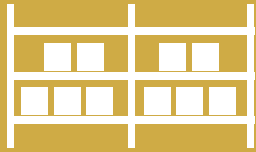


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الهيئة العامة للغذاء والدواء  
العلمية  
العمالة



المطبخ  
الافتتاحي  
البنكي



# SMART KITCHEN

INFRASTRUCTURE GUIDE

PART II - SERVICES AND SPECIFICATIONS





# PREAMBLE

**This guide is divided into three parts**

- I. Spatial planning and requirements
- II. Services and specifications
- III. Layouts and annexes

**Part II** explains the detailed services and specifications including drainage, electrical systems and ventilation considerations. This part is the product of extensive research done by architects and service consultants.

This guide segregates the requirements under three heads for each area:

- **MANDATORY** – Basics (essential and must)
- **RECOMMENDED** – Value addition
- **OPTIONAL** - Convenience

**Note:** All dimensions are in millimeters unless specified otherwise.

**Whenever niyaz thaal are served from the same kitchen; thaal serving and related services must be taken into consideration.**

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# 1. SERVICES

## A. Drainage System

- Effective drainage is vitally important to improve hygiene and needs to be planned as part of the building process. Good drainage mitigates the risk of bacteria.
- With efficient drainage, any FOG (fats, oils and grease) which is put down the drain will be less likely to stick and there is no spillage and overflow.
- In mawaze where the site is not connected to the municipal sewer, septic tank of adequate size should be provided.

### Drainage Types:

#### i. Floor Drainage

Floor drain capacity must be adequate for the intended application. Its capacity is affected by factors like hydraulic head, outlet size, grating design, filter basket or sieve design and any foul air trap provision. It is advisable to specify more capacity than is required to accommodate future increase in use.

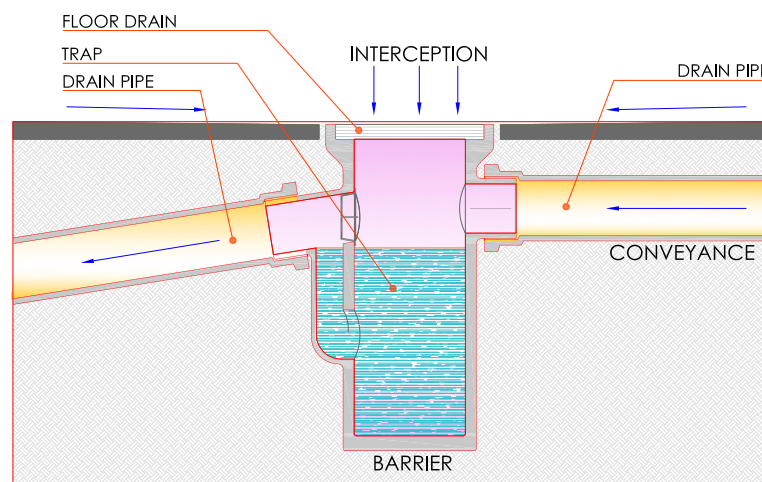


Exhibit 01: **FLOOR DRAIN FUNCTIONS**



## Floor Drainage:

- Floor slope to be 1–1.5% so that it can be easily washed without pooling and splashing of water.
- The surface of all gullies and channels should be such that fluids can be discharged smoothly.

## ii. Drainage Management

- Soiled water is intercepted, conveyed to a gully and discharged into an external drainage system. The waste water contains high amount of FOG, which if not treated properly will lead to blockages in external sewers and result in back flowing of drains. **(Refer Exhibit 01, pg01)**

## Drainage Systems - Key Elements:

### 1. Soil, Waste & Vent Pipes

- Design/installation should ensure bends/tees/junctions have long radius or swept feature to allow easy access for rodding/cleaning jetting function to reduce potential for blockage.
- All underground storm water drainage pipes and sewer lines shall be of RCC pipes.
- Drainage pipe in cooking area should be 75mm and should pass through grease trap.
- Soil, waste, vent anti-siphonage and rainwater pipes shall be cast iron, galvanized steel or PVC conforming to I.S. Codes.
- Pipes and fittings shall be fixed adequately to provide easy accessibility for repair and maintenance.
- Pipes shall be securely fixed to walls and ceilings by suitable clamps at intervals.
- Pipes passing under floors must have a long radius bend fitted to assist cleaning (if it is required).
- If gully is fitted through the floor, trap must give access for rod cleaning of the long radius bend and pipe run.
- Main pipe work within commercial kitchens should be 50mm.
- Short connections of appliances to main pipe work should be 40mm.
- Wash hand basin connections to pipes should be 32mm.
- Minimum clearance of 20 mm shall be provided between wall and pipe to allow cleaning in case of any surface/external piping.



