

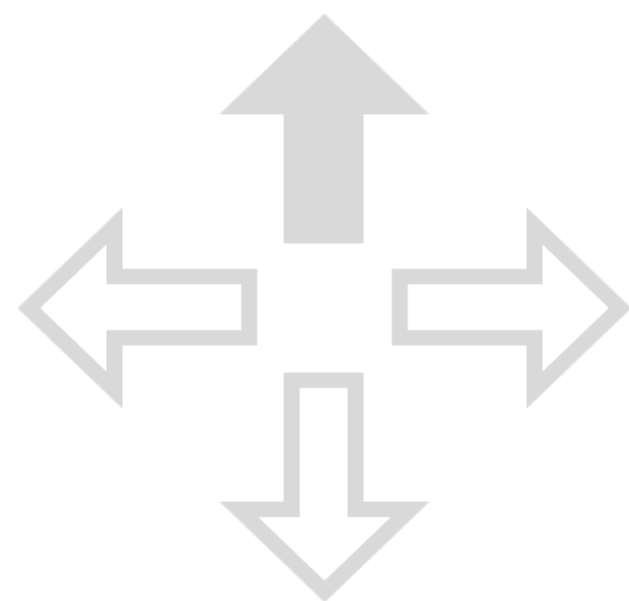


The Arch Company
Corporation Street, Manchester

Project Number 19-259-014 - Planning application

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

01.12.23 - Rev 9



SGP
Architects + Masterplanners



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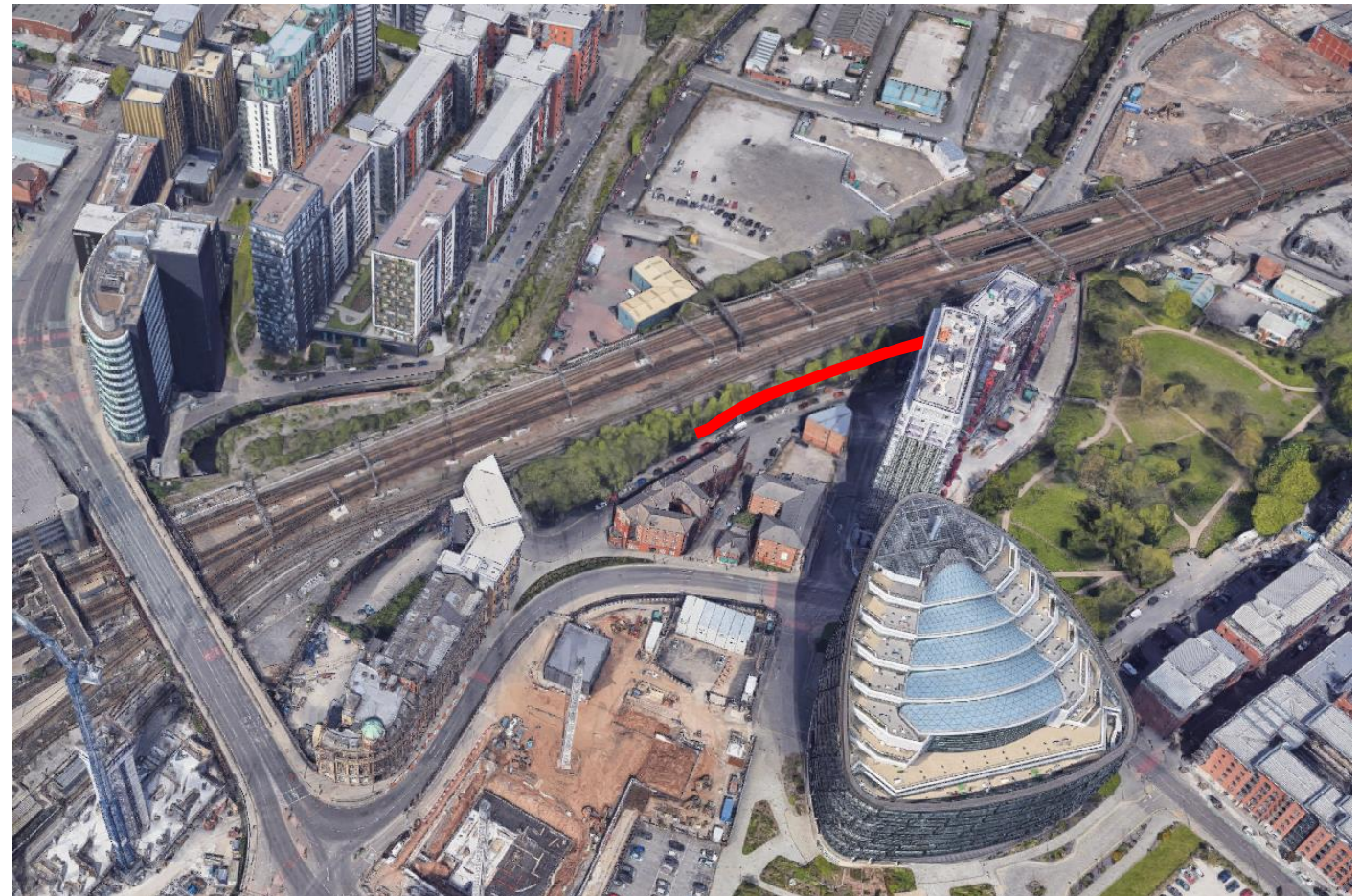




