	SM	SPM	MB
P02	STAGE 3a ISSUE	18/12/2015	AD	SPM	MB
P01	PRELIMINARY ISSUE	03/07/2015	AD	SPM	MB
Rev	Description	Date	By	App	
			Chk		

STAGE 3A

PRINCESS STREET
RESIDENTIAL PROJECT

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MECHANICAL SERVICES
VENTILATION SCHEMATIC
BASEMENT

Project No:	Scale (@A1):	Drawn:	Date:
1620000466	N.T.S.	AD	25/06/15
Drawing No.:	Rev:		
RAM-XX-XX-SK-M-550	P04		

7. APPENDIX D

7.1 Smoke Control Ventilation Performance Specification

- 7.1.1 The smoke control ventilation systems to be installed to service the development at Princess Street/ Whitworth Street shall comply with the following performance specification:

7.2 Smoke Control Ventilation

- 7.2.1 The smoke ventilation system shall be designed to meet the fire strategy and fire officers' requirement.
- 7.2.2 Smoke ventilation to the communal corridors shall be via a naturally ventilated smoke shaft at each protected stair. The top of the shaft shall be fitted with an automatic opening air vent linked to the fire alarm installation.
- 7.2.3 Smoke ventilation to the protected lobbies at the basement levels will be via a mechanical extract system. The design of the smoke ventilation system will be by the Specialist as part of the CFD Elements.
- 7.2.4 The specialist smoke system (designed, installed, tested, commissioned by Colt or Equal or Approved) shall be designed to provide ventilation in accordance with Approved document B: 2006 (ADB) for the ventilation of common corridors and escape stairs in residential buildings. The system shall be designed such that it continually flushes through the corridor, limiting any build-up of smoke and protecting the stairs from smoke entry. The proposal will be designed to move air away from the stairs and avoid pockets of potentially stagnant smoke.
- 7.2.5 The strategy will be achieved via Mechanical means using a ventilation duct serving each floor with the makeup air via the head of Stair open door.
- 7.2.6 The system shall comprise (but not limited) of the following:
- Run & Standby smoke fans
 - Lobby Ventilators to each level served by the shaft
 - Adjustable door closers
 - Fan control panel
 - Head of stairwell ventilator
 - Fire fighter override switches
 - Control Panel
 - Manual call points
- 7.2.7 The shafts passing through the building must be smooth internally and well-sealed. The maximum permissible leakage for the shaft is 3.8m³/hr/sqm at 50Pa.

7.3 Car Park ventilation

- 7.3.1 The basement car park shall be provided with ventilation for general purposes and also smoke control ventilation to meet the Approved document B guidelines and BS 7346 Part 7:2013
- 7.3.2 The basement shall be ventilated via mechanical means using extract fans mounted at level -1 in the car park with make-up air provided via the entrance opening at the main gate. The main extract system should be designed to run in at least two parts, such that the total exhaust capacity does not fall below 50% of the rates prescribed below (Paragraph 7.3.3), in the event of failure of any one part the fault or failure in one will not jeopardize the others.
- 7.3.3 Under normal operation general ventilation shall be via mechanical means. The CO monitoring is to run the system at a lower flow rate, providing 3 ACH under normal circumstances, with the system only going to 6 ACH if the CO detection system detects higher CO levels typically above 35 ppm (parts per million). During smoke conditions the ventilation rate shall increase to 10ACH on the affected floor. The ventilation arrangement would be designed and installed by the contractor to ensure that the concentration of carbon does not exceed 35ppm average over an eight hour period and peak concentration next to entry and exit points not exceeding 90ppm over a 15mins period.
- 7.3.4 The inlet provision for the car park ventilation is via the main entrance ramp which will be fitted with an open lattice shutter. A number of impulse fans are to be located as indicated on the drawings to move the air around the car park to be extracted via the main extract fans.
- 7.3.5 The smoke specialist shall ensure that where necessary a CFD model for the car park is undertaken to validate the proposal and ensure that the proposal will meet the building control officers requirements.