- Extreme care should be taken to ensure walls are not chased too deeply on each side to accept services.
- Connections from fittings should enter walls between 200mm - 250mm from finished floor level.

## 2. Floor Channels

Channels are suitable for large kitchens where wash down is carried out using hoses or large quantities of water.

(Refer Exhibit 02)

### Design considerations:

- Gradient to allow self cleansing velocity for liquids with ideal self-cleansing velocity being 0.75 m/s. Typical gradients are 1%. (1:100) for liquid waste, 2% (1:50) for water-borne solids.
- Width of channels should be a min 200mm wide for wash down installations to avoid back splashing.

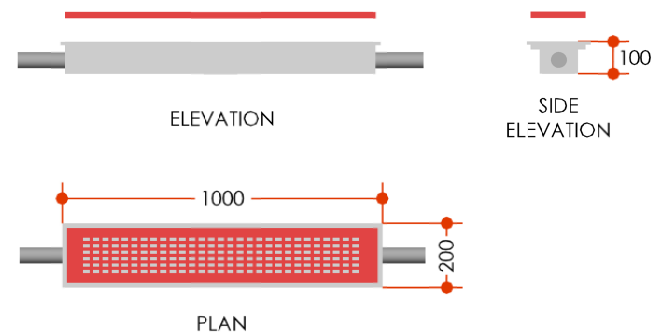


Exhibit 02: **NON-SLIP SQUARE MESH FOR FLOOR CHANNELS**

## 3. Gratings

Gratings are required for direct discharge from equipments. The free drainage area is up to 90% of the surface area achieving a virtually anti-splash installation.

- Standard or heavy duty smooth mesh is recommended for use in general drainage area.
- Non-slip mesh to be used in kitchen, pot wash and preparation areas.



## 4. Traps

There are four types of traps:

### i. FLOOR TRAP

- The minimum depth of water seal should be 50 mm.

### ii. GULLY TRAP

- A gully trap disconnects the kitchen from the building drain by means of a 75 mm water seal, preventing the foul gases entering the kitchen
- Gullies are height adjustable with removable gratings or covers, odor traps, rodding ports and waste baskets, allowing full bore access. Outlets are vertical or horizontal.
- It is recommended that these to be kept to a minimum and wherever possible should have a sealed lid. **(Refer Exhibit 03)**

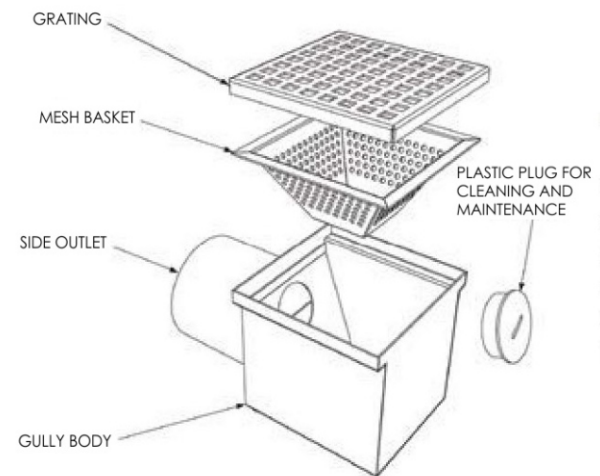


Exhibit 03: **GULLY TRAP**

### iii. GREASE TRAPS/ INTERCEPTORS

A grease interceptor is a device designed to slow the flow of waste water permitting FOG (fats, cooking oils and grease) having a specific gravity of less than 1 to rise to the top. **(Refer Exhibit 04, pg 5)**

- Grease traps must be designed as per site and units connected, to stop FOG from entering drainage system. Lids to stop release of air borne bacteria should be installed.
- All grease interceptors shall be located where they are easily accessible for inspection, cleaning, and maintenance.
- Wastes that do not require treatment or separation shall not be discharged into any interceptor or separator.
- A space of at least 250mm is required above the lid to facilitate cleaning.
- Grease interceptor must have a vented waste, of 15 mm to retain water seal and to prevent siphoning.