1. The Site

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 the north eastern end of Corporation Street and continuing onto Dantzic 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 and between Arches 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

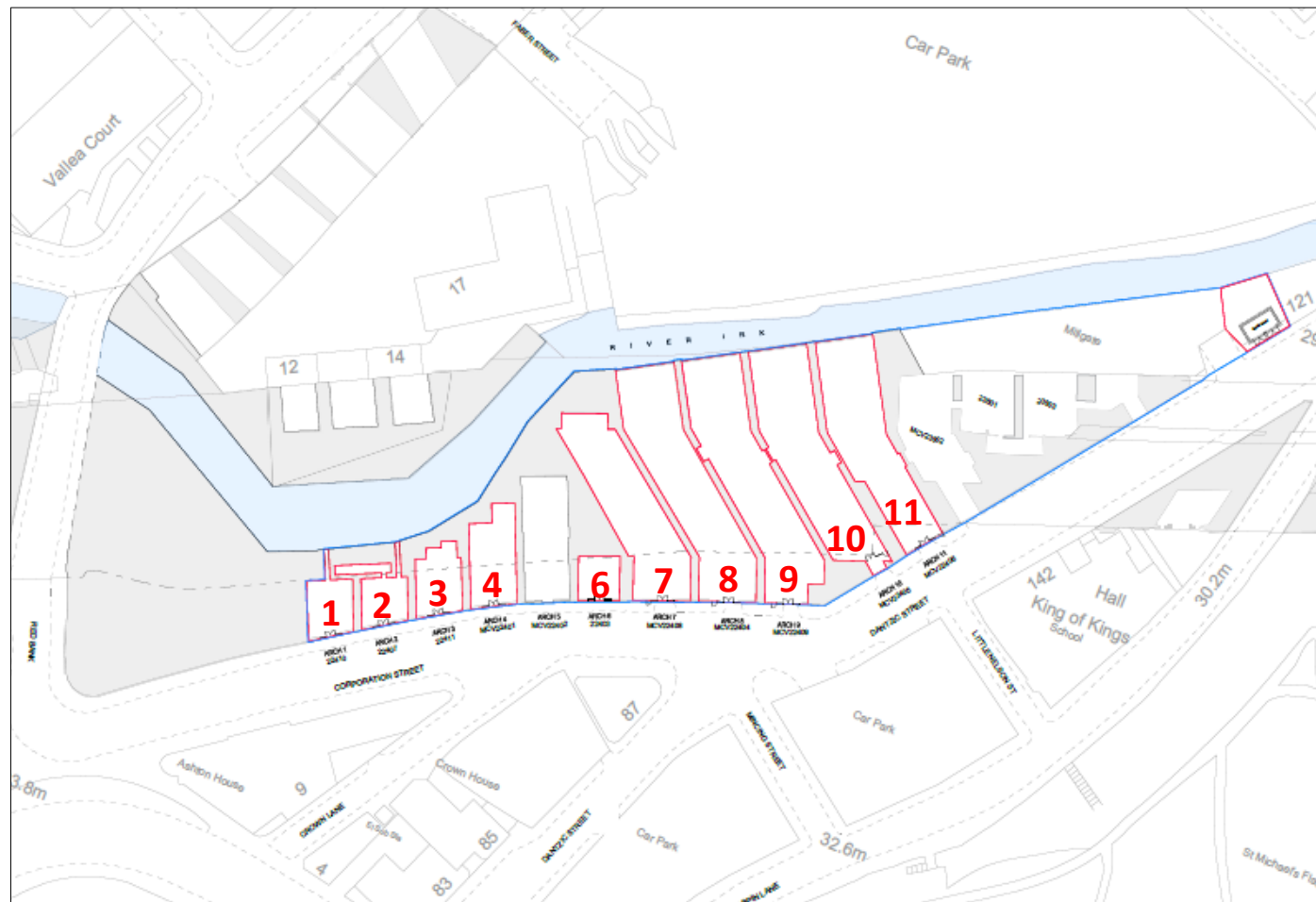
The Arch Company through their agreement with Network Rail have the development rights to 'airspace' to the majority of railway arches across the UK. Over the last few years, the Arch Company have embarked upon the delivery of their Capital Expenditure programme, with the aim to develop and repurpose 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 its location and tenant demand which will also provide new business opportunities, re-activate the street and support wider regeneration.





