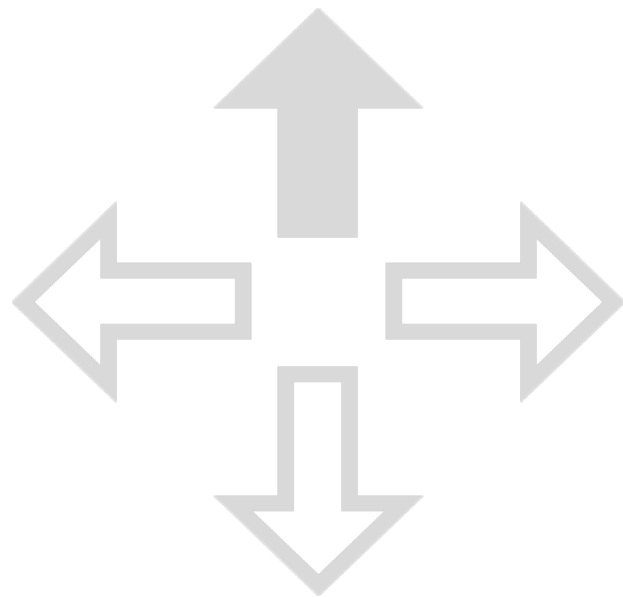




**The Arch Company**  
**Corporation Street, Manchester**

Project Number 19-259-014 - Planning application

**Technical Statement for Ventilation and  
Louvres Design Strategy**



**SGP**  
Architects + Masterplanners



## Contents

1. The Site
2. Development in Context
3. The Site Plan
4. Site Restrictions
5. Design Requirements
6. Proposed Louvre Design
7. Louvring Strategy Calculations
8. CIBSE & BS EN Guidance