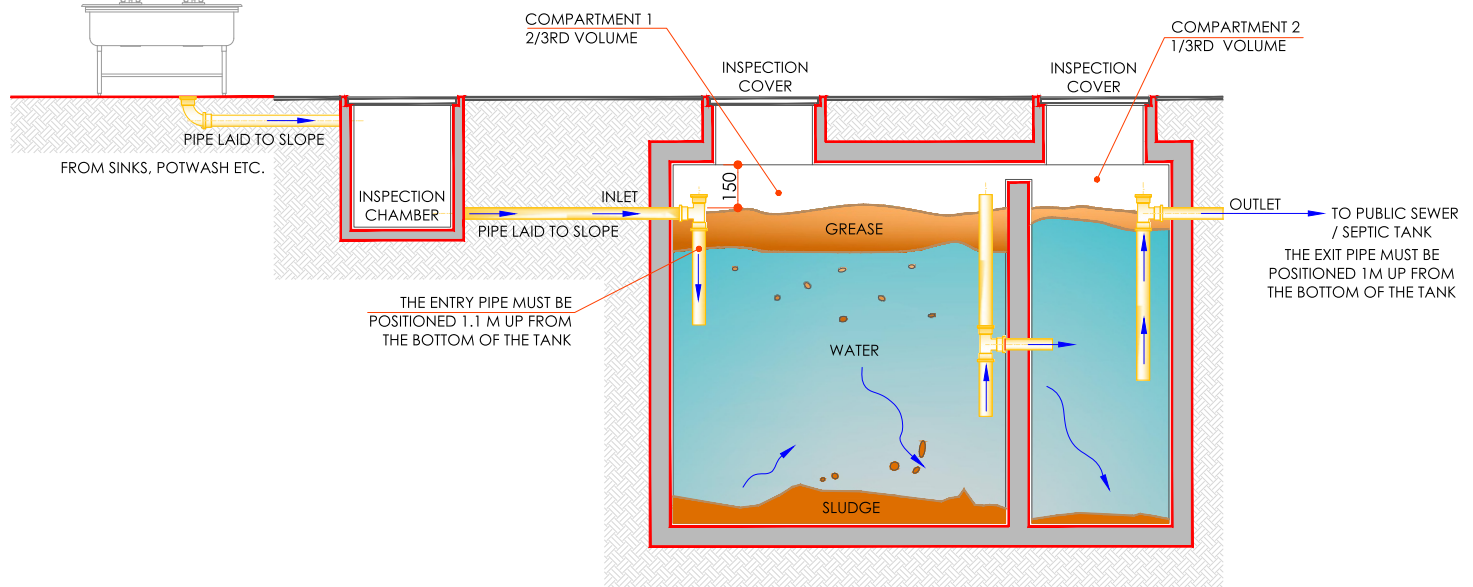


Exhibit 04: **GREASE TRAP**

## Grease Trap Size Calculation (Example 200 pax kitchen):

**Formula: Number of meals x waste flow x retention x storage = size of trap**

Factors for single serving kitchen:

- Number of meals served at peak operating hour x Peak Factor  
Peak Factor = 1.00
- Waste Flow Rate = 7.5 Lts/meal
- Retention Times = 1.5 hours
- Storage Factors = 1.5







TABLE 01 : GREASE TRAP SIZE CALCULATIONS [EG 200 PAX]

FORMULA: NUMBER OF MEALS X WASTE FLOW X RETENTION X STORAGE						
NUMBER OF MEALS (AT PEAK HOUR)	WASTE FLOW (LITERS)	RETENTION (TIME)	STORAGE (FACTOR)	TANK CAPACITY (LITERS)	TANK CAPACITY (CU M)	TANK SIZE LXBXH (M)
200	7.5	1.5	1.5	3,375.00	3.375	2.4 X 1.2 X 1.2

#### iv. Intercepting Trap

- This trap is provided at the last manhole of building sewerage to prevent entry of foul gases from public sewer to building sewer. It has a deep-water seal of 100 mm.

TABLE 02: TRAPS AND THEIR APPLICATION

TYPE	DESCRIPTION	WATER SEAL	APPLICATION
<b>P - TRAP</b> 	CAN BE EASILY REMOVED FOR CLEARING BLOCKAGES ETC WITHOUT DISTURBING THE REST OF THE PIPE RUN	50 MM - 100 MM	USED WITH INDIAN WATER CLOSET (ORISSA PATTERN) FOR OUTLET THROUGH THE WALL SINKS/BASINS
<b>BOTTLE TRAP</b> 	THE BOTTLE TRAP PREVENTS FOUL GASES TO ENTER THE BATHROOMS, THUS HELPING MAINTAIN HYGIENE IN THE BATHROOM.	50 MM - 100 MM	BELOW WASHBASIN AND SINKS
<b>FLOOR TRAP</b> 	INSTALLED FLUSHED TO ADJIOING FLOORING TO COLLECT SURFACE DISCHARGE	50 MM	ON THE FLOORS UNDER WASHBASIN AND SINKS
<b>GULLY TRAP</b> 	CONNECTED TO THE BUILDING DRAIN/SEWER TO PREVENT FOUL GASES, COCKROACH AND OTHER INSECTS ENTERING THE PREMISES.	75 MM	OUTSIDE THE BUILDING TO CARRY WASTE WATER DISCHARGE FROM WASHBASIN, SINKS, BATHROOM ETC.