3. The Site Plan



Development and Commercial Requirements

To provide suitable spaces 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, high quality, predominantly glazed frontages are proposed which incorporate areas of louvring at high level, suitable for the connection of ductwork as part of a tenant 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 11No. arches, form the substantial part of the railway viaduct which carries live railway lines into Victoria Station and also links 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 within the original construction, therefore no mechanical ventilation ductwork can be taken through the perimeter masonry walls or the arch structure / roof.

Restrictions due to arch size and configuration

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

Arch No's 1, 2, 3, 4 & 6 are small in size whilst No.7 is medium sized, but all present significantly restricted opportunities to locate opening windows or ventilation louvres because:

- They have small street frontages (both in width and in 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.

Arch No's 8, 9, 10 & 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 facing the River Irk, 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 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 the future tenant fit out design, we have used Industry design data to establish the size of louvred areas in anticipation of what a tenant will require for an 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 an 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 & 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 summary of the calculations for louvre areas 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 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)

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**

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 are required to be ventilated at an air flow rate of 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

6.1 The Proposed Louvre Design

The area of louvres incorporated into the design of the front elevation reflect the requirement and calculations laid out in Section 7 Table 1

The proposed louvre appearance and functionality has also been selected based 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
- One of the planners' suggestions was to investigate the possibility of using a smaller profile louvre blade, the team sourced a manufacturer with this availability and this has now been incorporated into the design, replacing the standard louvres without having to add any further areas of louvring to the elevations. The design has been updated to accommodate the small profile louvre blade balancing good quality appearance and retaining all the functional parameters of a standard louvre blade.
- Renson ventilation louvre reference: 411, 414, 421 with a 33mm louvre pitch size, or its equivalent are the selected louvre system.
- Refer to the elevations shown in sections 9.1 & 9.2 for typical frontage designs showing the small profile louvring and keeping a consistent family of design throughout the run.
- Images adjacent were sent by the planners as good examples of small profile louvring, this is coincidentally from the from same manufacturer we have as preferred for the project.



414 - Glazed-in louvre



421 - Wall louvre, heavy-duty series



411 - Wall louvre





6. Proposed Louvre Design

Review of Alternative Louvre Specifications - Options considered for aesthetics include:

- **6.2 Glass Louvres:**

Generally, this louvre type comprises 'simple flat glass blades' which are not designed for commercial ventilation applications, being predominately used to provide natural ventilation in residential or leisure projects, decorative ventilation to atrium features or glasshouses or for fail-safe emergency smoke extract.

They are sometimes used to provide natural 'purge ventilation', however the project requirements are for mechanical extract and supply ventilation. Purge ventilation will not work on this site or within the arches, due to their significant depth meaning that the purge ventilation air flow will not reach most of the internal space.