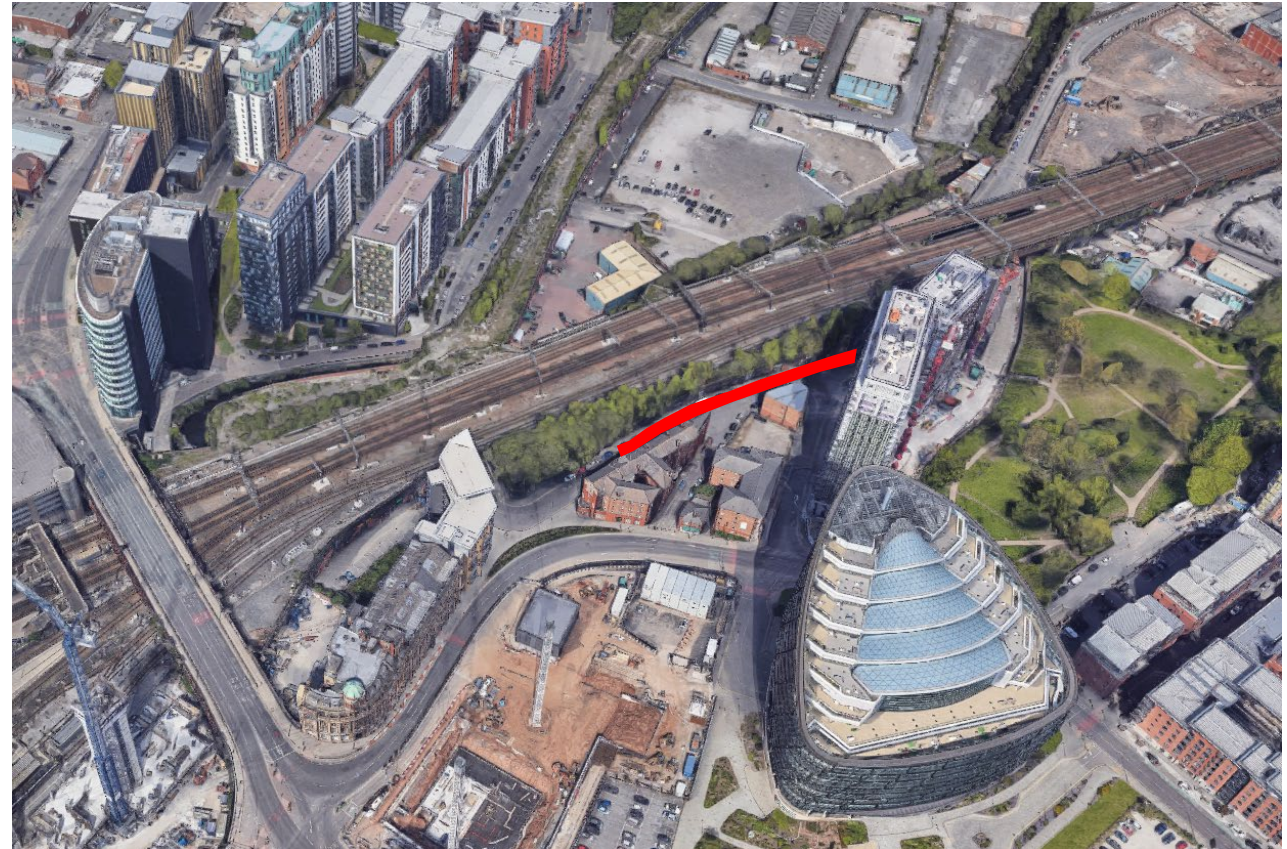




### 1. The Site

The existing site consists of 10 No. previously tenanted, currently vacant railway arches, numbered 1-4 & 6-11, forming a section of an arched viaduct located on Corporation Street, Manchester. The site is bordered to the South East (main frontage elevation) by Corporation Street & Dantzic Street footpath and road. The North West is bordered by the River Irk and a large car park beyond, within another ownership.

Arch 5, which sits adjacent Arch 4 & 6, is occupied and will remain tenanted throughout. Beyond arch 11 are several further arches not part of this project but under the same demise.





### 2. Development in Context

#### The Arch Company Project and Development Context

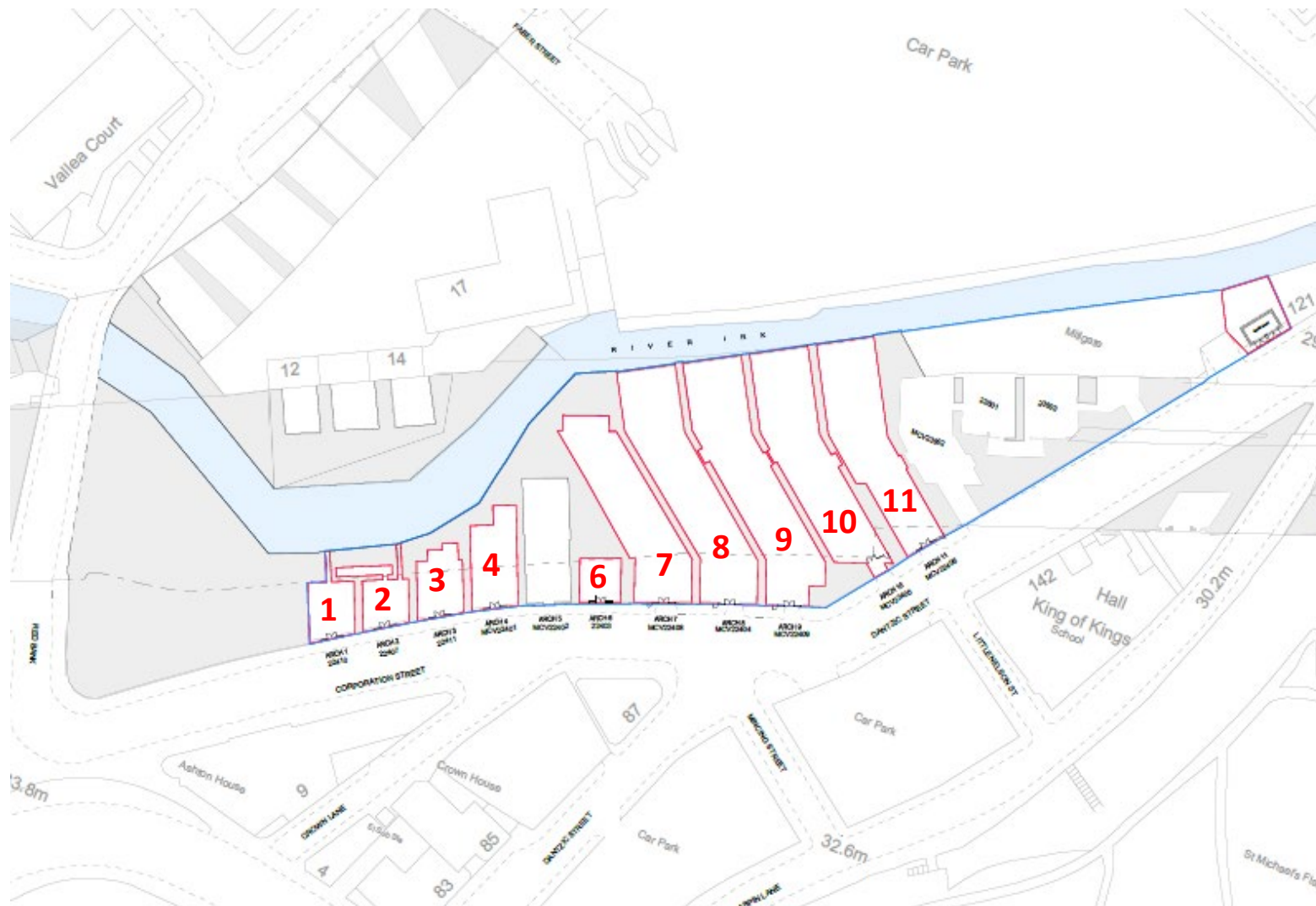
The Arch Company through their agreement with Network Rail have the development rights to 'airspace' to the majority of railway arches across the UK. Over the last few years, the Arch Company have embarked upon the delivery of their Capital Expenditure programme, with the aim to develop and repurpose railway arches, in order to make them attractive for tenants and consequently bringing them into new use. This will generally also have the added benefit of contributing to the wider economic and urban regeneration of the surrounding area and streets.