## 5. Manholes & Chambers

- All manholes and chambers shall be of rectangular or circular shape, constructed in brick and plastered both inside and outside with 12mm thick plaster.
- All manholes shall be provided with cast iron covers and frames.

## Drainage System – Layout/Design Considerations:

### 1. Staff Amenities

- All pipe works should be concealed and of durable material.
- The drains or pipes which remove waste water from each fixture should be connected to the primary drainage trap.
- Drainage line from toilet should be connected to external sewers and not to a grease trap.

### 2. Goods Delivery & Receiving

- It should have a drainage gully or channels with slip resistant gratings for the cleaning down of floor.

### 3. Storage

#### **Bulk, grocery and general store**

- Food storage areas will require floor gullies or channels for cleaning of floor which will happen occasionally or in case of any spillage. The capacity of these floor drains need only accommodate low flows.
- Ideally the drainage unit will be accessible in the centre of an area or in entrance ways as a barrier. They should not be under immobile equipment enabling easy cleaning and maintenance of the drain itself. Gratings should be removable, and allow mobile racks and goods trolleys to travel easily over them without the risk of grating displacement.

#### **Bulk refrigeration or freezer store**

- Local drainage is required for the evaporator condensate water to be discharged. The drain should prevent splashes and provide an air break to the main drainage.



#### 4. Preparation Areas: Vegetable & Meat Preparation

All the operations here produce food debris and will use water either in automated machinery or manually via a sink.

- The drainage layout should ensure efficient surface water removal from within these areas using centrally located channels, with simple one way floor gradients.
- The channels should be easy to clean and maintain.
- Depending upon the size of the kitchen channels may be required at entrance thresholds to prevent the transfer of water to corridors and other areas, thus reducing the risk of slips & falls.
- Well designed systems should have a debris filter at the outlet, easily removable gratings, and easily removable foul air trap.
- Waste pipes from sinks should not discharge into floor gullies.
- P-traps should be installed under all items of equipment connected to the drains to prevent mal-odors backing up through pipes.
- Care should be taken to ensure that rodding points are installed in case of blockages in locations where access is difficult.
- Drainage pipes from hand washing basins must be 50 mm minimum.
- When positioning sinks, drainage should be addressed e.g. sinks should be in line, in order to reduce the number of gully traps.

#### 5. Cooking Areas

The positioning of floor drainage is crucial to facilitate cleaning and removal of water that is being produced or discharged from cooking equipment.

- The sizing and positioning of channels, or gullies must be co-ordinated with the kitchen equipment layout, otherwise splashing might occur causing water, grease and food debris to spread to the surrounding floor area.
- The drainage volume capacity should be sized to cope with appliance discharge, debris filter at outlet, easily removable non slip gratings, and easily removable foul air trap.
- The smaller kitchens where cooking volumes are not high may rely on the specific gullies only for cleaning.
- The perimeter of the main cooking area would also further benefit from the strategic location of smaller gullies or channels to facilitate the cleaning of the facility at the end of the cooking period.



## 6. Thali Filling & Distribution

- It must have a drainage gully or channels with slip resistant gratings for the cleaning down of floor.

## 7. Roti Making

- It must have a drainage gully or channels with slip resistant gratings for the cleaning down of floor.
- Floor drain, sinks and gullies should be connected to grease trap.

## 8. Zabihat & Butchery

- All parts of floors where wet operations are conducted should be laid to slope of about 20 mm per meter to drainage inlets.
- Traps and vents on drainage lines
- Each floor drain, including blood drains, should be equipped with a deep seal trap (P- or U-shaped)
- Drainage lines shall be properly vented to the outside air and be equipped with effective rodent screens.
- Drainage pipes of minimum 100 mm diameter shall be provided.

## 9. Pot Wash

- All drainage should be routed to a grease trap.
- Floor drainage should be planned in front of pot wash area. Channels with appropriate grating perform well in this area.
- Food debris shall be removed from wastewater and ideally sediment or debris baskets should be used at the outlet in every gully or channel run.
- Drainage pipe from pot wash must be 75 mm and from the main outlet must be 100 mm.

## 10. Janitor & Cleaners Room

- Floor trap or drain is required.
- The floor drain, basin or sink should be connected to the sanitary sewer.

