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# Queens Market Rhyl

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## Ventilation and Extract Statement - For Planning

Doc No. QMR-BDP-ZZ-XX-MS-M-01  
Issue: For Planning  
Date: July 2020

## Issue Status

Revision	Description	Issued by	Date	Checked
P01	For Planning	GK	July 2020	AM

*Final issue of this document shall be based on contract drawings issued by the designers and the final design information issued to the main contractor. The final installation may vary from the arrangements shown but the principles set out within the document should be achieved by the contractor. It remains contractor's responsibility to collate and record all as built information.*

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# 1 – Introduction

This Ventilation and Extract Statement supports both the detailed Planning Application for the proposed Market Hall and the outline planning application for the Queens Market Rhyl development as a whole. BDP were commissioned by ION Developments to produce the design for the Queens Market re-development. The site, based in Rhyl, is a key part of the Council's regeneration strategy for Rhyl Town Centre. The project has developed a strategy for urban transformation including improvements to the public realm, economic incentives and the promotion of mixed-use development, building restoration and upgraded movement connections across the town.

A central theme of the strategy is the restoration of lost connections between the town and its spectacular beach. The design proposal is for the redevelopment of an entire seafront urban block around the historic Queens Market. It comprises the restoration of a few of the existing structures and the clearance and redevelopment of the remainder of the site.

A mixed-use development is proposed including residential accommodation, shops and restaurants, a library, offices and workplaces around a re-configured market.

The application seeks approval for the wider scheme but this ventilation and extract statement is mainly focused on the development of the Market/Food - Event Halls. A short description of the ventilation strategy associated with the rest of the scheme is described at the end of this report.

The ventilation strategies comply with the guidance in the building regulations Approved Document part F: - Means of Ventilation as well as the following standards and guidance:

- AD L2A Conservation of fuel and power in new buildings other than dwellings
- Non Domestic Building Services compliance guide
- BS EN 13053:2006+A1:2011 Ventilation for buildings. Air handling units. Ratings and performance for units, components and sections
- BS EN 5588-9:1999 Fire precautions in the design, construction and use of buildings. Code of practice for ventilation and air conditioning ductwork (AMD 14993) (No longer current but cited in Building Regulations guidance)
- BS 9999:2008
- CIBSE guide B
- CIBSE commissioning code A
- HSG 258 A guide to local extract ventilation
- DW 144
- DW172
- EU directive 2009/125/EC Regulation 1253/1254 Ecodesign requirements for ventilation units
- CAIS 10 Ventilation in catering kitchens
- CAIS 26 Preventing exposure to carbon monoxide from use of solid fuel appliances in commercial kitchens

## 2 – Ventilation and Extract Statement

The three storey structure of the Market Hall contains:

- Multiple retail / food and beverage units and a dining space on the ground floor which will also house amenity spaces, stores and serving facilities.
- A dining space on the first floor of the food court.
- A triple height events hall which will likely host regular events. This space is separate to the food court but still linked via large doors in the centre of the building.

The ventilation systems shall be designed in accordance with buildings regulations part F and CIBSE guide B and shall provide an adequate means of ventilation for the buildings occupants whilst ensuring that air quality and occupant comfort is satisfactorily maintained.

### 2.1 – Food retail units

Kitchen extract ventilation is provided to each food retail unit and makeup air supply is supplied by a separate supply fan. The two units shall be stacked for optimal spatial efficiency in the external plant compound and heat recovery via a run around coil will be utilised to maximise the system's efficiency. The proposed location of the ventilation plant is in the service yard at the east side of the building. In-duct attenuators shall be provided and the units will be carefully selected to meet the required acoustic criteria.

