



MECHANICAL EXHAUST VENTILATION SPECIFICATIONS FOR FOOD PREMISES

MECHANICAL EXHAUST SYSTEMS SPECIFICATIONS

REFERENCE: Australian Standard AS 1668.2 - 2002
"The use of mechanical ventilation and air-conditioning in buildings"
"Part 2: Mechanical ventilation for acceptable indoor-air quality"

NOTE: Approval must be sought from the Regulatory Authority for any variation from these Standards and especially in relation to air discharge points.

AIM: To achieve acceptable indoor air quality for enclosures in which contaminants are generated or are contained and need to be extracted.

APPLICATION OF THIS CODE:

GENERAL:

The application of this code relates to mechanical exhaust ventilation systems that are designed to remove heated air, with or without water or grease vapour produced by cooking and heating devices and such equipment that the Regulatory Authority deems appropriate.

The information in this code is taken from the above referenced standards but for the purpose of clarity only specifications relating to Type B effluent (Kitchen canopies) are included.

The information in this code is for commercial applications within food premises. For low scale situations where for example an individual appliance does not exceed 8 kW (electrical) or 29 MJ/h (gas) input, may be able to have a lesser requirement (subject to Council's Environmental Health office approval); However this does not apply to deep frying appliances.

Microwave cookers and similar low power cooking equipment used for commercial purposes, which are used infrequently or used solely for the purpose of reheating food shall be exempt this requirement.

In the design of the mechanical exhaust system, make up air to counter air removal is required to be incorporated.

ACTIONS REQUIRED:

1. Submit to Council detailed plans and specifications and obtain approval of proposed work prior to commencing any works.
2. Two copies of plans, showing overall layout in a scale of 1:100 and details of the canopy, ductwork and other fitting in a scale of 1:20 or similar dimensions. Drawings should include the following details:-
 - the angle of the hood sizes to the horizontal
 - the height of the hood above the cooking appliances
 - the number, size, type and capacities (megajoules or kilowatts) of cooking facilities to be ventilated
 - the number, size and type of filters and the angle of installation
 - the condensate gutter and drain plug
 - all ducting showing size, length, bends, inspection openings, sumps and dampers
 - height of termination above roof, position in relation to adjoining premises and cowl
 - exhaust fan type, capacity, mounting and situation within the system, and
 - Details of wall surfaces adjacent to canopy.

METHOD:

EFFLUENT REMOVAL GENERAL REQUIREMENTS: The removal of effluents by means of local exhaust shall be as follows: -

1. The effluents shall be collected as they are being produced, as close as practical to the source of generation, using special surroundings, hoods, surface mounted exhaust air intakes or other approved means. The airflow rates shall be such as will ensure positive capture and removal of all effluents.
2. Local exhaust airflow rates shall be in accordance with relevant Australian Standards the relevant requirements of any regulatory authority shall be complied with. If these do not apply, then contact the authority for further direction.
3. Canopy exhaust extraction may complement normal premises ventilation exhaust when satisfactorily designed, and may be substituted for that ventilation when the canopy exhaust quantity exceeds the quantity required of the premises.
4. Make-up air openings or mechanical ventilation system air outlets to an enclosure, in which an exhaust hood is situated, shall be distributed and designed so as not to be detrimental to the performance of the hood, or cause excessive cross-draughts over any apparatus required to be ventilated.
5. Sufficient airflow shall be suitably distributed over exhaust hoods to effectively capture and convey all convected heat fumes and other aerosols to hood exhaust openings.

5.4 KITCHEN EXHAUST HOODS

5.4.1 General

Requirements for low velocity air-filtered kitchen exhaust hoods are set out in this Clause for the four common types and configurations of hoods that apply to the five most common types of cooking processes. Clause 5.5 sets out a prescriptive procedure for hood design and Clause 5.6 sets out an engineered procedure for hood design. Required kitchen exhaust hoods shall comply with Clause 5.5 or 5.6, and Appendix C. Appendix C sets out construction and installation requirements for these hoods.

Alternative exhaust hood designs including proprietary designs and specialised (application specific) designs may be used provided that it can be established that the performance of such hoods is at least equivalent to the hoods described in this Section.