There is no acoustic baffle functionality to a glazed louvre system, and they are not manufactured with this specification option or capability, whereas standard aluminium type louvres are shaped to a profile so will baffle some acoustic levels. These proprietary louvre systems offer acoustic Test Data and Certification to ensure they will perform to the correct technical requirements and achieve the acoustic criteria, especially when installed in noise sensitive locations.

Glass louvres normally have an open or closed function which means they are not inherently weathertight, therefore they will often remain in a closed position which is also not suitable for commercial operations and for the food and beverage operations proposed at Corporation Street, where tenants will require a constant supply of incoming air and continual extract ventilation.

Glass louvres cannot be installed in a non-rectangular frame as they need to be openable, which means all the louvre blades must be 'squared off' and in vertical alignment to allow the opening operation of the louvres to function. This is not achievable within the proposed design of the new glazed frontages, which incorporate louvres at high level (within the curving arch sections) to avoid pedestrian nuisance and importantly to maximise the amount of glazed frontage to the street level for visual amenity and for tenant commercial benefit.

If glass louvres are used as a purely decorative frontage piece, internal plenums would need to be constructed to allow extract through one and supply air through the other to keep them separate and to avoid cross air contamination, there will also need to be an insect / animal protection layer. This would cause a reduction in air flow and impact on the overall technical performance of the ventilation system. In addition, the sectional ends of the mechanical extract and supply air ducts would be visible through the glass louvre blades and the spaces between, making it very visually unattractive. Inherently this type of louvre system is not principally intended to be linked or connected to mechanical ventilation systems.

Furthermore, whilst glass louvres can be strengthened or manufactured from laminated glass, they would not have the same robustness as aluminium louvre systems and given that they would be exposed to the street, they would be more susceptible to vandalism and damage, especially if positioned at a lower level. They will therefore require increased cleaning and a greater maintenance and repair regime.





6. Proposed Louvre Design

- **6.3 Decorative panels / screens:**

Manchester City Council Planning Officer (Jennifer Atkinson), in an email dated 11.07.2023 acknowledged that glass louvres may not be practical in this instance due to the velocity of the ventilation. The Planning Officer requested Arch Co to further explore whether decorative screens could be placed over the standard louvre too improve its visual appearance.

Arch Co and SGP have further explored this point and produced two drawings which provide a comparison of the existing elevations, the current proposed louvre strategy, and the Planning Officers request for decorative screening. These drawings are:

19-259-014-SGP-ZZ-ZZ-DR-A-201300-P11-Corporation Street Existing
19-259-014-SGP-ZZ-ZZ-DR-A-201301-P11-Corporation Street Existing

These drawings demonstrate that with the incorporation of the decorative screens, there will be a direct impact on the airflow across the louvres, which consequently decreases their efficiency by 50%. Therefore, the effect of this lower efficiency means that the overall louvre area must increase by 100%, i.e., it needs to double in size, to compensate for the screens, to maintain the ventilation capacity which is required to ensure the units are suitable for F&B tenant uses.

From previous discussions with the Planning Officer, they required an active frontage with minimal louvring, however through installing decorative screens to the currently proposed louvre strategy will further impact the active frontages of these arches. The applicant has demonstrated through several iteration of the louvre strategy including this one that the current louvre strategy is the best option alongside providing the active frontages to Corporation Street, but also allowing the units to be suitable for F&B end users.

Considering the above, the request for decorative screens over the proposed louvre strategy will require an increase in louvring to ensure sufficient air flow which will impact on the active frontage and the operations for a F&B user. On this basis the incorporation of decorative screens is not suitable for these arches, and we request that the application be determined as currently submitted.





6. Proposed Louvre Design

- **6.4 Soffit Louvres:**

In an email dated 30 October 2023 from Manchester City Council's Planning Officer (Jennifer Atkinson) to Abraham Laker, there was a request for Arch Co to explore whether a louvred soffit was a viable option. Arch Co and SGP have explored this possibility as a solution, unfortunately we could not get this to work due to several constraints outlined below, namely:

- **Security**

The introduction of soffits would mean parts of the frontage would need to be recessed to accommodate them, these recesses cause security worries from any anti-social behaviour as we cannot secure them with security shutters, we are utilising a secured by design approved shop frontage system.