At this stage the scheme considers six food retail units and each of them has an area of circa 12m<sup>2</sup>. The kitchen extract system has been sized based on 60 air changes per hour (ACHR) for each food retail unit and it is assumed that 2/3 of the unit's area will be a kitchen space. If the kitchen area within a unit is to be smaller/larger, then the ventilation rate shall be amended accordingly. All kitchen extract ductwork shall be fire rated, to be reviewed with the fire engineer, fire officer and building control during the development of the design. The kitchen extract fan configuration has been proposed to have extensive filtration: Capture Ray UV-C Grease & Odour in the canopies, Panel & bag filters, Carbon filter, run around coil, etc.

Solid fuel is an option which a number of catering establishments prefer to utilise in the production of their menu. This poses several issues which stringent guidance governs (CAIS 10 and 26 applies) and therefore the current design assumes that solid fuel will not be used. This shall be made clear in any tenant pack for the food units. If this changes in future design stages to increase the letting potential of the units then the following shall be taken into consideration:

Each solid fuel extract system would need to be a separate system and mechanical makeup air supply shall be provided at a rate of at least 85% of the extract air rate. When using solid fuels such as charcoal, the kitchen extract fan for the particular unit shall be linked to a carbon monoxide sensor to ensure the fan continues running during the cooling down hours of the fuel and its associated embers. This precaution is to prevent the build-up of toxic fumes forming in the space whilst the embers are cooling down at the end of the day.

Solid fuels also pose an added risk in terms of fire, whilst ESP filters prevent flames protruding too far into duct work they will not stop small sparks or embers from penetrating into the ductwork and igniting any grease or oil which has gathered in the ductwork, therefore spark arresters will need to be incorporated into the entrance of the system after the canopy to prevent any sparks entering into the ductwork. Due to the added risk of fires within a solid fuel extract system, an individual extract system shall be used to ensure the risk of fires spreading is kept to a minimum should a fire occur. Using solid fuels within catering is deemed to be an 'Extra high intensity cooking activity' and therefore only a limited number of extract canopies are suitable for this type of cooking and fuel type,

any tenant utilising solid fuels shall ensure that the canopy installed is sufficient for the purpose in which it is installed.

As described above currently the use of solid fuel is excluded from Queens Market Rhyl.

The main kitchen extract system shall be provided by the landlord from the external plant to each unit. It is the responsibility of each food unit tenant to ensure that their kitchen extract canopies/hoods are provided with UV-filtration before any connection to the central system is permitted.

There is no requirement for flues rising to roof level and all kitchen appliances shall be electric. Also due to the extent of the proposed filtration on the kitchen extract system the exhaust stream shall be kept clean to be discharged straight at the occupant's level (back of house area). The exhaust will be terminated with a high velocity vertical cowl pointing upwards.

In summary the kitchen extract rates are based on the following:

- 2/3 of the food retail unit to be kitchen with storage at the rear and servery at the front.
- 60 air change per hour based on recommendations within DW172 where specific catering equipment is not available to undertake detailed assessments.
- 4.0m high ceilings in the kitchens.

## 2.1.1 – System Comparison

Two kitchen extract options have been analysed for this scheme and are described below. The proposed kitchen extract option for this stage is a 2.1.2 a Combined Kitchen Extract System.

### 2.1.1.1 Individual Unit Kitchen Extract System

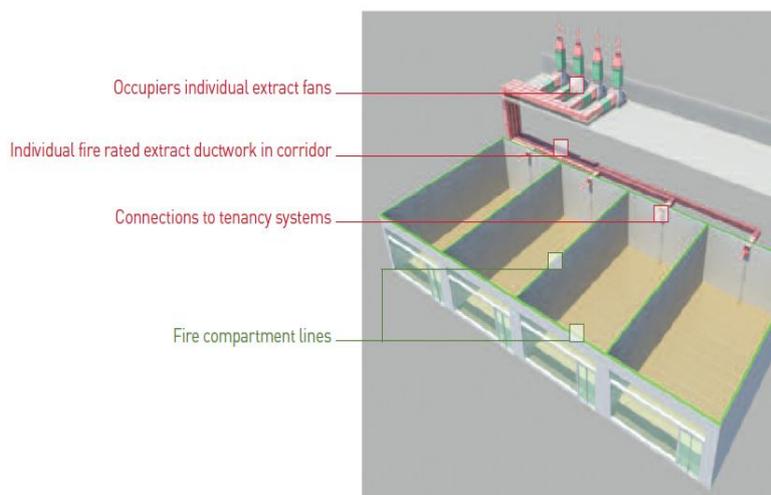
The individual unit kitchen extract system would consist of 1 No kitchen extract fan per each individual food/beverage unit, along with an individual duct route to each of the kitchen extract fan configurations (located externally). Multiple ducts would run in parallel within the building. The advantages and disadvantages of the system are shown below;