***C5.4.1** This Clause sets out two procedures for hood design, a prescriptive procedure and an engineered procedure. The prescriptive procedure does not allow for cooking process diversity and the entire hood is required to be designed on the worst case cooking process type under the hood. The engineered procedure does allow for cooking process diversity and each section of hood may be individually calculated using the appropriate cooking process factors. Where the hood being designed does not incorporate cooking process diversity, the engineered procedure may produce a higher ventilation requirement than the prescriptive procedure. The prescriptive procedure should be used in these cases.*

5.4.2 Hood and cooking process types

5.4.2.1 General

The four common types and configurations of hoods and the five types of cooking processes are defined in Clauses 5.4.2.2 and 5.4.2.3.

5.4.2.2 Hood type nomenclature

Hood type nomenclature is as follows:

- (a) *Hood Type 1* Low sidewall (see Figure C3)—where the canopy does not extend at least 150 mm beyond the edge of the cooking surface.
- (b) *Hood Type 2* Corner-mounted (see Figure C4)—subject to a maximum length to

width ratio of 2:1.

(c) *Hood Type 3* Sidewall (see Figure C5).

(d) *Hood Type 4* Island (see Figure C6).

NOTE: See Appendix C for typical sketches of hood types.

5.4.2.3 Cooking process type nomenclature

Cooking process type nomenclature is as follows:

(a) *Process Type 1*—Non-grease producing equipment and void spaces under the hood, which serve to ventilate other cooking equipment.

(b) *Process Type 2*—Low-grease, medium-heat producing equipment such as griddles, ranges, conventional fryers, tilting skillets, steam kettles and gas ovens.

(c) *Process Type 3*—High-grease, low-heat producing equipment such as electric deep-fat fryers, grooved griddles, hot tops and hot top ranges.

(d) *Process Type 4*—High-grease, medium-heat producing equipment such as countertop barbecues and gas-fired deep fat fryers.

(e) *Process Type 5*—High-grease, high-heat producing equipment such as woks, salamanders, and open flame charcoal equipment utilising solid fuel.

5.4.3 Dishwashing hoods

Where an exhaust hood is located over a dishwashing machine, air filtration is not required and the exhaust airflow rate shall provide a hood face velocity of not less than 0.3 m/s.

5.4.4 Proprietary exhaust allowance

Where kitchen appliances are provided with proprietary exhaust systems, that is, exhaust spigots ready for connection to an exhaust system, the exhaust airflow rate shall be in accordance with the manufacturer's requirements. Separate exhaust hoods may not be required in this case (see Clause 5.4.1).

5.4.5 Charcoal and solid fuel appliances

All hoods and associated exhaust systems for use over charcoal and solid fuel appliances shall be provided with separate systems, and shall not be combined with a system serving grease- or oil-generating or oil-heating appliances.

NOTE: Where the exhaust air is likely to significantly pollute the outdoor air, the exhaust discharge may be required to be treated to reduce the concentration of contaminants. Reference to pollution control authorities is recommended for requirements relating to the quality and concentration of discharge contaminants.

5.5 KITCHEN EXHAUST HOOD AIRFLOW—PRESCRIPTIVE PROCEDURE

The exhaust airflow rate (Q) for a hood shall be calculated using one of the equations set out in Table 5.1. The particular equation used in calculating the exhaust airflow rate shall be dependent on the worst case. For example, where a Type 4 cooking process is located under the same hood as a Type 2 cooking process, the equation applicable to the Type 4 cooking process shall be used for the entire hood. The calculated exhaust airflow rate shall never be less than 300 L/s per square metre of cooking surface.

NOTE: For oven applications, the cooking surface area is deemed to be equivalent to the oven door area.

The equations of Table 5.1 are based on a minimum overhang, beyond the edge of the cooking surface or point (location) of discharge of effluent if not from cooking surface, of 150 mm for cooking process Types 1 to 4 and 300 mm for cooking process Type 5. The face of Type 1 hoods shall not exceed a maximum horizontal setback of 300 mm from the leading edge of the kitchen appliance. The length of the hood shall not be less than the length of the kitchen appliance.

NOTE: Fan-forced cooking appliances may require more detailed consideration of overhang due to the increased penetration of the effluent into the enclosure.