- **Contamination**

The only recesses useable would have to be created vertically at the doorways, meaning that extract air would be mixed with supply fresh air as the vents would be facing each other and the shared area in front of the doors would be an unpleasant space for users of the arch whilst in use.

- **Acoustics**

The louvres in a soffit situation ordinarily on a large building would be able to move air normally away from the building but our arch situation would mean the supply and extract air of the systems would need to blow across the shared recessed door area in the frontage and be forced against each other to move the air out of this recess and away from the frontages. This needs more power to do so which ultimately is more noise.

- **Buildability**

The sizes and shape of our arches set some constraints which we cannot overcome, the main constraint to the shorter of the arches is that we cannot get any ventilation above the heads of the doors and using the sides means we would have internal ducting adjacent the doors all the way down to floor level to achieve our required louvre area, this would limit circulation within the arches at the entrance areas.

- **Loss of area**

Notwithstanding the above point, the sizes of the louvred soffits required would vary along the row of arches due them being designed on internal area per person required. Losing a minimum of 4.7m² internal floor area per unit.

- **Aesthetics**

Having a vertically recessed louvre system would mean that the internal ducting to it would run horizontally along the frontage as noted above, to feed it, this would either mean that you would see the ducting through the frontage glazing or we would have to hide it with solid spandrel/look-a-like panels reducing the maximised light we have established into the shorter units.

Considering the above, the option of soffit louvres over the proposed louvre strategy will impact on the operations for a Food & Beverage user. On this basis the incorporation of soffit louvres is not suitable for these arches, and we request that the application still be determined as currently submitted with forward facing small profiled louvres to the frontages.





6. Proposed Louvre Design

- **6.5 Continuous Band of Louvres**

It was suggested that the client team look at having all 10 of the arches in the proposal with a continuous band of louvring at high level, the issues below show this as not being viable:

- **Buildability**

The constraints set by the sizes and shape of our arches, which we cannot overcome, are that at the lower end of the arches, namely arches 1 to 7, do not have the physical height in the available frontages to install a band of louvring at high level above the door heads.

- **Aesthetics**

If the arches were tall enough and consistent in height with each other, a continuous band of louvre would be achievable, but the arches are unfortunately neither of these. Please see 9.1 & 9.2 to highlight the differences in arch heights.

Considering the above, the option of a continuous band of louvre throughout the run of arches is not achievable for these arches, and we request that the application still be determined as currently submitted with louvres to the frontages in the locations indicated on elevations.





6. Proposed Louvre Design

To summarise the technical constraints in consideration of the above options would be as follows.

Decorative screens or glass louvres would reduce the potential air flow, resulting in:

- A need to increase in the size of louvre area required to achieve the ventilation requirements suitable for the proposed commercial uses.
- An increase in the risk of noise breakout levels and duct borne noise both internally and externally.
- An increase in the size of the fan units, to make them more powerful so they could effectively force the air through the smaller apertures.

These are either planning restrictive or impose greater design restrictions and costs on the tenant fit out, because at this stage the client / developer is not aware of the plant / ventilation systems a tenant will need to install to meet the operational requirements of their business.

In comparison to using the proposed louvre design approach, the above louvre options would limit the ventilation rates achievable through the elevational area, thus restricting the ventilation system designs for the future tenant fit out.

In addition, if any of the above louvre options were adopted, and a tenant was required to install larger fans in order to achieve the required air flow rates, the ESPs would be higher, and additional acoustic attenuation would be required which then also has an impact on energy efficiency/consumption.

Exemplar Arch infill designs in Manchester

The Watson Street arch infills have been provided by the Planning Authority as an exemplar, which have been considered for the revised elevation designs for Corporation Street.

Notwithstanding this the glazed infills on Watson Street are adjacent to mostly louvered arch infills, which appear to form part of the same tenanted unit.

It seems fair to suggest that these large areas of louvre have been installed to satisfy the tenants mechanical ventilation requirements, resulting in minimal louvres to be incorporated into the main glazed infills.