At Corporation Street the Arch Company are seeking Planning Approval for a change of use for Food and Beverage (F&B) operations. This is in direct response to it's location and tenant demand which will also provide new business opportunities, activate the street and support wider regeneration.





### 3. The Site Plan



#### Development and Commercial Requirements

To provide suitable space which will be attractive to future tenants the Arch Company are investing considerable funds to undertake 'shell construction work' within each Arch to transform the internal environment from gloomy, damp, unheated spaces into attractive, light and airy lettable units. This includes new arch linings (to prevent water seepage from the tracks above), new concrete floor slabs, new services, and drainage.

Also as part of the overall renewal a high quality, predominantly glazed frontages are proposed, which incorporate an area of high level louvres suitable for the connection of ductwork as part of a tenants fit out design.

#### Proposed Food and Beverage Use Requirements

As mentioned above, the Arch Company are developing the Arches at Corporation Street to provide suitable accommodation to attract tenants who will take up leasehold contracts for F&B operations. This generates commercial needs such as;

- The lease agreements will require each tenant to fit out the arch space according to their F&B offer and the brand and interior style which they wish to achieve.
- The Arch Company need to make provision for tenant fit out requirements in terms of the mechanical ventilation and extract systems, which must allow for flexibility to accommodate a range of tenant operational requirements and occupation within this use category.





### 4. Site Restrictions

#### Corporation Street Arches: Restrictions on physical design options

The existing Arches inevitably, by the nature of their function and construction have a direct effect on their use and potential adaptation. These can be summarised as the following;

- The existing 11 No arches, form the substantial part of the railway viaduct which carries live railway lines into Victoria Station and also link to the wider network.
- Network rail as the owner of the track and infrastructure, including the viaduct, impose a number of restrictions on development and proposals within the arches.
- The existing rail operation and live tracks prevent ventilation ductwork or louvres from being located above the arch frontage (on the side of the viaduct) or either between or alongside the railway tracks.
- Network Rail precludes any major structural alteration or new openings with the original construction, therefore no mechanical ventilation ductwork can be taken through the perimeter masonry walls or through the arch structure / roof

#### Restrictions due to Arch Size and Configuration

The arches have different constraints due to their size which limits the options for the design of possible tenant ventilation systems.