**TABLE 5.1
CALCULATION OF MINIMUM HOOD EXHAUST AIRFLOW RATE**

	Cooking process			
Hood Type	Type 1 and Type 2	Type 3	Type 4	Type 5
Hood Type 1 Low sidewall	Q= 400 x L	Q= 600 x L	Q= 800 x L	Q= 800 x L
Hood Type 2 Corner mounted				
Hood Type 3 Sidewall	Q= 190 x P x H	Q= 250 x P x H	Q= 375 x P x H	Q= 375 x P x H
Hood Type 4 Island				

LEGEND:

- Q = exhaust airflow rate, in litres per second
- L = length of hood, in metres
- P = inside perimeter of hood over all exposed sides, in metres
- H = height of hood above cooking appliance, in metres

5.6 KITCHEN EXHAUST HOOD AIRFLOW — ALTERNATIVE PROCEDURE

NOTE: The alternative procedure should only be applied to cases where two or more cooking appliances are grouped together under one exhaust hood. Where a single appliance is provided with a dedicated hood, the prescriptive procedure should be applied.

5.6.1 Low sidewall hoods (Hood Type 1)

The minimum design criteria for systems utilizing low sidewall (backshelf) type exhaust hoods may be calculated as follows:

- (a) 500 L/s.m² of cooking surface for cooking process Types 1 and 2.
- (b) 750 L/s.m² of cooking surface for cooking process Types 3 and 4
- (c) 1000 L/s.m² of cooking surface for cooking process Type 5.

5.6.2 Corner, sidewall and island hoods (Hood Types 2, 3 and 4)

The minimum design criteria for exhaust air quantities of island and sidewall type hoods may be calculated using the following equation:

$$Q = 5 \times v_f \times P \times H$$

where

- Q = exhaust airflow rate, in litres per second
 - v_f = velocity factor of each cooking appliance
 - P = inside perimeter of hood over all exposed sides of each piece of equipment, in metres
 - H = vertical distance from the top of cooking appliance to the lower edge of the hood, in metres
- Velocity factors shall be used as applicable to each cooking appliance under the hood see Table 5.2:

**TABLE 5.2
VELOCITY FACTORS APPLICABLE TO EACH COOKING APPLIANCE UNDER A HOOD**

Velocity factors v _f	Cooking process type
150	1
250	2
375	3
500	4
750	5

5.10 AIR DISCHARGES

5.10.1 General

All exhaust air shall be discharged to atmosphere in such a manner as not to cause danger or nuisance to occupants in the building, occupants of neighbouring buildings or members of the public. For the purpose of this Standard, any of the discharges at the flow rates specified in Table 5.3 shall be deemed to contain objectionable effluent.

Discharges that are not deemed to contain objectionable effluent shall comply with Clause 5.10.2 and discharges that are deemed to contain objectionable effluent shall comply with Clause 5.10.3.

**TABLE 5.3
OBJECTIONABLE EFFLUENT DISCHARGES**

Exhaust-air discharge	Flow rate
Type B effluent	> 1000 L/s (see Clause 5.10.3)

5.10.2 Discharges not deemed objectionable

Air discharges that are not deemed to contain objectionable effluent (see Clause 5.10.1) shall be—

- (a) located and arranged so that the effects of wind, adjacent structures or other factors do not cause the exhaust airflow rates to be reduced below the minimum requirement of this Standard;
- (b) not less than the distance given in Table 5.4 from any outdoor-air intake opening, natural ventilation device or opening;
- (c) emitted to the outside at velocities and in a direction that will ensure, to the extent practicable, a danger to health or a nuisance will not occur; and
- (d) not less than the distance given in Table 5.4 from the boundary to an adjacent allotment, except that where the dimensions of the allotment make this impossible, then the greatest possible distance shall apply.

NOTES:

- 1 The choice of a suitable method of discharging air depends on a number of local and environmental factors as well as the nature and quality of the effluent and the direction and velocity of the discharge. Generally, it is preferable to discharge exhaust air upwards in a vertical or near vertical direction above the roof. Discharges that extend less than 2 m above a thoroughfare or roof subject to regular traffic are not recommended. Where discharge extends less than 3 m above a pedestrian thoroughfare, the discharge should not create a nuisance.
- 2 Where large, relatively clean or high velocity discharges are soundly engineered, separations less than specified in Table 5.4 may be acceptable if it can be proved that any such engineered discharge does not significantly pollute the outdoor air.

