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1. VENTILATION SYSTEM DESIGN

1.1 Proposed Ventilation Systems As confirmed by the applicant (refer email Appendix B), the proposed menu will comply with the Council condition regarding no 'cooking, frying etc. In this respect an odour risk assessment has not been carried out here, however, an extract system suitable for the proposed facility shall be installed within the kitchen area. The proposed ventilation systems shall comprise the following:

Supply: For Fresh-air supply, there one single phase acoustic 315 mm in line fan is used. Fresh air supply ductings are designed to connect extractor hood with proper sealants. 4 outlet vent grills mounted on extractor hood to keep homogeneous air flow.

Extract: New canopy located above main cooking equipment, approximate dimensions 5400 x 1200 x 300mm high complete with grease filter baffles.

Extract duct routed at high level within kitchen and rise through roof. External extract fan and discharge at high-level via cowl.

Control: The extract fan is to be controlled by electronic speed control to provide varying airflow and ensure containment of cooking odours within the kitchen area. The sketch below shows the proposed extract arrangement:

1.2 Calculation of Extract Rate Refer document EMAQ 2018 'Control of Odour and Noise from Commercial Kitchen Exhaust Systems'. Whilst this document is primarily concerned with control/mitigation of odour effects (not being considered here), it also provides useful design information for kitchen ventilation rates.

METHOD RECOMMENDED BY DW/172

1. *Thermal Convection Method: Each appliance is assigned a thermal convection coefficient, which is multiplied by a factor dictated by its mode of heating (gas or electricity) to generate a convection value. Values for individual appliances are summed to determine the required ventilation capacity. More detailed description and input data are given in BESA DW/172 and CIBSE guide B2.*

Several other methods could be used to calculate the vent rates:

2. **Face Velocity Method:** Capture velocity for the level and type of loading is multiplied by canopy face area to determine the required ventilation rate. Velocities for light, medium, and heavy loading are 0.25, 0.35, and 0.5 m/s, respectively.
3. **Appliance Power Input:** Each appliance is assigned a ventilation rate, which is multiplied by the power input in KW to determine the required air flow rate. Individual flow rates in m³/s are added to calculate the total flow rate for a system. More detailed description and input data are given in CIBSE guide B.
4. **Air Changes Method:** A per hour vent rate equivalent to 40 times the ventilation volume is considered minimum for comfort under normal conditions, but rates as high as 60-120 volumes per hour may be required where high-output equipment is densely located. Using this method air may be extracted via both a hood extract and a ceiling extract.
5. **Linear Extract Method:** Each linear meter of active filter length is assigned a vent rate depending on the vent canopy type.
6. **Meals Method:** Extract rate in litres/sec is expressed as 10-15 times the number of meals served per hour.
7. **Area Method:** Area of the cooking space in m² is multiplied by 15-20 litres/sec to give an approximate volume flow rate.

A commercial kitchen where no cooking takes place is classified as a Preparation Area and should be ventilated at a rate of at least 20 air-changes per hour.

1.2.1 Kitchen Air Change Rate Refer EMAQ guidance Table regarding kitchen where medium (Mediterranean-Tapas) cooking is taking place. This is an acceptable air change rate for what is a medium loaded commercial kitchen. The kitchen extraction will therefore be sized on 40 air changes per hour.

1.2.2 KITCHEN AIR CHANGE RATE CALCULATION

Recommended ACH (Air Change rate per Hour.) = 40

Room size: 5.4m L, 3.6m W, 2.5m H

Room Volume : $5.4 \times 4 \times 2.5 = 54 \text{ m}^3$

Air Flow Rate = $\text{ACH} \times V = 40 \times 54 = \mathbf{2160 \text{ m}^3/\text{h}}$

Calculations with Air Velocity method:

For medium loaded commercial kitchen required velocity rate is :

Extractor hood area: $5.4 \text{ m} \times 1.2 = 6.48 \text{ m}^2$

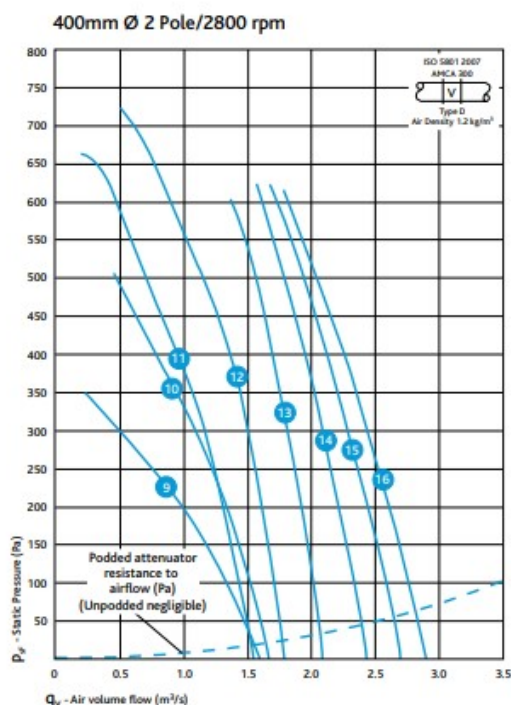
Recommended air flow rate: $2.88 \times 0.35 = 2.27 \text{ m}^3/\text{s}$

$2.27 \text{ m}^3/\text{s} = \mathbf{8164 \text{ m}^3/\text{h}}$

So based on two calculations, if we choose a fan which air flow rate is greater than $3600 \text{ m}^3/\text{h}$, can provide over 40 ACH rate and enough air velocity for 2.4 m Long commercial extractor hood.