Arches Nos 1- 4 and 6 are small in size whilst No 7 is medium size but all present significantly restricted opportunities to locate opening windows or ventilation louvres because:

- They have small street frontages (both width and height)
- They do not have any rear frontage.
- The environmental conditions at the rear are also not favourable for intake or extract due to the 'undercroft character' of the space and reduced vertical height increasing the risk of cross contamination.

Arches Nos 8-11 are wide and long, but nevertheless have impact on potential ventilation system design and louver locations options, because:

- Due to their bigger size / volume they require more mechanical ventilation.
- these arches have rear elevations onto the River, however due to their length it is not practical to design a ventilation system with intake and extract from one elevation only, as the arches are longer than the optimum length for the efficient performance of ductwork. If a system was designed in this manner to extend to the whole length of the arch and back, it would result in significant increase in fan size and power and consequently noise emissions.



Arch 1



Arch 8



Arch 8 - Interior





## 5. Design Requirements

### Design Requirements for Tenant Fit Out Installations

Although we do not know the exact details of a future tenant fit design we have used Industry Design Data to establish the size of louvred areas in anticipation of what a tenant will require for a F&B operation. This constitutes 3No requirements:

- i) kitchen ventilation
- ii) customer and staff ventilation
- iii) sanitary facilities ventilation.

#### i) Kitchen Ventilation

This has been calculated on the basis of the ventilation requirements (intake and extract) for likely kitchen equipment which would be installed for a F&B use. This would typically be:

- Double oven range,
- double fryer,
- chip skuttle,
- contact grill,
- kebab rotisserie,
- bain marie,
- benching,
- small appliances
- Dishwasher
- 3no. sinks

The project Mechanical and Electrical engineers, Pick Everard, undertook their own DW172 calculation to determine the required mechanical supply and extract ventilation air flow rate(s) that canopy/ canopies which would be required to ventilate a tenant kitchen. This is based on the provision for Fresh air and exhaust ductwork would be connected to the front elevation louvres in an arrangement to be determined by the tenant.

See **Table 1** for a summary of the calculations for the louvre area requirements for each Arch.

#### ii) Staff and Customer Ventilation

In addition, we have to allow for tenants to provide ventilation for customers and staff to maintain suitable air quality. To make a suitable assessment and allowance for this we have utilised a projected occupancy levels and importantly this has been undertaken in accordance with design guidelines including :

- CIBSE Guide A / Indoor Air Quality
- BEN EN 13779
- BSI 2007 (Performance requirements for ventilation and air conditioning air conditioning)

We have utilised a mean occupancy/area figure of 1 person / 1.8M2 which is an average for seated restaurant / café type operations. The air flow allowance for potential dining areas is based on 10L/sec/person This would be provided by mechanical ventilation with heat recovery with fresh air and exhaust ductwork connected to the front elevation louvres in an arrangement to be determined by the tenant.

See **CIBSE & BS EN Guidance** (highlighted in section 8 of this document)

#### iii) Sanitary Facilities

In addition, there must be provision for mechanical ventilation to staff and public WC facilities which under the above Guidance and Building Regulations these areas are required to be ventilated at an air flow rate of for 6 air changes per hour. This would be provided by mechanical ventilation with heat recovery with fresh air and exhaust ductwork connected to the front elevation louvres as designed by the tenant.





### 6. Proposed Louvre Design

#### The Proposed Louvre Design

Therefore the area of louvres incorporated into the design of the front elevation design reflect the above requirement and calculations.

The proposed louvre appearance and functionality has also been selected on the following performance / technical criteria:

- The louvres must have certified Test data for good quality weathering performance
- To achieve good air flow performance generally ventilation louvres with a DLC of 0.35 or better if possible are specified.
- Acceptable acoustic performance
- Ease of replacement / maintenance
- A medium sized blade width balancing good quality appearance and functionality.