TABLE 5.4

MINIMUM SEPARATION DISTANCES FROM DISCHARGES TO INTAKES, BOUNDARY OR NATURAL VENTILATION DEVICE

Airflow rate L/s	Minimum distance m
≥1000	6

5.10.3 Discharges deemed objectionable

Air discharges that are deemed to contain objectionable effluent (see Clause 5.10.1) shall be in accordance with Clause 5.10.2 and—

- (a) be arranged vertically with discharge velocities not less than 5 m/s;
- (b) located not less than 6 m from a property boundary, any outdoor air intake opening or any natural ventilation device or opening; and
- (c) treated to reduce the concentration of contaminants when required.

Where it can be demonstrated that special filtration processes will remove the contaminants from the cooking process exhaust gas and prevent exhaust operation if filters are not in place, horizontal discharge of kitchen exhaust of flow rates greater than 1000 L/s may be acceptable. In these cases, the flow rate may be taken as the actual flow rate multiplied by the lowest fractional efficiency of the filtration process.

NOTE: Where the outdoor air is liable to be significantly polluted, Item (d) may be invoked. Reference to pollution control authorities is recommended for control requirements relating to concentration of contaminants.

5.10.4 Non-required discharges

Spill air and relief air shall be discharged to atmosphere in such a manner as not to cause nuisance to occupants in the building, occupants of neighbouring buildings or members of the public.

Where air that has ventilated enclosures within the building is discharged from the building, it may re-enter the ventilation system provided that the net inflow of uncontaminated outdoor air is not less than that required by Section 4.

***C5.10.4** This provision allows a non-required air discharge point to be located closer to an outdoor air intake point than would be allowed for a required exhaust air discharge point and would apply to non-required design provisions such as those applied to an economy air cycle.*

APPENDIX C KITCHEN EXHAUST HOODS (Normative)

C1 SCOPE

This Appendix sets out requirements for the construction and installation of kitchen exhaust hoods where their provision is required under Clause 5.4.

C2 APPLICATION

Where a kitchen exhaust hood is required, it shall comply with Paragraphs C3, C4, and C9, and, where grease vapour is present, it shall also comply with Paragraphs C5 or C6 and Paragraph C7.

C3 HOOD CONSTRUCTION

C3.1 General

Hoods shall be designed—

- (a) to capture cooking vapours and associated products of combustion;
- (b) to exhaust cooking vapours and associated products of combustion together with dilution air;
- (c) to prevent condensate falling onto the food, cooking appliance(s) or the floor;
- (d) to permit easy access to cleaning spaces where condensate may accumulate;
- (e) with vertical flat sides where walls abut; and
- (f) to be free of insulation material on the internal surface of the hood or exhaust plenum between the hood and connecting duct.

C3.2 Manufacture

Hoods shall be manufactured from rigid impervious hard-faced material not deemed combustible when tested in accordance with AS 1530.1, such as steel or stainless steel, reinforced where necessary to provide stability and rigidity with smooth-faced liquid-tight seams and joints made by appropriate methods, such as the following:

- (a) Continuous welding.
- (b) Grooving or lapping, riveting and continuous soldering.
- (c) Continuous jointing and sealing with an appropriate compound unaffected by grease, water or cleaning agents that are in compression at the joint.

C3.3 Openings

Exhaust openings in hoods shall be—

- (a) suitably located in relation to the types of cooking and heating appliances being ventilated and positioned so that a uniform capture velocity is maintained;
- (b) not more than 500 mm from the extremities of the exhaust plenum, not more than 1 m apart, and of dimensions that permit access into the exhaust plenum for cleaning purposes (refer to Figure C4); and
- (c) designed to prevent condensate from the top surface of the exhaust plenum or duct from falling through the exhaust opening.

NOTE: Removable panels between filters provide easy access to exhaust plenum for cleaning.

C3.4 Internal surface

C3.4.1 Sloping

All surfaces of hoods exposed to the appliance being ventilated shall be sloped at an angle not greater than 40° from the vertical (see also Paragraph C5), unless the design and performance of hoods prevent the formation of any condensate on such surfaces.