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• A very simple system as each unit has its own fan and section of ductwork.</li> <li>• A single fan being faulty will not affect any of the other retail unit extract systems.</li> <li>• Very simple controls including simple fan switching and interlocks.</li> <li>• Easier to meter each fan individually should this be required to allow individual tenant consumption based billing</li> <li>• Responsibility rests with each individual tenant</li> </ul>	<ul style="list-style-type: none"> <li>• Inefficient services distribution with a number of individually accessible small ducts which taking up a large volume of space.</li> <li>• Ducts will need to be cleaned regular to avoid grease build-up and mitigate fire hazard meaning more space needed for constant access.</li> <li>• Fire hazard if maintenance regime is not followed and a reliance on tenants to undertake this activity</li> <li>• Higher energy costs for running an individual fan for each unit.</li> <li>• An individual fan for each unit will take up significant space in the plant area.</li> </ul>

	<ul style="list-style-type: none"> <li>• Access needs to be arranged for each tenant to reach and maintain their remote equipment</li> </ul>
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**Table 2.1.1: Advantages and Disadvantages of individual extract systems**

Figure 2.1.1 is an abstract showing individual extract systems, installed in a multi-tenancy scenario. Having multiple ducts running parallel and above one another in the shared corridors and risers increases the complexity of extract system maintenance, possibly leading to not complying with the maintenance regime, thus increasing the risk of fires.



**Figure 2.1.1: Abstract Images of an individual extract system.**

### 2.1.1.2 Combined Kitchen Extract System

A combined kitchen extract system would consist of 1 No kitchen extract fan for six units and 1 No extract duct with a smaller branch into between five and seven kitchen extract canopies depending on the duty of each canopy and the turndown ratio of the extract fan (*to be determined with the tenants and mechanical contractor at the fit out stage*)

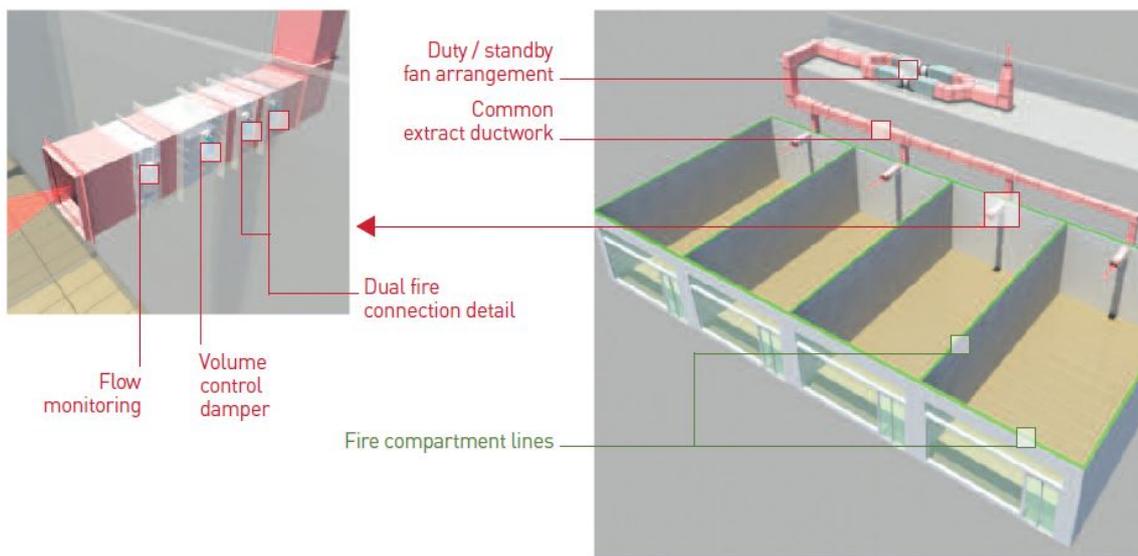
Kitchen extract ducts can be combined by using an Electrostatic precipitation filter (ESP) and motorised dampers (MD) on each of the units extract canopies within each food unit. When the canopy is on the damper would open and the fan would run either on a timer or 24 hrs. This would be controlled via a pressure transducer to maintain a constant pressure in the duct, as each damper opens the pressure drops and the fan speeds up to match the pre-determined pressure.