#### Review of possible Alternative Louvre Specifications

Options which might be considered for aesthetic reasons could include:

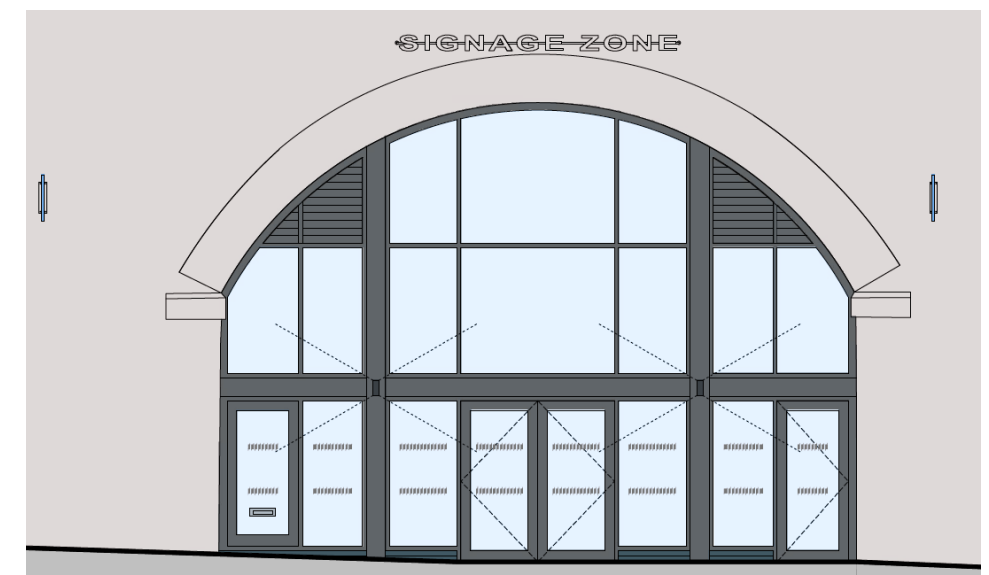
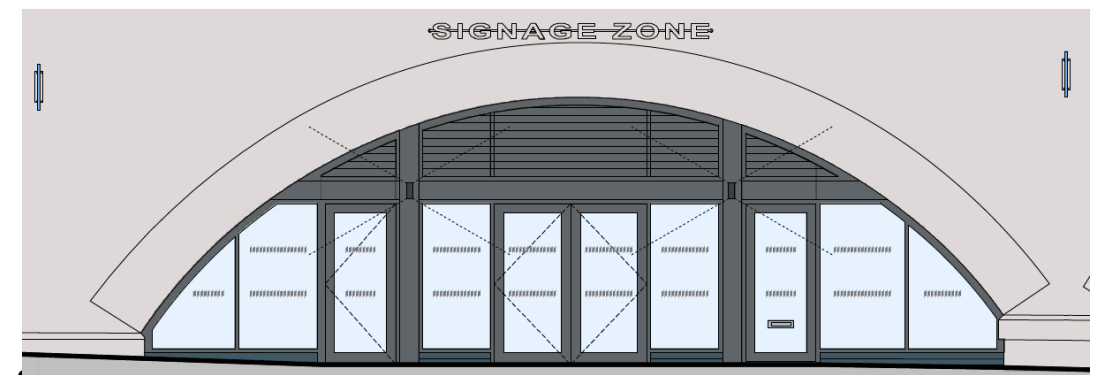
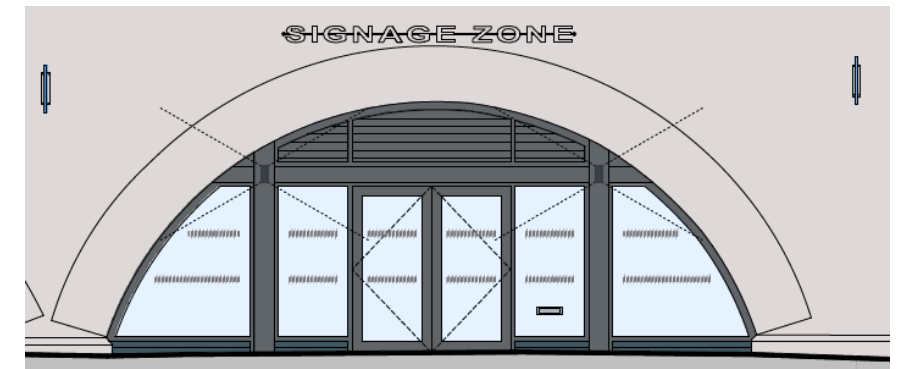
- Thinner louvre blade
- Decorative panels/screens in front of functional louvres