C3.4.2 Profile

The surfaces of the canopy hood exposed to the appliance being ventilated shall be free of stiffeners or any protrusions, other than fire-extinguisher heads, which shall be installed in accordance with AS 3772.

C3.4.3 Hood gutters

Hood gutters not less than 50 mm wide and not less than 25 mm deep shall be provided around the lower edges of canopy-type hoods and shall include 25 mm minimum diameter drainage holes fitted with removable caps.

For low sidewall hoods, grease may be drained into removable collection containers.

C3.4.4 Distance from grease gutter to perimeter of appliance

In a canopy-type kitchen exhaust hood, the inside edge of the grease gutter shall be not less than 150 mm beyond the plan perimeter of the appliance over which the hood is installed for cooking process Types 1 to 4 and 300 mm for cooking process Type 5, except on sides adjoining a wall.

C3.4.5 Internal lights

Where fitted, internal light fittings shall be flush mounted.

NOTE: Access from the outside face of the hood avoids disturbing the vapour seal to the inside face of the hood during servicing.

C4 HOOD INSTALLATION

The lower edge of a canopy-type kitchen exhaust hood shall be not less than 2 m above floor level at the operator side of the appliance being ventilated and no higher than 1.2 m above the cooking appliance.

C5 KITCHEN EXHAUST HOODS INCORPORATING GREASE-ARRESTING FILTERS

Hoods shall incorporate a device that will impede the process of grease within the airstream in accordance with the following:

- (a) Filter media and holding frame shall be constructed of rigid material not deemed combustible when tested in accordance with AS 1530.1.
- (b) The number, size and distribution of the filters shall be such that the air temperature and flow rate through each filter is within the manufacturer's design limits.
- (c) Filters shall be installed so as to prevent significant leakage of air around their perimeter.
- (d) The faces of filters shall be either vertical or sloped at an angle not greater than 30° from vertical.
- (e) The filters shall be fitted at exhaust openings of the hood so that any grease draining from filters is collected and disposed of without spilling or otherwise contaminating the kitchen area (for example, filter support channel designed to collect and convey grease into hood gutter).
- (f) The filters and the filter retaining devices shall be flush mounted to comply with Paragraph C3.4.2.
- (g) The filters shall be removable by hand, without the need of tools, for the purposes of their cleaning and the cleaning of the supports and the grease-drainage devices, unless an in situ washing system is provided.

C6 KITCHEN EXHAUST HOODS INCORPORATING GREASE-REMOVAL DEVICES

Kitchen exhaust hoods incorporating grease removal devices other than those in Paragraph C5 shall—

- (a) remove grease from the cooking vapours;
- (b) prevent grease from falling back onto food, the cooking appliance or floor;
- (c) provide for manual or automatic cleaning of grease-trapping devices, and all internal surfaces of the device housing; and
- (d) be demonstrated to capture and remove cooking vapours and grease with efficiency at least equal to that of kitchen exhaust hoods complying with Paragraph C5.

C7 DISTANCE FROM GREASE-ARRESTING DEVICE TO HEAT SOURCE

C7.1 General

Unless otherwise reduced (see Paragraph C7.2), the distance between the lowest edge of a grease-arresting device and the cooking surface shall be not less than—

- (a) 1350 mm—for charcoal and similar type of open fires, including where food is typically ignited during the cooking process;
- (b) 1050 mm—where the heat source is provided by means of a naked flame, e.g. gas stove; and
- (c) 600 mm—where the heat source is provided by electrically operated equipment or a fixed plate or pan above gas flame (e.g., solid grill plate or deep fryer).

C7.2 Reduction of distances

In variation to Paragraph C7.1 the distance of grease-arresting filters from the heat source given in Paragraph C7.1 may be reduced where the kitchen exhaust system is provided with a fire protection system which in the event of fire—

- (a) automatically floods the cooking appliance and the exhaust plenum between the filters and the exhaust duct with fire 'quenching' media; or
- (b) is automatically activated to inhibit fire.