From a design and operation perspective there is a key of issues to consider when designing a multi-tenant kitchen extract system. As of yet the scheme has not been reviewed in detail by a fire engineer, but the below assumes that the individual units F&B units would not be considered as individual fire compartments as they are contained within one space with open servery counters.

**FIRE SEPARATION**

Fire dampers are not recommended for installation in kitchen extract ducts due to the risk of grease build up reducing the effectiveness of the damper. This could increase the risk of fires spreading through ductwork to neighbouring retail units sharing a common kitchen extract system. If a strict maintenance strategy is adhered to fire dampers can be used. Using a common kitchen extract system will require strenuous agreements with local building control officers to ensure a reliable system is installed and a strict maintenance regime is adhered to.

Shown below is an abstract of a common extract system. If all units were individual fire compartments, they would share a common kitchen extract duct therefore a strict regime of filter cleans would be required to ensure that there is no grease build-up to ignite and that should a fire ignite, the fire dampers will not be hindered by any grease present.



**Figure 2.1.2 : Abstract Images of a multiple tenancy shared extract System.**

The advantages and disadvantages of a shared kitchen extract system are shown below;

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• Although the combined duct is larger it will occupy less space than several smaller individual ducts.</li> <li>• More energy efficient as there is only one fan to run 6 units rather than 6 individual fans.</li> <li>• Large ducts are easier to clean than small ducts.</li> <li>• The system is maintained by the landlord and is more likely to be easier to control the standard and quality of maintenance</li> </ul>	<ul style="list-style-type: none"> <li>• Requires more complex control strategy.</li> <li>• If one fan fails several kitchens will be affected, duty/standby fan arrangement will be necessary.</li> <li>• A number of filters are required to reduce grease build-up and to eliminate odours from the airstream.</li> <li>• Fire dampers may not be acceptable to the fire officer and building control</li> <li>• Fire dampers will require regular maintenance and cleaning</li> </ul>

**Table 2.1.2: Advantages and Disadvantages of shared extract systems**

Taking into consideration the advantages and disadvantages of both options the preferred option for this stage is to use a Combined Kitchen Extract System.

The central system shall be maintained by the market hall operator and the details shall be agreed with the building control officer for the maintenance regime on this extract system. For individual food units the responsibility will rest with the tenant, refer to 2.3 below.

## 2.2 General Supply and Extract

The building is split into two main areas with each served by a separate air handling unit that will have filtered and tempered air supply and heat recovery on the extract. The air intake and discharge shall be separated to ensure no cross contamination, air intakes shall also be located away from other air discharges.

Air Handling Unit 01 (AHU01) serves the dining hall on the north side of the building and AHU02 serves the events hall on the south side.

Supply and extract shall be ducted from the central plant and distribute in the building to supply and extract grilles and bellmouths in both the dining area and the events hall.

A decentralised ventilation strategy is applied to the toilets and bars in the dining space and the commercial units on the south (heritage building). Those spaces are served by dedicated heat recovery units (MVHRs) and they are not connected to the two main central AHUs. The MVHRs shall be used to ensure adequate fresh air is provided (6 ACH) with supply and intake louvres being located on the façade of the building.