## 11. Waste Management

- Waste management area must have a drainage gully or channels with slip resistant gratings for the cleaning down of floor, bins, spillages or leaks.



## B. Water Supply

An adequate supply of water is defined as “water that is available at a volume, pressure and temperature that is adequate for the purposes for which it is used”.

### i. Water Storage

- Underground and over head tanks of adequate capacity with pumping arrangements should be provided. Booster pumps can be installed on down pipe lines for pressure specific requirements.

## Water Distribution System:

### 1. Planning Principles

- The potable water shall be used for drinking and cooking, food preparation sinks, drinking water points and cooking equipment. This can be supplied directly from the mains supply/treated water tank. **(Refer Exhibit 05, pg 11)**
- Water for other purposes like cleaning, toilets, washing can be provided through over head tank.
- Water for cooking and cooking equipments shall be provided through flexible connections/hoses and disconnecting valves.
- An adequate supply of hot and cold potable water is required at all pot wash, sinks and wash hand basins.
- All water taps should be suitably labeled ie. Drinking, non-drinking, hot and cold.
- Adequate water supply shall be provided to the waste management area.
- It is recommended to keep water outlet on each stove.
- Provide separate water storage and piping for fire suppression systems.

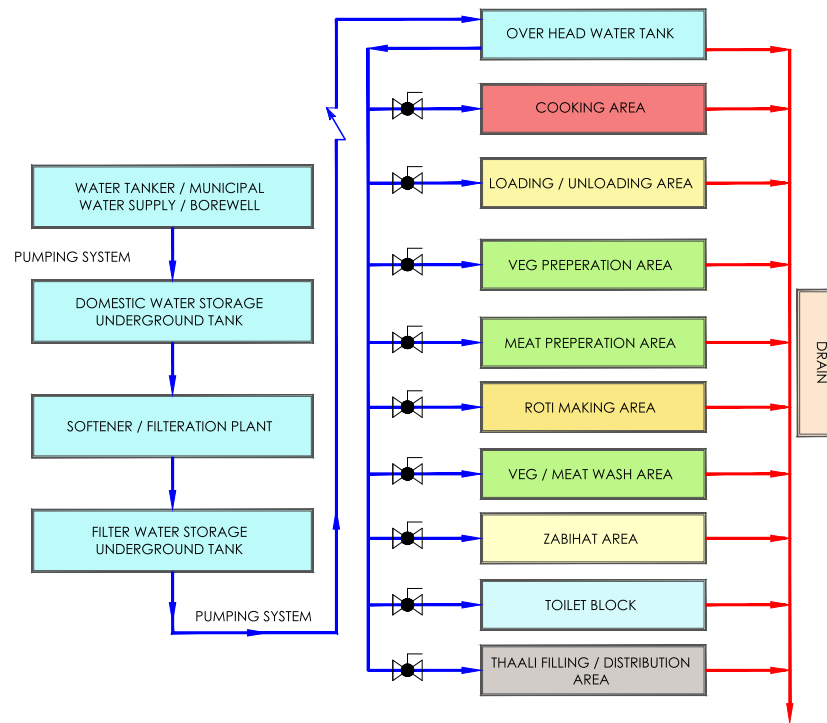


Exhibit 05: **TYPICAL WATER DISTRIBUTION SYSTEM**

## 2. Pipes & Piping

- All internal piping shall be concealed and of GI, UPVC conforming to codes where the kitchen is being constructed.
- For hot water supply UPVC or composite pipes should be used with non return valves.
- All pipes, accessories and valves shall should have easy access for maintenance and repair.
- All pipes should be provided with adequate supports, every pipe shall be supported at 2- 3 meters each. Pipe in wall chases shall be anchored by iron hooks.
- Preparation sinks shall be fitted with 22 mm taps.
- For water distribution, pipe sizing 25NB vertical header line is to be use and 15NB tapping's for plumbing fixtures and fittings.