Both of these options however affect the performance of the louvre with a reduction in airflow through the overall louvre system. Generally, the finer the fins, and the more screening/mesh is added to the louvres, the greater the air resistance becomes across the louvre area. Thus a finer louvre or screen with reduced air flow would result in:

- An increase in the size of louvre area required.
- An increase in the risk of noise breakout levels internally and duct borne noise both internally and externally
- An increase in the size of fan unit to make it more powerful and force the air through the smaller louvre.

These are either planning restrictive or impose greater design restrictions and costs on the tenant fit out, as we don't know what plant will be installed, so we are effectively limiting the tenants ventilation rates achievable through the elevational areas available than by comparison to using a larger finned louvre.

To achieve the required air flow rates the tenants will be required to install larger fans with higher ESP's and additional acoustic attenuation, which also has an impact on energy efficiency/consumption.





## 7. Louvring Strategy Calculations

Table 1

**Technical Note:**  
**Louvring Strategy Calculations.**

### Arch 1

GIA 97.5m<sup>2</sup>

LOUVRE REQUIREMENT @ 1 PERSON PER 1.8m<sup>2</sup> = 3.388m<sup>2</sup>

including catering canopy (not including dishwasher)

Louvring Shown (maxed out over 2.15m AFFL) = 1.036m<sup>2</sup>

### Arch 2

GIA 105.2m<sup>2</sup>

LOUVRE REQUIREMENT @ 1 PERSON PER 1.8m<sup>2</sup> = 3.436m<sup>2</sup>

including catering canopy (not including dishwasher)

Louvring Shown (maxed out over 2.15m AFFL) = 1.613m<sup>2</sup>

### Arch 3

GIA 113.2m<sup>2</sup>

LOUVRE REQUIREMENT @ 1 PERSON PER 1.8m<sup>2</sup> = 3.500m<sup>2</sup>

including catering canopy (not including dishwasher)

Louvring Shown (maxed out over 2.15m AFFL) = 2.034m<sup>2</sup>

### Arch 4

GIA 162.8m<sup>2</sup>

LOUVRE REQUIREMENT @ 1 PERSON PER 1.8m<sup>2</sup> = 3.900m<sup>2</sup>

including catering canopy (not including dishwasher)

Louvring Shown (maxed out over 2.15m AFFL) = 3.113m<sup>2</sup>

### Arch 6

GIA 68.5m<sup>2</sup>

LOUVRE REQUIREMENT @ 1 PERSON PER 1.8m<sup>2</sup> = 3.148m<sup>2</sup>

including catering canopy (not including dishwasher)

Louvring Shown (door head maxed out) = 1.963m<sup>2</sup>

### Arch 7

GIA 411.8m<sup>2</sup>

LOUVRE REQUIREMENT @ 1 PERSON PER 1.8m<sup>2</sup> = 5.884m<sup>2</sup>

including catering canopy (not including dishwasher)

Louvring Shown (max) = 3.860m<sup>2</sup>

### Arch 8

GIA 509.8m<sup>2</sup>

LOUVRE REQUIREMENT @ 1 PERSON PER 1.8m<sup>2</sup> = 6.668m<sup>2</sup>

including catering canopy (not including dishwasher)

