



The Prudential Assurance Company Limited.

Brazennose House

Ventilation Strategy – Planning Statement

Job No: 1008534

Doc No: 1008534-RPT- 13

Latest Revision: B

Date: 29/03/2016

Project name	Brazennose House	Job Number
Report Name	Ventilation Strategy – Planning Statement	1008534

Document Revision History

Revision Ref	Issue Date	Purpose of issue / description of revision
-	15/12/2015	Draft
A	08/02/2016	Issue for Information
B	29/03/2016	Planning Submission Issue – Applicant name change as Deloitte comments

Document Validation (latest issue)

Revision B	Issue Date 29/03/2016	Purpose of issue / description of revision / version			
		For information			
			Prepared by	Checked by	Verified by
		Initials	AB / KK		
		Signature			

© This report is the copyright of Cundall Johnston & Partners LLP. It has been prepared for the sole and confidential use of The Prudential Assurance Company Limited and cannot be reproduced in whole or in part or relied upon or used by any third party without the express written authorisation of Cundall Johnston & Partners LLP. If any third party whatsoever comes into possession of this report, they rely on it at their own risk and Cundall accepts no duty or responsibility (including in negligence) to any such third party.

1. Ventilation

1.1 Introduction

This report describes the ventilation strategy for the Brazennose House development.

1.2 Ground Floor – Active Use / Retail

As part of 'Shell and core' fit out louvres will be provided in the facade of the ground floor for air supply and exhaust from the future active use / retail units. It will be the tenant responsibility to provide a mechanical supply and extract ventilation system to serve their own demise to meet occupant / type of use requirements. All the ventilation plant will be either floor mounted or located at high level / ceiling void within each unit.

Make up supply air will be provided by the tenant system via intake louvers on the south, east and west facades. Exhaust air from all units will be provided as required to suit the type of tenancy (toilet exhaust, general exhaust and kitchen exhaust) and discharge on the north elevation. For louver location refer to the architectural elevation drawings.

Any future kitchens installed by tenants will be ventilated via independent extract fans, interlocked with the gas safety system. There will be no mixing of kitchen supply and exhaust air. The tenancy agreement will require odour control to be provided to prevent odour nuisance. The scoring methodology from DEFRA 2005 'Guidance of the Control of Odour and Noise from Commercial Kitchen Exhaust Systems' will be used as a means of determining odour control requirements. Appropriate technologies may include electrostatic precipitators, ultra violet treatment, carbon filtration or a combination of these.

Where the active ground floor uses fall within Use Classes A3 then the above works shall be submitted for approval by the local planning authority.

1.3 Levels 1 to 6 – Offices

A mechanical supply and extract ventilation system will serve the office floors. A central air handling system will provide fresh air to two tenancy zones on each floor. The Air Handling Units (AHUs) will be at roof level with intake and exhausts separated by at least 10m and intakes will be at least 20m from sources of external pollution.

The building has been designed to provide fresh air and minimise internal pollutants (and ingress of external polluted air into the building) in accordance with the criteria of the relevant standard for ventilation in CIBSE and BCO. Fresh air supply to office spaces will be fixed volume based on occupancy with time extension override per zone per floor.

The toilets on levels 1 to 6 will have an exhaust system. Exhaust from these toilets is via service risers with exhaust at roof level at least 10m distance from any air intakes. Toilet ventilation will be on a fixed time basis during core hours, with demand based ventilation during out of hours use.

1.4 Impact on Local Air Quality

No adverse impact on local air quality at operational stage are expected from the construction of the development. The operation of the office building will not give rise to long-term residual effects on air quality in accordance with the Environmental Statements findings.

2. Air Pollutants

Air pollutants that are commonly found within buildings that an IAQ plan would be typically address (where applicable) include:

- 1) Particulates including vehicle emissions, pollen, dust.
- 2) Volatile organic compounds (VOCs).
- 3) Formaldehyde.
- 4) Gaseous oxides such as CO, CO₂, NO_x, SO₂ and O₃.
- 5) Airborne bacteria and micro-organisms and their spores.
- 6) Airborne inorganic substances such as metal fumes ,ammonia, chlorine, radon.
- 7) Unpleasant odours.

3. Removal of Contaminant Sources

Construction activities as well as building operational process can affect the indoor air quality (IAQ) of a building. Therefore this IAQ plan looks at ways to design out and manage this process during construction and post occupancy. It also has design guidelines to inform the ventilation strategy of the offices.