Also, the units on Watson Street appear to be designated as bar type uses which arguably have less louvre requirement, rather than a restaurant with associated kitchens, which form part of the development criteria for Corporation Street, where the client is aiming to provide spaces suitable for a wide range of uses, including café / bar and restaurants.

In summary, we suggest that the revised infill designs and overall elevations proposed for the Corporation Street arches optimise the aesthetic and technical performance criteria in consideration of the extent and quantum of louvre needed and balance this by amending as much as practicable to suit the comments and good design examples received from the Planning officer.





7. Louvring Strategy Calculations

Table 1

Technical Note: Louvring Strategy Calculations.

Arch 1

GIA 97.5m²

LOUVRE REQUIREMENT @ 1 PERSON PER 1.8m² = 3.388m²

including dishwasher & catering canopy

Louvring Shown (maxed out over 2.15m AFFL) = 1.217m²

Arch 2

GIA 105.2m²

LOUVRE REQUIREMENT @ 1 PERSON PER 1.8m² = 3.436m²

including dishwasher and catering canopy

Louvring Shown (maxed out over 2.15m AFFL) = 1.494m²

Arch 3

GIA 113.2m²

LOUVRE REQUIREMENT @ 1 PERSON PER 1.8m² = 3.500m²

including dishwasher and catering canopy

Louvring Shown (maxed out over 2.15m AFFL) = 1.678m²

Arch 4

GIA 162.8m²

LOUVRE REQUIREMENT @ 1 PERSON PER 1.8m² = 3.900m²

including dishwasher and catering canopy

Louvring Shown (maxed out over 2.15m AFFL) = 2.014m²

Arch 6

GIA 68.5m²

LOUVRE REQUIREMENT @ 1 PERSON PER 1.8m² = 3.148m²

including dishwasher and catering canopy

Louvring Shown (door head maxed out) = 2.543m²

Arch 7

GIA 417.2m²

LOUVRE REQUIREMENT @ 1 PERSON PER 1.8m² = 5.932m²

including dishwasher and catering canopy

Louvring Shown (max) = 5.166m²

Arch 8

GIA 523.1m²

LOUVRE REQUIREMENT @ 1 PERSON PER 1.8m² = 6.780m²

including dishwasher and catering canopy

Louvring Shown = 2.764m²

There is scope to louvre on the rear infill - 6.294m²

Arch 9

540.6m²

LOUVRE REQUIREMENT @ 1 PERSON PER 1.8m² = 6.956m²

including dishwasher and catering canopy

Louvring Shown = 1.836m²

There is scope to louvre on the rear infill - 7.804m²

Arch 10

GIA 486.8m²

LOUVRE REQUIREMENT @ 1 PERSON PER 1.8m² = 6.524m²

including dishwasher and catering canopy

Area of entire arch minus door = 5.3m²

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

There is scope to louvre on the rear infill - 6.957m²

Arch 11

GIA 434.5m²

LOUVRE REQUIREMENT @ 1 PERSON PER 1.8m² = 6.124m²

including dishwasher and catering canopy

Louvring Shown = 3.646m²

There is scope to louvre on the rear infill - 6.042m²

Note: The addition of screening to the front of the louvres, decreases the performance considerably.

The louvre area will increase by **100% (i.e., double in quantum).**





8. CIBSE & BS EN Guidance

Summary table of CIBSE & BS EN guidance for ventilation rates and CO₂ concentrations

Classification	Explanation	Indoor air (IDA) quality standard	Ventilation range (l/s/p)	Typical total CO ₂ 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 ⁻¹ /person)	Default value / (L.s ⁻¹ /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 CO₂ concentration as shown in Table 4.5.