All toilet areas are to be provided with MVHRs to remove odours and moisture from the spaces in line with Air Change Rates provided within CIBSE Guide C. The MVHR shall be located within the ceiling void of each space and should be capable of providing no less than 6ACH, odour control filters are to be used on the exhaust side of the ductwork to reduce the level of odours escaping to the surrounding atmosphere.

### AHU01 - Central Dining Space Ventilation System

It is proposed that fresh air will be provided to the central dining space to ensure the minimum fresh air requirements can be met. The ventilation system shall provide at least 12 ACH into the central dining space. The system will have a series of inlet/exhaust louvres, dampers, fans and an integral heat pump to enable various modes of operation. Appropriate attenuation will be provided to reduce noise breakout from the dining space. The supply shall be via diffusers on ground and first floor and the extract via bellmouths at high level.

The market units (non F&B units) will also be served by AHU01 and it should be capable of providing no less than 10ACH in each unit.

### AHU02 - Central Event Space Ventilation System

It is proposed that fresh air will be provided to the central events space to ensure the minimum fresh air requirements can be met. The ventilation system shall provide at least 12 ACH into the central dining space. The system will have a series of inlet/exhaust louvres, dampers, fans and an integral heat pump to enable various modes of operation. Appropriate attenuation will be provided to reduce noise breakout from the dining space. The supply shall be via displacement ventilation bins at low level and the extract via bellmouths at high level.

## 2.3 – Filtration System - Contaminants and Odours

Kitchen extract systems shall be installed complete with appropriate grease/odour filters that best suit the kitchen extract strategy chosen. This is to prevent the discharge of grease laden fumes to atmosphere. The level of treatment will be related to the menu being prepared and will range from minimal filtration for beverage outlets to full filtration of smoke, grease and odour for catering outlets preparing smoky, greasy and spicy meals.

Regardless of the type of system utilised at Queens Market Rhyl scheme, grease and odour filters will still be necessary to reduce the amount of grease, oil and smoke getting into the ductwork and increasing the amount of cleaning and maintenance required. The use of certain filters within kitchen extract systems can aid the reliability of fire dampers due to the lower levels of grease within the duct. It will also be imperative that a stringent maintenance regime be implemented and adhered to ensure all filters perform to their maximum efficiency.

Since each catering provider will offer different menus requiring different treatment the level of treatment shall be agreed during the letting of the food unit. The client shall provide a tenant fit out guide which will specify tenant requirements for filters and maintenance based on the proposed offering of the outlet (refer to table 2.3.2). ESP filters are recommended to be installed in order to reduce the amount of grease, oil and smoke passing into the ductwork, greatly reducing the need for duct cleaning and reducing the risk of duct borne fires within the duct systems. Along with ESP filters, ultraviolet odour control filters should also be installed to eliminate odours in the air stream where appropriate.

The advantages and disadvantages of ESP filter systems are presented in the table below:

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• Will significantly reduce the amount ducts need cleaning as ESP filters prevent 98% of Grease/oil and smoke getting into the duct.</li> <li>• Significantly reduces the risk of fires within ducts.</li> <li>• As there isn't much grease in the air within the duct, lower velocities can be used without hindering performance.</li> <li>• Greater fan life span due to cleaner air flow.</li> <li>• Although ESP filters are quite expensive, money will be saved on the reduced number of fans making the capital cost lower with the combined extract system.</li> <li>• Although more complex controls required they can be wireless.</li> <li>• ESP cleaning and servicing is expected to be less than the cost of cleaning the individual kitchen extract ducts.</li> </ul>	<ul style="list-style-type: none"> <li>• ESP filters require regular cleaning and servicing by a specialist contractor.</li> <li>• An odour control filter will still be required i.e. ultra-violet</li> </ul>