3.1 During Design Stage

- 1) The implication of building location and development configuration.
- 2) Reducing outdoor air pollutants ingress through consideration of building form, layout and permeability of the building envelope.
- 3) Locating the air intakes away from sources of external pollution, such as car parks and delivery/vehicle waiting areas.
- 4) Selection of construction materials and finishes with low air quality impact.
- 5) Protection of HVAC equipment and ductwork from dust and other pollutants during installation and when in the vicinity of other construction/installation works.
- 6) Checking and cleaning ventilation systems and ductwork prior to or during commissioning, so that pollutants are not released in to the building.
- 7) Practical procedures and checks to ensure that the above outcomes are achieved and documented.

3.2 During Construction

- 1) During construction, temporary protective dust curtains must be used to isolate the work area from other clean spaces and prevent dust and odours from escaping.
- 2) Walk-off mats for workers should be provided to prevent tracking dust and contaminants from the construction area.
- 3) Stored porous or fibrous materials such as carpets must be protected from absorbing moisture and VOCs until installed.
- 4) Dust should be cleaned up immediately following construction activity. Safe, low-toxic cleaning supplied must be used for surfaces, equipment and worker's personal use.
- 5) Keep containers closed when not in use.
- 6) Use wet sanding for gypsum board assemblies. Allow dry sanding only if dust protection is provided.

3.3 During Operation

Maintaining good indoor air quality requires attention to the building's heating, ventilation, and air conditioning (HVAC) system; the design and layout of the space; and pollutant source management. The ventilation systems should be designed to minimise the amounts of external air pollution entering the occupied spaces.

External sources of pollution can come from road traffic, industrial process, ventilation exhaust discharges from buildings and construction process. Therefore the design team will make sure that:

- 1) The building will be designed to provide fresh air and minimise internal pollutants (and ingress of external polluted air into the building) in accordance with the criteria of the relevant CIBSE recommended standard for ventilation.
- 2) Meeting rooms which are subject to large and unpredictable or variable occupancy patterns will have CO₂ sensors specified (by Tenant) and:
 - a. In mechanically ventilated spaces, the sensor(s) will be linked to the mechanical ventilation system and provide demand-controlled ventilation to the space.
 - b. In naturally ventilated spaces – Not applicable as windows are not openable.

HVAC systems can even act as sources of pollutants in some cases, such as when ventilation air filters become contaminated with dirt and/or moisture and when microbial growth results from stagnant water in drip pans or from uncontrolled moisture inside of air ducts. Because of the HVAC system's importance, diligent maintenance of HVAC equipment is essential for the adequate delivery and quality of building air. All well-run buildings have preventive maintenance programs that help ensure the proper functioning of HVAC systems.

4. Dilution and Control of Contaminant Sources

The main contractor will appoint at the beginning of the works a suitable qualified person to monitor and enforce the following good practices measures:

4.1 Protect Ventilation Systems

All air handling equipment, ductwork and products shall be stored off site until needed for immediate installation where feasible and will be protected from contaminants (dust, vapours, moisture, etc.) at all times.

During construction, air supply and return ductworks must be sealed off to protect the ventilation system components from contamination, OR the ductwork and ventilation components have to be thoroughly cleaned prior to occupancy.

HVAC systems shall generally not be utilised until all major construction work is completed and commissioning phase is to begin. It is understood that units might need to be used on a temporary basis to condition buildings for finishing installation. In those cases, proper filtration and maintenance of filtration will be implemented while in temporary use as described herein. As an alternative, temporary heat and ventilation during major construction may be used in lieu of the HVAC system.

During installation of carpet, primer, paints, adhesives, furnishings, and other VOC-emitting products, provide supplemental ventilation for at least 72 hours after work is completed.

Preferred HVAC system operation is supply air only; with exhaust provided through windows. Use exhaust fans to pull exhaust air from deep interior locations. Stair towers and other paths to exterior can be useful during this process.

4.2 Regular Inspection and Maintenance

The main contractor will conduct regular inspection and maintenance of indoor air quality measures including ventilation system protection, and ventilation rate.

Ducts, grills and vents will be periodically inspected. If ducts become contaminated due to inadequate protection, ducts to be cleaned professionally in accordance with NADCA (National Air Duct Cleaning Association) standards.

Photographs will be taken demonstrating measures taken.