C8 ALTERNATIVE AIR FLOW—EXAMPLES

C8.1 Sidewall hood calculation example

To calculate the required air quantity for the hood shown in Figure C1, use the equation $Q = vfPH$. Velocity factors are as follows:

Kitchen equipment	Velocity factor (<i>vf</i>)
A Range	250
B Gas barbecue	500
C Deep fryer	375
D Steamer	150

For the purpose of this example, the distance (*H*) from the cooking appliance to the bottom of the hood is 1.2 m. The following air quantities are calculated:

Kitchen equipment	Air quantity
A Range	$250 \times 2.1 \times 1.2 = 630$
B Gas barbecue	$500 \times 0.9 \times 1.2 = 540$
C Deep fryer	$375 \times 0.6 \times 1.2 = 270$
D Steamer	$150 \times 2.1 \times 1.2 = 378$ $Q = 1818 \text{ L/s}$

If side skirts or adjacent walls are used, the length of the exposed sides (perimeter) and, therefore, the air quantity may be reduced as follows:

Kitchen equipment	Air quantity
A Range	$250 \times 1.05 \times 1.2 = 315$
B Gas barbecue	$500 \times 0.9 \times 1.2 = 540$
C Deep fryer	$375 \times 0.6 \times 1.2 = 270$
D Steamer	$150 \times 1.05 \times 1.2 = 189$ $Q = 1314 \text{ L/s}$

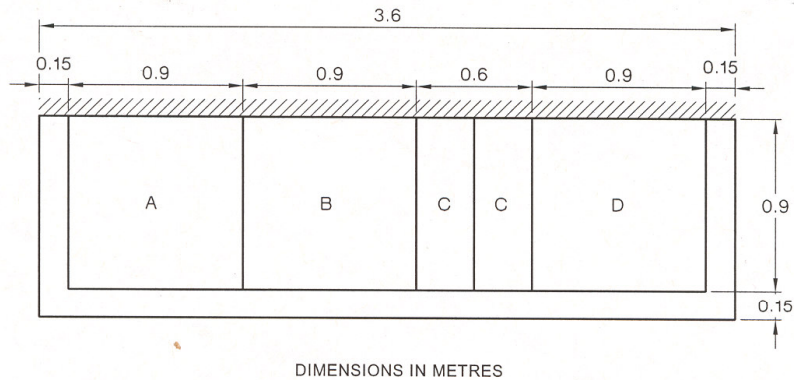


FIGURE C1 PLAN OF KITCHEN EQUIPMENT UNDER SIDEWALL HOOD

C8.2 Island hood calculation example

To calculate the air quantity for the hood shown in Figure C2 use the equation $Q = V_fPH$. Velocity factors are as follows:

Kitchen equipment	Velocity factor (V_f)
A Range	250
B Deep fryer	375
C Hot top range	375
D Charcoal barbecue	750
E Steam kettle	150
F Work table	150
G Oven	150

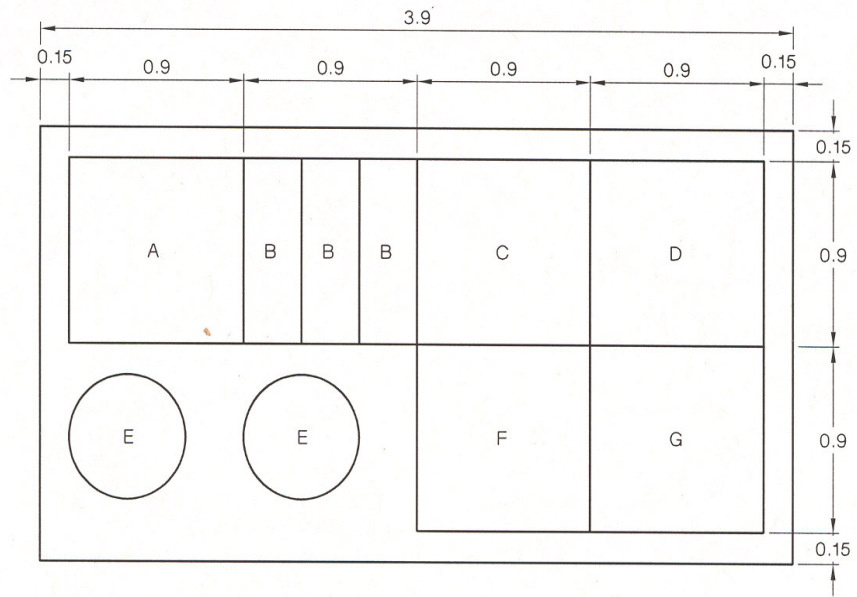
NOTE: Charcoal barbecue is required to have a separate exhaust system and hood.