Louvring Shown to front elevation = 1.689m<sup>2</sup>

Louvre on the rear infill = 6.294m<sup>2</sup>

### Arch 9

GIA 526.4m<sup>2</sup>

LOUVRE REQUIREMENT @ 1 PERSON PER 1.8m<sup>2</sup> = 6.812m<sup>2</sup>

including catering canopy (not including dishwasher)

Louvring Shown to front elevation = 1.359m<sup>2</sup>

Louvre on the rear infill = 7.804m<sup>2</sup>

### Arch 10

GIA 461m<sup>2</sup>

LOUVRE REQUIREMENT @ 1 PERSON PER 1.8m<sup>2</sup> = 6.524m<sup>2</sup>

including catering canopy (not including dishwasher)

Area of entire arch minus door = 5.3m<sup>2</sup>

The door and facade is recessed and has a greater area than the entrance opening but the opening is the limiting size to the front elevation

Louvre on the rear infill = 6.957m<sup>2</sup>

### Arch 11

GIA 434.5m<sup>2</sup>

LOUVRE REQUIREMENT @ 1 PERSON PER 1.8m<sup>2</sup> = 5.948m<sup>2</sup>

including catering canopy (not including dishwasher)

Louvring Shown to front elevation = 1.632m<sup>2</sup>

Louvre on the rear infill = 6.042m<sup>2</sup>





## 8. CIBSE & BS EN Guidance

Summary table of CIBSE & BS EN guidance for ventilation rates and CO<sub>2</sub> concentrations

| Classification | Explanation                                                                                                                                                                                      | Indoor air (IDA) quality standard | Ventilation range (l/s/p) | Typical total CO <sub>2</sub> value (ppm) |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------|-------------------------------------------|
| IDA1           | High level of expectation and is recommended for spaces occupied by very sensitive and fragile persons with special requirements like handicapped, sick, very young children and elderly persons | High                              | >15                       | 700 - 750                                 |
| IDA2           | Normal level of expectation and should be used for new buildings and renovations                                                                                                                 | Medium                            | 10 - 15                   | 850 - 900                                 |
| IDA3           | An acceptable, moderate level of expectation and may be used for existing buildings                                                                                                              | Moderate                          | 6 - 10                    | 1150 - 1200                               |
| IDA4           | Values outside the criteria for above categories. This category should only be accepted for a limited period of the year                                                                         | Low                               | <6                        | 1550 - 1600                               |

The supporting information for the previous summary table citing indoor air (IDA) quality is taken from CIBSE Guide A and references BS EN standards.

### CIBSE Guide A – Section 4.2.1 Minimum ventilation rates for indoor air quality.

BS EN 13779: Ventilation for buildings. Performance requirements for ventilation and air-conditioning systems (BSI, 2007) provides basic definitions of air quality standards in occupied spaces and relates these to fresh air ventilation rates required for each occupant (in terms of L/s per person). These are summarised in Table 4.1.

Table 4.1 Ventilation and indoor air quality classification (source: BS EN 13779 (BSI, 2007))

| Classification | Indoor air quality standard | Ventilation range / (L.s <sup>-1</sup> /person) | Default value / (L.s <sup>-1</sup> /person) |
|----------------|-----------------------------|-------------------------------------------------|---------------------------------------------|
| IDA1           | High                        | >15                                             | 20                                          |
| IDA2           | Medium                      | 10–15                                           | 12.5                                        |
| IDA3           | Moderate                    | 6–10                                            | 8                                           |
| IDA4           | Low                         | <6                                              | 5                                           |

### CIBSE Guide A – Section 4.2.3 Ventilation rate and metabolic carbon dioxide

By applying the concept of dilution ventilation to the indoor air classifications of Table 4.1 it is possible to equate these classifications against the steady state CO<sub>2</sub> concentration as shown in Table 4.5.