TABLE 03: PLUMBING AND DRAINAGE PIPES SPECIFICATIONS

PROPERTIES	RIGID PVC PIPE	GALVANIZED PIPE	AC PIPE	CAST IRON PIPE
WEIGHT	LIGHT (APP. 10 TIMES LIGHT WEIGHT IN COMAPARISON TO OTHERS)	HEAVY	HEAVY	VERY HEAVY FOR BIGGER LENGTHS
SURFACE	VERY SMOOTH	ROUGH	LITTLE ROUGH	ROUGH
LENGTH	5 M	5 TO 6 M	3 TO 4 M	3 TO 4 M
FLOW	INITIALLY 50 PERCENT MORE FLOW IN COMPARISON TO OTHER AND RETAIN THAT STANDARD TILL END	INITAL FLOW GETS REDUCED SLOWLY BECAUSE OF RUST	INITAILLY FLOW IS 40 PERCENT MORE	INITIAL FLOW REDUCES 40 TO 50 PERCENT AFTER 5 TO 10 YEARS
EFFECT OF RUST	DOES NOT RUST	GETS RUSTED	DOES NOT RUST	RAPID RUST FORMATION
ACCUMALATION OF PARTICLES FORMING RUST	VERY LESS CHANCES, THEREFORE, DIAMETER REMAINS UNALTERED PERMANENTLY	RUST PARTICLES ACCUMULATE HEAVILY, THEREFORE, DIAMETER GETS REDUCED ON LONG RUN	PARTICLES DO NOT ACCUMULATE	HEAVY ACCUMALATION OF PARTICLES, THEREFORE, DIAMETER GETS REDUCES AFTER A PERIOD
FITTING ARRANGEMENT	VERY EASY QUICK AND LEAK-PROOF BUT SKILLED WORKMANSHIP REQUIRED	THREADING IS REQUIRED AND THE SKILLED LABOUR IS EASILY AVAILABLE	EASY	VERY LABORIOUS AND TIME CONSUMING
LIFE	LASTS A LIFETIME	GETS RUSTED SO ERQUIRED TO BE CHANGED AFTER 50 YEARS	LESS CHANCES OF CHANGING	REQUIRES CHANGE AFTER 20 YEARS
TEMPERATURE	CANNOT BE USED FOR HOT WATER	SUITABLE FOR ANY TYPE OF TEMPERATURE		



## C. Electrical Services:

### i. Electricals

- Electrical services, sockets, switches and all other cables shall be concealed. Use of surface mounted cables or trunking should be prohibited.
- Meters, distribution boards and control panels shall be installed adjacent to the kitchen office that is secured and easily accessible.
- Earthing to all equipments shall be carried out as per norms.
- The design shall be such that a single emergency isolator shall cut off both the electrical and gas supplies
- Electric points should be covered, away from heat & water.
- Each electrical appliance shall have its isolation switch with tagging for ease of access and safe usage.
- Emergency lighting and generators or UPS systems should be provided for uninterrupted power supply.
- Emergency isolators (panic buttons) shall be installed adjacent to the main entrances/exits and emergency exits. They shall be manually operable, suitably protected against accidental use and clearly labeled.

TABLE 04: RECOMMENDED ILLUMINATION LEVELS

SPACE / AREA	RECOMMENDED LIGHTING LEVEL (LUX)
<b>OFFICES</b>	
KITCHEN OFFICE	500
<b>STAFF AREAS</b>	
CHANGING ROOMS AND TOILETS	100
JANITORIAL CLOSET	100
<b>KITCHEN</b>	
FOOD PREPERATION AND COOKING	500
POT WASH AREA	300
THAALI FILLING AREA	300
ZABIHAT AREA	500
ROTI MAKING AREA	500
<b>CIRCULATION AREAS</b>	
ENTRANCES / EXITS	200
CORRIDORS & STAIRS	100
<b>DISTRIBUTION AND STORAGE</b>	
LOADING BAYS	150
THAALI DISTRIBUTION	300
RECEIVING AREA	200
DRY STORE	200
COLD STORE	300
<b>SERVICE AREAS</b>	
GAS BANK	200
EXTERNAL REFUGE AREA	200