For the purpose of this example, the distance (H) from the cooking appliance to the bottom of the hood is 1.2 m. The following air quantities are calculated:

Kitchen equipment	Air quantity
A Range	$250 \times 2.1 \times 1.2 = 630$
B Deep fryer	$375 \times 0.9 \times 1.2 = 405$
C Hot top range	$375 \times 0.9 \times 1.2 = 405$
D Charcoal barbecue*	$750 \times 2.1 \times 1.2 = 1890$
E Steam kettle	$150 \times 3.0 \times 1.2 = 540$
F Work table	$150 \times 0.9 \times 1.2 = 162$
G Oven	$150 \times 2.1 \times 1.2 = 378$
	$Q_1 = 2520 \text{ L/s}$
	$Q_2 = 1890 \text{ L/s}$

NOTE: Charcoal barbecue is required to have a separate exhaust system and hood.

If side skirts are used, the length of the exposed sides (perimeter) and, therefore, the air quantity may be reduced.

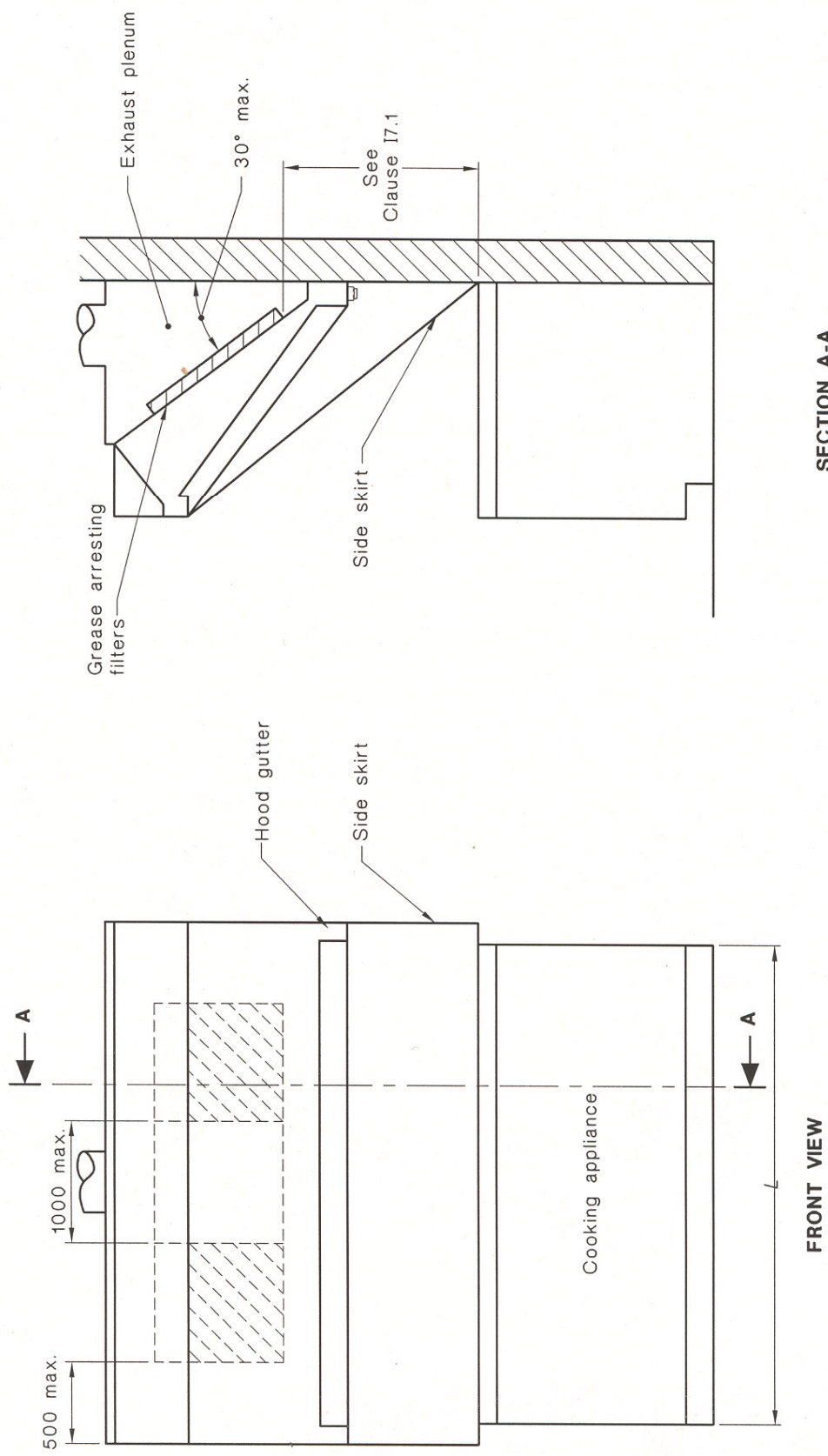


DIMENSIONS IN METRES

FIGURE C2 PLAN OF KITCHEN EQUIPMENT UNDER ISLAND HOOD

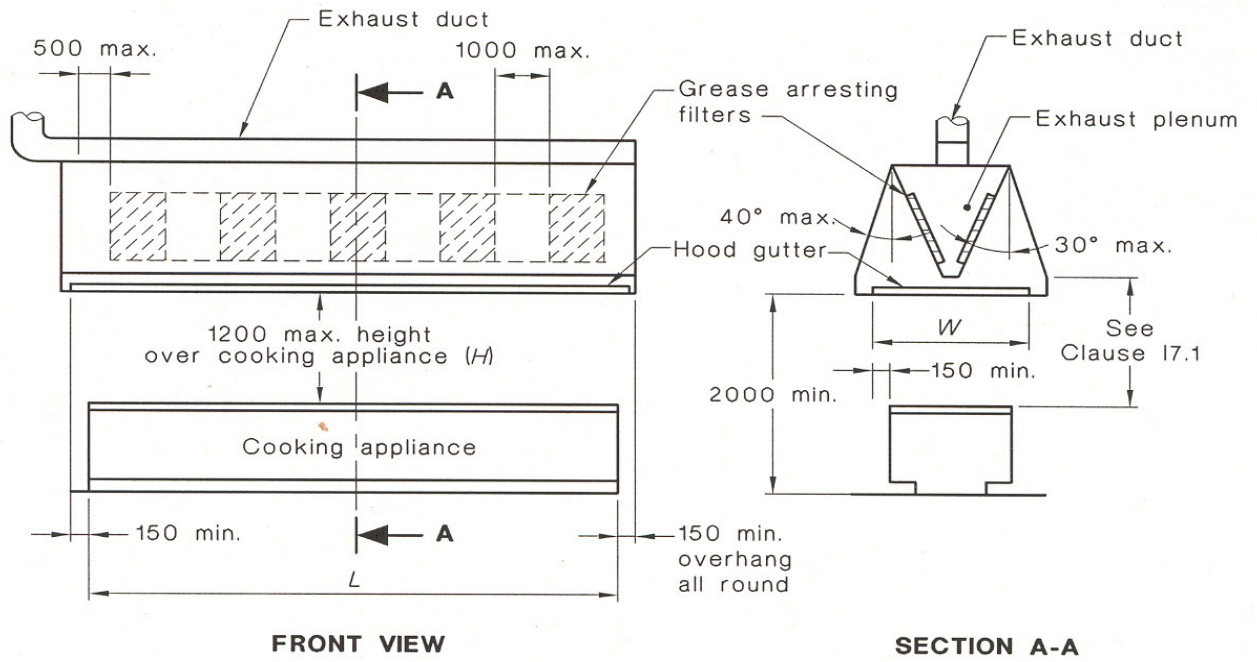
C9 HOOD TYPE NOMENCLATURE

Indicative sketches for common hood types are given in Figures C3, C4, C5 and C6.



DIMENSIONS IN MILLIMETRES

FIGURE C3 TYPICAL LOW SIDEWALL (BACK SHELF) TYPE HOOD INCORPORATING



DIMENSIONS IN MILLIMETRES

FIGURE C6 TYPICAL ISLAND-TYPE CANOPY HOOD INCORPORATING GREASE FILTERS