
General

The information below is a summary of the kitchen extract system serving the residential care home facility at Pine Marten Close, Pagham.

The report shall address items raised in the document EMAQ+ Control of Odour and Noise from Commercial Kitchen Exhaust Systems (05/06/2022). Specifically, the Best Practice for Design and Operation section.

Summary of kitchen use

Type of food to be served:

Mainly staple British classics like Soups, Casseroles and Pies. Occasionally pasta and curry type dishes.

Number of meals to be served a day:

Breakfast, lunch and Dinner will be served every day.

Maximum of 80 people served at each service when the home is full.

Methods of Cooking:

The kitchen will be equipped with an electric induction 6 hob stove/oven, 1 x 10 grid Combi Oven and 1 x Twin Fryer.

Most of the cooking will be done on the stove or in the Combi oven.

Fryers will occasionally be used to fry chips and do Fish on Fridays.

Hours of Operation:

Cooked Breakfast will be served approx' 8am-10am

Lunch will be cooked and served approx' between 10.30-12.30

Dinner will be cooked and served approx' between 15.30-17.30

Kitchen will only be used during these hours of cooking so no anti-social hours.

Baffle filtration will be used on the canopy and will be commercially cleaned six monthly.

Stack type discharge used – extracted air is discharged vertically at the highest point on the site.

Ventilation

The kitchen internal temperature will be maintained below 26degC. The kitchen has two 7.1kW wall mounted cooling units which are occupant controlled.

Ventilation equipment is installed at roof level, remote from the kitchen workspace. Inline attenuation is installed where required.

Fresh supply/make-up air is c.85% of the extract to maintain a clean to dirty pressure profile. Incoming air is filtered and tempered.

The total kitchen extract rate is 1.6m³/s. This equates to 43 air changes per hour at full duty. This system is speed controllable locally, therefore during times of light use this extract rate will be adjusted down by the end user.

Canopy

The system is designed and installed in accordance with the guidance document BESA DW/172, therefore the canopy flow rate is based on the thermal convection method.

The canopy and kitchen layout drawings attached from James S. Scott. The canopy has integrated removable grease separators to ensure grease / particulate is caught.

The face velocity over the canopy area is c.0.32m/s at full speed.

Refer to the canopy drawings to confirm the dimensions and overhang complies.

The canopy is constructed of stainless steel.

Ductwork

Ductwork is designed and will be installed in accordance with BESA DW172.

Duct velocity on the extract system is 8m/s in the main runs.

The ceiling is accessible; ductwork will have access hatches for cleaning in accordance with DW172. The ductwork is fire rated due to a small void in the ceiling build up.

Fan

A vertical discharge fan is used, which is a specifically designed unit for this purpose (see attached brochure and selection). The fan is backward curved, centrifugal type .

The fan will be commissioned and set at 85%-90% to achieve full duty.

The fan temperature spec:

Vertical up blast (Dual Purpose) roof composite mounted extract fan, suitable for continuous operation up to a maximum temperature of 200°C & once off emergency extract 400°C for a maximum period of 2 hours.

The kitchen fans are located on the roof where plant access is available via roof hatch and access walkway. Space is allowed for routine inspection and maintenance.

The system will be installed in accordance with the BESA and CIBSE guidance on air leakage. The extract fan is at the end of the system therefore all internal ductwork is under negative pressure.

Air is ejected vertically to allow maximum air dispersal.

The fan is located at roof level, c.11.5m above ground level, in excess of the 15 meter distance from adjacent properties required in the EMAQ+ guidance page 45, section 4.7.9 which states:

...Guidance on minimum stack height ranges from:

- a) 1m above the eaves of the premises and / or above any dormer*
- b) 1m above ridge height of any building with 15m and,***
- c) low level discharge should be avoided.....*

The fan itself is constructed to minimise breakout noise, the acoustic information is noted in the manufacturer's brochure. Noise is analysed below.

Odour

In accordance with section 4 of the EMAQ+ document (particularly section 4.7.9 'stack' and table 12), the 'stack' method has been applied to ensure odour does not affect adjacent properties.

This method has been selected over the others due to the height of the structure at 11.5m and therefore the placement of the vertical discharge fan.

The distance from the nearest domestic property is c. 54m from the fan measured horizontally. In addition, the discharge is c.8m above the roof level of the nearest dwelling.

The Odour risk assessment figure below as per Appendix 3 in the EMAQ+ document:

Dispersion: Good - 5 (Discharging above eaves at 15m/s)

Proximity: Medium - 5 (closest dwelling is 54m)

Size of kitchen: Medium - 3 (max 80 covers)

Cooking type: Medium - 4 but leaning towards 1 (see description under the general summary above)

This gives a total odour risk figure of 17.

With reference to the formula noted on page 45, $\Delta H = 3W.D/U$

$$W/U = 15/4.8 = 3.2.$$

$$\Delta H = 3 \times 15 \times 0.4/4.8$$

Therefore $\Delta H = 3.75m$.

Noise

Ventilation equipment is installed at roof level, remote from the kitchen workspace. This system is speed controllable locally, therefore during times of light use this extract rate will be adjusted down by the end user. Refer to the summary above for details of operating hours confirming no operation at anti-social times. Referring to the fan selection document, the Sound Power level at the given operating point of the fan outlet is 64dB, at 3m (hemispherical).

From this, using the formula $L_w = L_p + 10 \cdot \log(A/A_0)$

Where:

L_w – Sound Power Level

L_p – Sound Pressure Level

A – Measurement of the surface Areas of the Source (71m²)

A_0 – Reference area of 1m²

with:

- $L_w = 64$ dB
- $A = 71$ m²
- $A_0 = 1$ m²

$$L_p = 64 - 10 \log_{10}(71)$$

$$\log_{10}(71) \approx 1.851$$

$$L_p = 64 - 18.51 \approx \boxed{45.5 \text{ dB}}$$

Converting sound power to pressure we get a Sound Pressure Level of 45.5dB.

Using that Sound Pressure Level and the inverse square law:

$$(L_p(R_2) = L_p(R_1) - 20 \cdot \log_{10}(R_2/R_1))$$

Where:

$L_p(R_1)$ = Known sound pressure level at the first location (typically measured data or equipment vendor data)

$L_p(R_2)$ = Unknown sound pressure level at the second location.

R_1 = Distance from the noise source to location of known sound pressure level (3m)

R_2 = Distance from noise source to the second location to calculate the reduction in sound pressure due to the distance to the nearest receptor 54 metres away from source.

- $L_p(R_1) = 45.5$ dB
- $R_1 = 3$ m
- $R_2 = 54$ m

$$\frac{R_2}{R_1} = \frac{54}{3} = 18$$

$$\log_{10}(18) \approx 1.2553$$

$$20 \times 1.2553 \approx 25.1 \text{ dB}$$

$$L_p(R_2) = 45.5 - 25.1 \approx 20.4 \text{ dB}$$

$$\boxed{L_p(54 \text{ m}) \approx 20.4 \text{ dB}}$$

The sound pressure level at 54m from the source is 20.4dB.

Fire

The kitchen is covered by the building sprinkler system.

An ANSUL gas fire suppression system is installed under the canopy.

No wood burning appliances are proposed.

Maintenance.

Periodic plant maintenance will be carried out by the end user in accordance with the manufacturer's recommendations.

Periodic cleaning will be carried out by the end user in accordance with their cleaning regime. As noted above this interval will be six months.