Table 4.5 Approximate sedentary CO₂ concentrations associated with air quality classification (BS EN 13779 (BSI, 2007)) (all values in ppm)

Classification	Typical rise in indoor CO ₂ above outdoor value	Default rise in CO ₂ above outdoor value	Typical range in outdoor CO ₂ value	Typical total indoor CO ₂ 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)

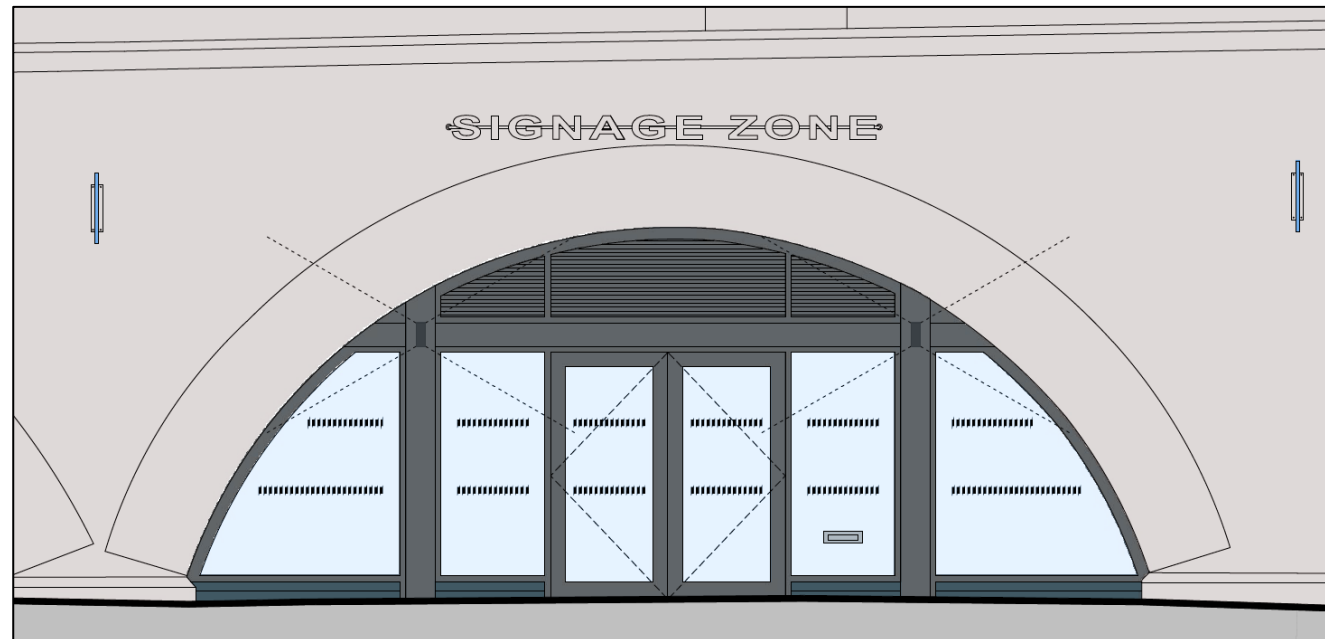
NIOSH & OH&S are American Agencies with the criteria below being cited by the UK Health & Safety Executive (HSE).

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.