Use safety meetings, signage, and subcontractor agreements to communicate the goals of the indoor air quality construction plan.

4.3 Procedures For Pre-Occupancy Flush Out

Once the construction activities are completed and all the finishes have been installed, the building will be cleaned completely. New filters will be fitted to all HVAC systems and then a full flush-out for three days at 100% outside air will be conducted, after construction ends and prior to occupancy.

4.4 3rd Party Testing And Analysis

The main contractor will arrange for indoor air quality testing analysis to be conducted after completion of works, prior to occupancy using recognised testing methods for different air pollutants in accordance with the relevant standards, to provide impartial and objective measurement results which record levels of air pollutions in the newly constructed building:

- 1) Formaldehyde concentration level measured post construction (but pre-occupancy) has to be less than or equal to 100µg/m³ averaged over 30 minutes (WHO guidelines, source WHO guidelines for indoor air quality selected pollutants, World health Organisation, 2010).
- 2) The total volatile organic compound (TVOC) concentration level measured post construction (but pre-occupancy) has to be less than 300µg/m³ over 8 hours, in line with the Building Regulation requirements.
- 3) Where levels are found to exceed these limits, measures will have to be undertaken to reduce the TVOC and formaldehyde levels to within the above limits.
- 4) The testing and measurement of the above pollutants should be in accordance with the following standards where relevant:
 - a. BS EN ISO 16000-4: 2004 Diffusive sampling of formaldehyde in air
 - b. EN ISO 16000-6 VOCs in air by active sampling
 - c. BS EN 16017-2: 2003 VOCs - Indoor, ambient and workplace air by diffusive sampling
 - d. BS EN ISO 16000-3: 2011 - Formaldehyde and other carbonyls in air by active sampling.

All standards outlined in Table 18 (Appendix A) are standards recognised across Europe and internationally for VOCs content and testing. In instances where a product is not assessed against the listed European or International standard, it is acceptable to use an alternative, nationally recognised standard provided the following is met as a minimum:

- a. The performance level requirements required by an alternative standard are equivalent to or better than those specified in Table-18. For example, if a material containing formaldehyde has been added to the floor covering product as part of the production process, then the E1 emission measured for formaldehyde must be less than 0.124mg/m³ (as required by EN 14041:2004).
 - b. Where an alternative standard omits evaluation of a particular material, it is only acceptable to use the alternative standard in instances where the product does not contain that particular material.
- 5) The measured concentration levels of formaldehyde (µg/m³) and TVOC (µg/m³) will be reported via the BREEAM scoring and reporting tool.

4.5 Maintaining Indoor Air Quality In-Use

Dissemination of relevant information to the building occupier, via a Building User Guide, regarding operating and managing the building to maintain suitable IAQ. This may include:

- i. Recommendations for establishing policies and procedures for minimising the use of VOC/Formaldehyde emitting materials or substances within the building throughout operation
- ii. Recommendations for establishing policies and procedures for carrying out regular cleaning of the building interior to prevent collection of dust and other pollutants
- iii. Recommendations for establishing policies and procedures for carrying out maintenance of ventilation plant. This can include replacing filters at regular intervals in addition to clean of heating/cooling coil surfaces and ductwork

5. Appendix A- BREEAM VOC Criteria

Table - 18: VOC criteria by product type

Ref	Product	Requirements
A	Paints and varnishes	
	Performance requirements	VOC content limit
	Compliant performance standard	EU Directive 2004/42/CE ('Paints Directive')
	Compliant testing standard	BS EN ISO 11890-2:2013 – Paints and varnishes – Determination of VOC content, Part 2 – Gas Chromatographic method
	Manufacturer also to confirm	Paint to be fungal and algal resistant in wet areas e.g. bathrooms, kitchens, utility rooms