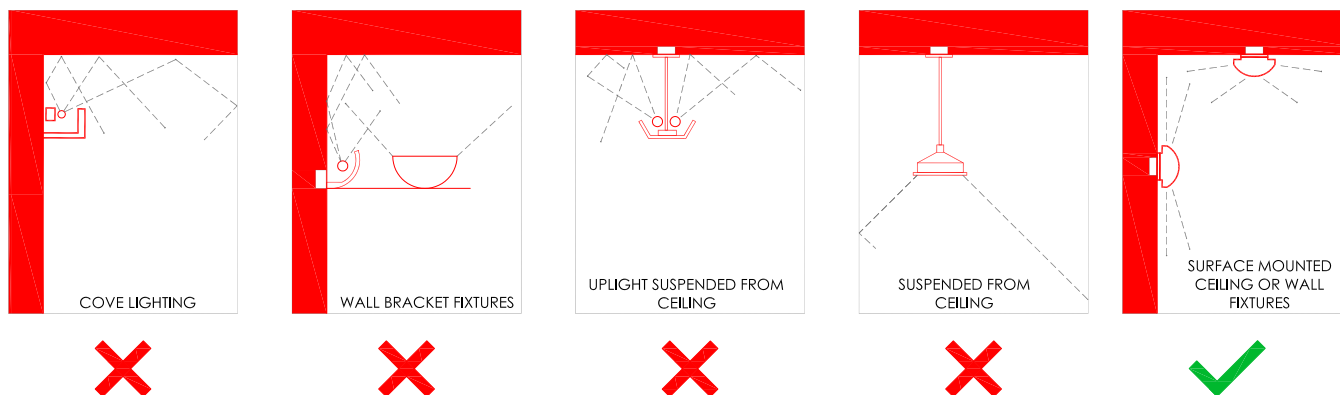


## ii. Lighting

Adequate and well designed lighting will help reduce energy costs and improve the working environment. The area should be free from glare and unwanted reflections. It is essential for staff efficiency and their safety.

### The design of a lighting system should take into account:

- Available natural light
  - Reflectance of surfaces
  - Required luminance levels (lux) for the tasks being performed
  - Emergency lighting requirements
- 
- Window area should be min 10% of floor area and located such that they allow maximum natural light.
  - The reflectance of walls, ceilings, floors and work surfaces contribute to the overall luminance level of the area. The color, material and type of finish of these should be carefully selected (preferably white or lighter color shades).
  - The luminance level should be made at least 100 lux higher than the recommended level, because of a light loss factor that occurs over time. For recommended lighting levels **(Refer Table 04, pg 13)**
  - Equipment layout and the presence of obstructions casting shadows should be considered while designing the lighting layout.
  - Vapor and water resistant surface mounted fittings covered with acrylic sheets should be used as they are easy to clean.
  - Suspended fittings shall be avoided as they collect dust and are a source of contamination. **(Refer Exhibit 06, pg 15)**
  - T-5 tubes with electronic starters should be used.
  - Diffused light (diffusers) should be provided for even distribution of light.
  - Vapor proof light fittings shall be fitted within the canopy of hoods for adequate lighting while working.
  - External weatherproof lighting shall be provided at entrances, loading and refuse areas.
  - Energy saving bulbs and fittings should be preferred.
  - Light switches shall be grouped and located at a convenient place for easy control. (e.g. at the entrance or exit to the catering area).



RECESSED OR SURFACE MOUNTED FITTINGS WITH COVER SHALL BE PREFERRED OVER COVE, WALL BRACKETS AND SUSPENDED FITTINGS, TO AVOID ACCUMALATION OF DUST AND INSECTS

Exhibit 06: **RECOMMENDED LIGHTING FIXTURES AND FITTINGS**

## 1. Emergency Lighting

- The emergency lights must be provided for staff safety at exits, at any point where there is a potential hazard and at regular intervals to maintain minimum lighting levels.
- Emergency lighting should be controlled on a separate emergency light DB and lights turns on automatically on power backup ( invertors / generator ) whenever there is a power failure.

## 2. Power Points

- Sockets for all equipment shall be located at a suitable height. The following heights are required:
  - Refrigerator/freezer cabinets: 2200 mm (min) finished floor level (FFL).
  - Table top appliances: 1450 mm FFL.
  - Cleaning machines and office equipment: 550 mm (min) FFL.
  - Equipment in food preparation area:
    - 1) 1400mm above the FFL
    - 2) 450mm above table tops
- Floor sockets should be avoided within the kitchen areas.
- Sockets shall be provided for the use of mobile cleaning and preparation equipment e.g. electrical stick blender.
- Covered sockets should be provided to avoid a trip hazard.



### 3. Telephone/Data

- Adequate telephone and data points should be provided in kitchen office and store.
- A telephone point to be provided for thaali dispatch areas.
- The telephone lines can be connected to existing EPBX system if any in the complex.

## D. HVAC/Ventilation System

### i. Natural Ventilation

The simplest form of ventilation is natural; using windows, doorways, vents and skylights. These should be carefully located so that dirt from the surrounding is not drawn inside. (Refer Exhibit 07A & 07B)

- An effective kitchen ventilation system needs “air balance”, in which the exhaust of fumes, smoke, grease and steam produced in the cooking process is replaced by fresh, clean air.
- Replacement air provides the airflow required by the exhaust systems to capture air borne cooking waste and fumes when using gas appliances, lack of replacement air can cause the gas burners to go out due to lack of oxygen.
- Windows, ventilators and door grills should be covered with rust proof metal nets to allow passage of fresh air and prevent insects and pests from entering the kitchen.