9.1 Appendix – Proposed Elevations – Arches 6 & 7



Arch 6

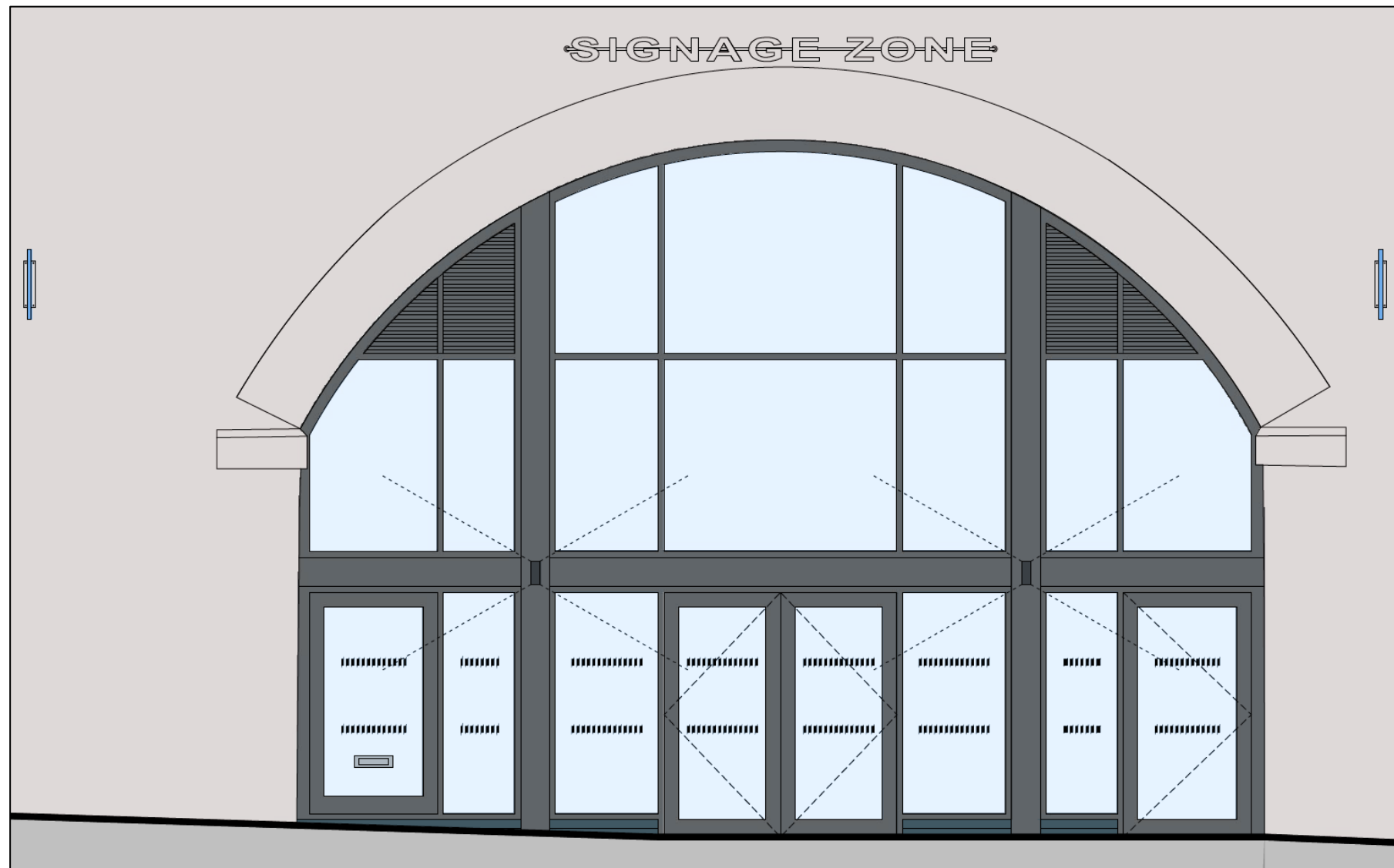


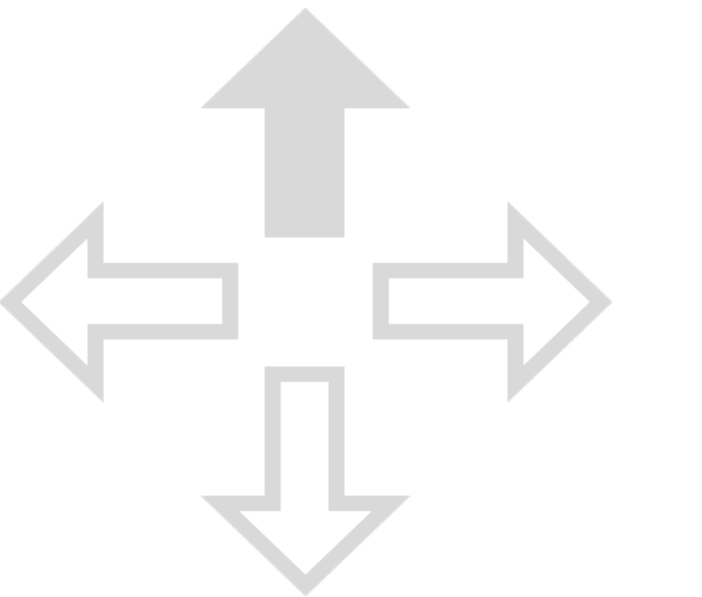
Arch 7





9.2 Appendix – Proposed Elevations – Arch 11





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