7.4 Smoke extract and control systems

7.4.1 System outline

7.4.1.1 110 - Smoke and heat exhaust ventilation system

- 7.4.1.1.1 Description: Refer to the general description section above.
- 7.4.1.1.2 System performance: Design of smoke and heat exhaust control systems;
- Activation of the systems;
 - Integration with fire alarm systems;
 - and Interaction with fire suppression systems.
- 7.4.1.1.3 Duct: Builder's work shaft;
- Fire resisting ductwork and fittings;
 - and Smoke extract ductwork.
- 7.4.1.1.4 Fans:
- Extract: Smoke extract fans.
- 7.4.1.1.5 External exhaust terminals: Aluminium louvre panel units.

7.4.1.2 Controls:

- Control panel: Smoke and heat exhaust control panels.
- Activation: Signal from smoke detection system.
- Strategy: Smoke and heat control system, extract position control.
- Fan control: Normal ventilation/ Emergency control starter.
- Auxiliary power: Standby generator or secondary power supply.
- Control wiring: Heat resistant.

7.4.1.2.1 Identification of ductwork and equipment: Identifying ductwork and Mechanical plant and equipment identification labels generally.

7.4.1.2.2 Execution: Installing smoke and heat exhaust ventilation systems and Installing smoke and heat exhaust control panels.

7.4.1.2.3 System completion: Testing;

- Commissioning of air distribution systems;
- Inspection and test records;
- Demonstrations;
- Documentation;
- Spares and consumables;
- and Maintenance.

7.4.2 System performance

7.4.2.1 210 - Design of smoke and heat exhaust control systems

7.4.2.1.1 Design: Complete the design of the smoke and heat exhaust ventilation system.

7.4.2.1.2 Requirement: Submit proposals including detailed design drawings, technical information, calculations and manufacturers' literature.

7.4.2.2 250 - Activation of the systems

7.4.2.2.1 Operation:

- Means of escape: Smoke alarm in accordance with BS 5839-1.
- Firefighting provision: Fire detection system in accordance with BS 5839-1.

7.4.2.3 260 - Integration with fire alarm systems

7.4.2.3.1 Objectives: Automatically triggered by smoke or fire detection system.

7.4.2.3.2 Standard: To BS 5839-1.

7.4.2.3.3 Operation: Locate fire according to different zones to allow the SHEV to respond appropriately.

7.4.2.4 270 - Interaction with fire suppression systems

7.4.2.4.1 Standard: To BS 7346-4, appendix K.

7.4.3 Execution

7.4.3.1 620 - Installing smoke and heat exhaust ventilation systems

7.4.3.1.1 Standard: In accordance with BS 7346-4.

7.4.3.2 640 - Installing smoke and heat exhaust control panels

7.4.3.2.1 Position: Main entrance.

7.4.3.2.2 Connection to sensors: Required.

7.4.4 System completion

7.4.4.1 810 - Testing

7.4.4.1.1 Acceptance testing: In accordance with BS EN 12101-6.

7.4.4.2 820 - Commissioning of air distribution systems

7.4.4.2.1 Pre-commissioning: In accordance with BSRIA BG 49/2015 and CIBSE Commissioning code A.

7.4.4.2.2 Commissioning: In accordance with BSRIA BG 49/2015 and CIBSE Commissioning Code A.

7.4.4.3 830 - Inspection and test records

7.4.4.3.1 Reports: Submit proposals.

7.4.4.3.2 Record sheets:

- Submission: On completion.

7.4.4.4 840 - Demonstrations

7.4.4.4.1 Running of plant:

- Operation: Run, maintain and supervise the installations under normal working conditions.
- Duration: Submit proposals.

7.4.4.4.2 Instruction: Instruct and demonstrate the purpose, function and operation of the installations.

7.4.4.5 850 - Documentation

7.4.4.5.1 Operating and maintenance instructions:

- Scope: Submit for the system as a whole giving optimum settings for controls.
- Product information: Include product description, date of purchase, performance characteristics,



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- application (suitability for use), method of operation and control, and cleaning and maintenance requirements.
- Format: Paper copy.

7.4.4.5.2 Record drawings:

- Content: Location and arrangement of plant in plant rooms; Location, size and route of ductwork; Location and identification of regulating dampers and fire dampers; and Location of outlets.
- Format: A1 paper print and Electronic.

7.4.4.5.3 Submittal date: At handover.

7.4.4.6 860 - Spares and consumables

7.4.4.6.1 Detectors: Supply two of each type.

7.4.4.7 870 - Maintenance

7.4.4.7.1 Servicing and maintenance: Undertake for 12 months after completion.