**Table 2.3.1: Advantages and disadvantages of electrostatic cleaning to kitchen extract systems**

Catering type	Smoke grease and odour characteristics			Grease, smoke and solid filtration			Low intensity odour control	Odour control			Odour counteraction
	Smoke	Grease	Odour	Grease filter	Cold water mist hood	Electrostatic precipitator		Ultra violet odour control	Activated carbon filter	Wet scrubbing	
African	Low	Moderate	Moderate	✓	X	✓	X	✓	X	X	X
Chinese	Low	Very high	Moderate	✓	✓	✓	X	✓	X	X	X
Char grilling	Very high	High	High	✓	✓	✓	X	✓	✓	X	X
European	Low	Low	Moderate	✓	X	✓	X	✓	X	X	X
Fish & chips	Low	High	Moderate	✓	✓	✓	X	✓	X	X	X
Fried chicken	Low	High	High	✓	✓	✓	X	✓	✓	X	X
Indian	Low	High	Very high	✓	✓	✓	X	✓	✓	X	X
Malaysian	Low	High	High	✓	✓	✓	X	✓	✓	X	X
Mexican	Low	High	High	✓	✓	✓	X	✓	✓	X	X
Pizzeria	Low	Low	Low	✓	X	✓	X	✓	X	X	X
Pub food	Moderate	Moderate	Moderate	✓	X	✓	X	✓	X	X	X
Sea food	Low	Low	High	✓	X	✓	X	✓	X	X	X
Turkish	High	Moderate	Moderate	✓	X	✓	X	✓	X	X	X
Warmed food	None	Low	Low	X	X	X	✓	X	X	X	X

**Table 2.3.2: Matrix of Kitchen Extract Filter Systems**

✓ Recommended  
 X Unlikely to be required

The level of kitchen extract treatment and the maintenance requirements for each food unit shall be agreed with the individual tenant based on the food being prepared to ensure compliance with the Local Authorities requirements.

### 3 – Maintenance

In all instances of mechanical ventilation there are to be stringent maintenance regimes which must be adhered to in order to ensure compliance, and resilience of any installed systems.

Any filters installed in the kitchen extract system shall be cleaned and replaced periodically in line with the manufacturer’s recommendations dependent upon the level of usage within each of the food retail units.

Additionally, all internal surfaces of any ductwork carrying contaminated, grease laden air streams shall be accessible at no more than every 3m and at each change in direction via a grease tight heat proof access panel sealed with a heat proof sealant or gasket.

Having elected the combined extract system the maintenance of the kitchen extract system shall be under the responsibility of the centre manager and shall be more manageable than reliance on individual food retail units. The responsibility for the maintenance of the equipment in the food unit rests with each tenant but this can be managed.

As described above there will always be a need to have a strict maintenance regime in place to ensure each type of filter performs as it is supposed to, and that the system installed complies with the building regulations. Below is a typical table showing maintenance periods for different types of filters. Below is a typical table showing the maintenance periods of different types of filters.

Kitchen extract component	Recommended maintenance intensity
<b>Grease, smoke and solid filtration</b>	
Grease filter – mesh / baffle / cartridge / water wash	Daily cleaning
Cold water mist hood	Daily cleaning
Electrostatic precipitator	4 weekly cleaning
<b>Low intensity odour control</b>	
3 stage fine filters	2 weekly replacement
<b>Odour control</b>	
Ultra violet odour control	4 weekly clean, annual lamp replacement
Adsorption – activated carbon filter	4 to 6 month filter replacement
Wet scrubbing – spray/venturi/packed tower	Manufacturer dependant
<b>Odour counteraction</b>	
Odour neutralising spray	Manufacturer dependant
<b>Ductwork</b>	
Kitchen extract ductwork	3 to 6 monthly

**Table 3.1: Kitchen Extract System Maintenance Requirements**

## 4 – Acoustics

The acoustic performance of equipment shall satisfy the requirements of the site wide acoustic performance criteria.

## 5 – Relevant Standards

All extract canopies and associated ductwork are to comply with DW172.

Local authorities regulations regarding contamination and odour control shall also be adhered to.