400mm Ø - 2 Pole/2800 RPM																					
9	AX40A-211	25°	2820	27	NAV2	71	0.37	3	13.5	0.37	1.0	3.5	82	87	81	79	74	69	67	54	-
10	AX40B-211	25°	2810	28	NAV2	71	0.55	4.1	17.1	0.37	1.0	3.5	79	89	85	81	78	74	71	57	-
11	AX40M-21*	20°	2850	31	NAV2	80	0.75	5.5	21.2	0.75	1.8	9.4	81	89	83	84	79	75	72	57	-
12	AX40F-21*	25°	2880	38	NAV2	90	1.5	9.5	44.7	1.5	3.5	24.5	78	82	86	83	81	78	74	58	-
13	AX40I-223	30°	2875	39	NAV2	90	-	-	-	1.8	3.7	28.9	82	81	89	84	80	78	75	61	-
14	AX40I-233	35°	2875	39	NAV2	90	-	-	-	1.8	4.2	28.9	85	83	90	84	80	75	70	62	-
15	AX40I-243	40°	2870	41	NAV2	90	-	-	-	2.2	5	31.5	88	86	92	85	81	76	72	63	-
16	AX40I-253	45°	2870	44	NAV2	100	-	-	-	3	6.8	51	92	87	90	90	85	80	76	63	-

Selected fan, Nuaire 3 phase 2 pole, AXF40L-253 (NO:16),can provide around $2.8 \text{ m}^3/\text{s}$, $10080 \text{ m}^3/\text{h}$ airflow.



2. ODOUR CONTROL

For odour and smoke control due to residual properties around kitchen, we recommended here to use activated carbon filters for medium loaded kitchens (Low - Most Pubs, Italian, French, Pizza or Steakhouse)

Extractor system includes grade 50 panel filter for odour control which is suitable for low-medium loaded kitchens. System also includes series of Stainless steel buffer grease filters inside the extractor hood and mesh filter inside the filter box.

3. NOISE CALCULATIONS:

For noise control due to houses around kitchen, there used sound reducer, anti-vibration kits and flexible connection to eliminate extra sound coming from vibration.

Under full speed of Fan, expected sound level is 77 db (shown on graphic below)

ELECTRICAL & SOUND																						
Curve No	Unit Code	Blade Angle°	Speed RPM	Unit kg	A.V. Set	Motor frame size	1 Phase (230V-50Hz)			3 Phase (400V-50Hz)			In-duct inlet sound power levels dB re 1pW								Breakout dBA	
							Motor kW	FLC amps	SC amps	Motor kW	FLC amps	SC amps	Octave band mid frequency Hz								@ 3m	E
													125	250	500	1K	2K	4K	8K			
400mm Ø - 4 Pole/1440 RPM																						
1	AX40A-411	25°	1390	25	NAV2	63	0.12	1.2	3.4	0.12	0.10	1.2	74	66	65	62	62	56	46	40	-	
2	AX40E-411	25°	1390	26	NAV2	63	0.12	1.2	3.4	0.12	0.10	1.2	75	69	66	64	64	58	49	41	-	
3	AX40D-411	25°	1390	26	NAV2	63	0.12	1.2	3.4	0.12	0.10	1.2	71	81	69	66	65	59	51	49	•	
4	AX40I-411	25°	1430	30	NAV2	71	0.25	2.2	9.5	0.25	0.77	2.3	72	77	73	69	67	63	54	45	•	
5	AX40I-421	30°	1430	30	NAV2	71	0.25	2.2	9.5	0.25	0.77	2.3	69	76	70	66	64	60	53	44	•	
6	AX40I-431	35°	1430	31	NAV2	71	0.37	2.9	11.6	0.37	1.06	3.5	72	79	70	67	63	58	53	45	•	
7	AX40I-441	40°	1430	31	NAV2	71	0.37	2.9	11.6	0.37	1.06	3.5	76	77	70	68	64	60	55	45	•	
8	AX40I-451	45°	1430	31	NAV2	71	0.37	2.9	11.6	0.37	1.06	3.5	76	77	71	69	64	60	55	46	•	
400mm Ø - 2 Pole/2800 RPM																						
9	AX40A-211	25°	2820	27	NAV2	71	0.37	3	13.5	0.37	1.0	3.5	82	87	81	79	74	69	67	54	-	
10	AX40B-211	25°	2810	28	NAV2	71	0.55	4.1	17.1	0.37	1.0	3.5	79	89	85	81	78	74	71	57	-	
11	AX40M-21*	20°	2850	31	NAV2	80	0.75	5.5	21.2	0.75	1.8	9.4	81	89	83	84	79	75	72	57	-	
12	AX40F-21*	25°	2880	38	NAV2	90	1.5	9.5	44.7	1.5	3.5	24.5	78	82	86	83	81	78	74	58	-	
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15	AX40I-243	40°	2870	41	NAV2	90	-	-	-	2.2	5	31.5	88	86	92	85	81	76	72	63	-	
16	AX40I-253	45°	2870	44	NAV2	100	-	-	-	3	6.8	51	92	87	90	90	85	80	76	63	-	

To calculate sound levels,

400mm silencer with pod total length 2x600mm: average calculated sound level is -21 dB (from 63Hz to 8kHz)

From this calculation, estimated background sound level is (with other pub-stores etc.) is 58dB (working Hours)

Estimated Sound level:

Location	Specific Noise Level from System dB	Extra Noise Level Rating dB	Expected Noise Level dB	Expected Background Noise Level dB	Difference dB
Around kitchen area,	42	+3	45	50	-5