Ref	Product	Requirements
B	Wood panels (including particle board, fibreboard including MDF, OSB, cement bonded particle board, plywood, solid wood panel and acoustic board)	
	Option 1	
	Performance requirements	Formaldehyde E1 class
	Compliant performance standard	BS EN 13986:2004 Wood-based panels for use in construction - Characteristics evaluation of conformity and marking
	Compliant testing standard(s)	In accordance with Annex B of BS EN 13986:2004
	Manufacturer also to confirm	The absence of prohibited wood preservatives/biocides.
	Option 2	
	Performance requirements	Formaldehyde level of 0.1 mg/m ³
	Compliant testing standard(s)	1. BS EN ISO 16000-9:2006 Indoor air - Part 9: Determination of the emission of volatile organic compounds from building products and furnishing - Emission test chamber method. OR 2. Standard method for the testing and evaluation of volatile organic chemical emissions from indoor sources using environmental chambers, version 1.1 - Emission testing method for California Specification 01350, Californian Department for Public Health, 2010. Note: For either method the resultant emission/surface area obtained from the chamber test method must be extrapolated to predict what the emissions would be in a theoretical model room (as detailed in the standard) and this extrapolated emission rate compared with the required formaldehyde level of 0.1 mg/m³.
	Manufacturer also to confirm	The absence of prohibited wood preservatives/biocides.

Ref	Product	Requirements
C	Timber structures (e.g. glue laminated timber)	
	Option 1	
	Performance requirements	Formaldehyde E1 Class
	Compliant performance standards	BS EN 14080:2005 Timber structures - Glues laminated timber - Requirements
	Compliant testing standards	In accordance with Annex B of BS EN 13986:2004
	Option 2	
	Performance requirements	As category B Option 2.
	Compliant testing standards	As category B Option 2.
D	Wood flooring (e.g. parquet)	
	Option 1	
	Performance requirements	Formaldehyde E1 Class
	Compliant performance standard	BS EN 14342:2005+A1:2008 Wood flooring - Characteristics, evaluation of conformity and marking
	Compliant testing standards	In accordance with Annex B of BS EN 13986:2004
	Option 2	
	Performance requirements	As category B Option 2.
	Compliant testing standards	As category B Option 2.

Ref	Product	Requirements
E	Resilient textile and laminated floor coverings (e.g. vinyl, linoleum, cork, rubber, carpet, laminated wood flooring)	
	Option 1	
	Performance requirements	Option 1 - Formaldehyde E1 Class
	Compliant performance standard	BS EN 14041:2006 Resilient, textile and laminate floor coverings - Essential characteristics
	Compliant testing standards	In accordance with Annex B of BS EN 13986:2004
	Option 2	
	Performance requirements	As category B Option 2.
	Compliant testing standards	As category B Option 2.
F	Suspended ceiling tiles	
	Option 1	
	Performance requirements	Formaldehyde E1 Class
	Compliant performance standard	BS EN 13964:2004+A1:2006 Suspended ceilings - Requirements and test methods
	Compliant testing standards	In accordance with Annex B of BS EN 13986:2004
	Option 2	
	Performance requirements	As category B Option 2.
	Compliant testing standards	As category B Option 2.

Ref	Product	Requirements
G	Flooring adhesives	
	Performance requirements	Carcinogenic or sensitising volatile substances are substantially absent
	Compliant performance standard	BS EN 13999-1:2013 Adhesives - Short term method for measuring the emission properties of low-solvent or solvent-free adhesives after application - Part 1: General procedure
	Compliant testing standard	1. BS EN 13999-1:2013 Adhesives - Short term method for measuring the emission properties of low-solvent or solvent-free adhesives after application - Part 1: General procedure 2. BS EN 13999-2:2013 Adhesives - Short term method for measuring the emission properties of low-solvent or solvent-free adhesives after application - Part 2: Determination of volatile organic compounds 3. BS EN 13999-3:2007+A1:2009 Adhesives - Short term method for measuring the emission properties of low-solvent or solvent-free adhesives after application - Part 3: Determination of volatile aldehydes 4. BS EN 13999-4:2007+A1:2009 Adhesives - Short term method for measuring the emission properties of low-solvent or solvent-free adhesives after application - Part 4: Determination of volatile diisocyanates
H	Wall coverings	
	Performance requirements	— Vinyl chloride monomer (VCM) content — Formaldehyde level — Migration of heavy metals
	Compliant performance standard	1. BS EN 233:1999 Wallcoverings in roll form - Specification for finished wallpapers, wall vinyls and plastic wall coverings 2. BS EN 234:1997 Wallcoverings in roll form - Specification for wallcoverings for subsequent decoration 3. BS EN 259-1:2001 Wallcoverings in roll form - Heavy duty wallcoverings - Part 1: Specifications
	Compliant testing standard	BS EN 12149:1998 – Wall coverings in roll form. Determination of migration of heavy metals and certain other elements, of vinyl chloride monomer and of formaldehyde release