Table 4.5 Approximate sedentary CO<sub>2</sub> concentrations associated with air quality classification (BS EN 13779 (BSI, 2007)) (all values in ppm)

| Classification | Typical rise in indoor CO <sub>2</sub> above outdoor value | Default rise in CO <sub>2</sub> above outdoor value | Typical range in outdoor CO <sub>2</sub> value | Typical total indoor CO <sub>2</sub> value |
|----------------|------------------------------------------------------------|-----------------------------------------------------|------------------------------------------------|--------------------------------------------|
| IDA1           | <400                                                       | 350                                                 | 350–400                                        | 700–750                                    |
| IDA2           | 400–600                                                    | 500                                                 | 350–400                                        | 850–900                                    |
| IDA3           | 600–1000                                                   | 800                                                 | 350–400                                        | 1150–1200                                  |
| IDA4           | >1000                                                      | 1200                                                | 350–400                                        | 1550–1600                                  |

Classifications for BS EN 13779 are detailed within BS EN 15251 and are as follows :-

Table 1 — Description of the applicability of the categories used

| Category | Explanation                                                                                                                                                                                      |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I        | High level of expectation and is recommended for spaces occupied by very sensitive and fragile persons with special requirements like handicapped, sick, very young children and elderly persons |
| II       | Normal level of expectation and should be used for new buildings and renovations                                                                                                                 |
| III      | An acceptable, moderate level of expectation and may be used for existing buildings                                                                                                              |
| IV       | Values outside the criteria for the above categories. This category should only be accepted for a limited part of the year                                                                       |

NOTE In other standards like EN 13779 and EN ISO 7730 categories are also used; but may be named different (A, B, C or 1, 2, 3 etc.)

### The National Institute for Occupational Safety and Health (NIOSH) & Occupational Health & Safety (OH&S)

NIOSH & OH&S are American Agencies with the criteria below being cited by the UK Health & Safety Executive (HSE).

|                |                                                                                                                                                           |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 250-350ppm     | Normal background concentration in outdoor ambient air                                                                                                    |
| 350-1,000ppm   | Concentrations typical of occupied indoor spaces with good air exchange                                                                                   |
| 1,000-2,000ppm | Complaints of drowsiness and poor air.                                                                                                                    |
| 2,000-5,000ppm | Headaches, sleepiness and stagnant, stale, stuffy air. Poor concentration, loss of attention, increased heart rate and slight nausea may also be present. |
| 5,000          | Workplace exposure limit (as 8-hour TWA) in most jurisdictions.                                                                                           |
| >40,000 ppm    | Exposure may lead to serious oxygen deprivation resulting in permanent brain damage, coma, even death.                                                    |





**LONDON**

t: +44 (0)207 268 3956

**LEICESTER**

t: +44 (0)116 247 0557

**LEEDS**

t: +44 (0)113 246 7969

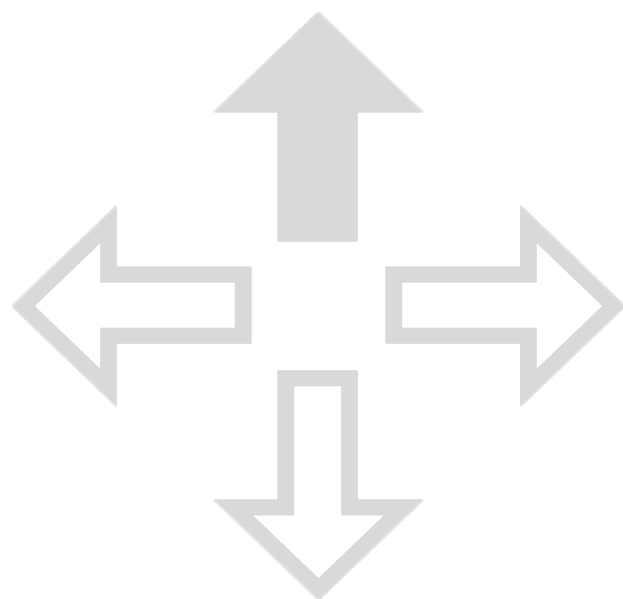
**BIRMINGHAM**

t: +44 (0)121 222 5346

**SOLIHULL**

t: +44 (0)121 711 6929

**[www.stephengeorge.co.uk](http://www.stephengeorge.co.uk)**



**SGP**  
Architects + Masterplanners