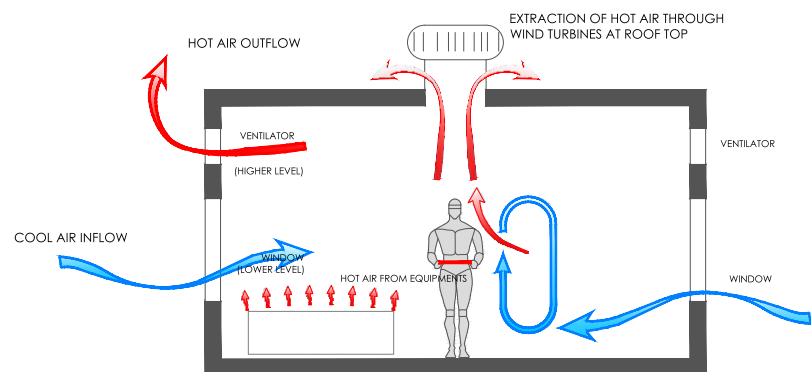


Exhibit 07A: **OPTIMIZATION OF NATURAL VENTILATION**

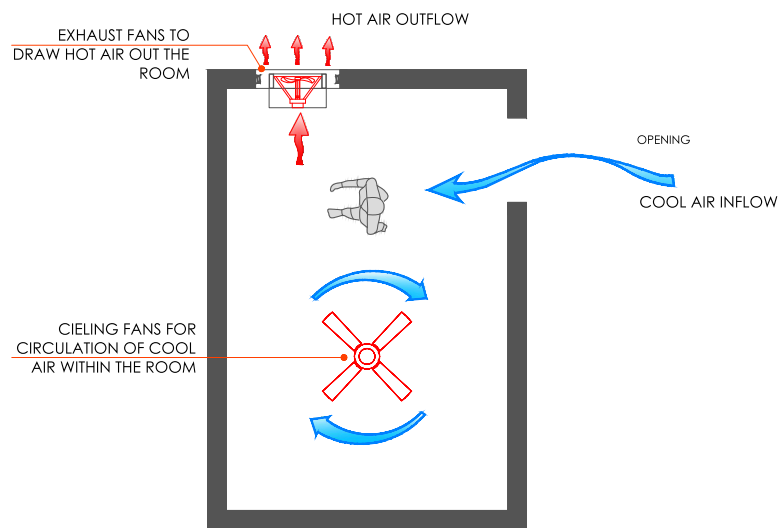


Exhibit 07B: **OPTIMIZATION OF NATURAL VENTILATION**



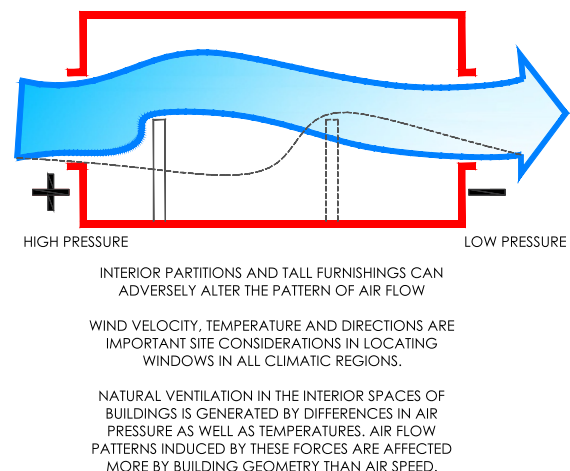
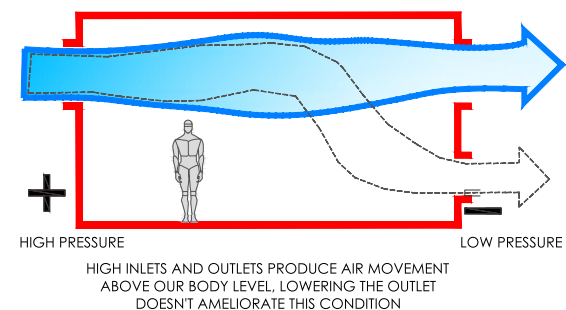
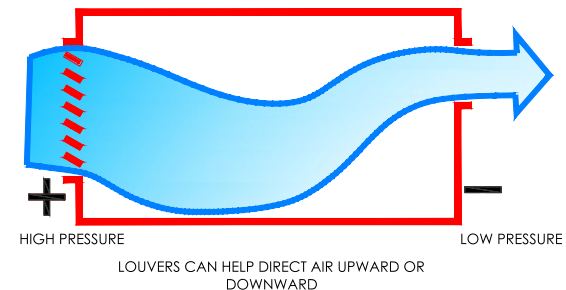
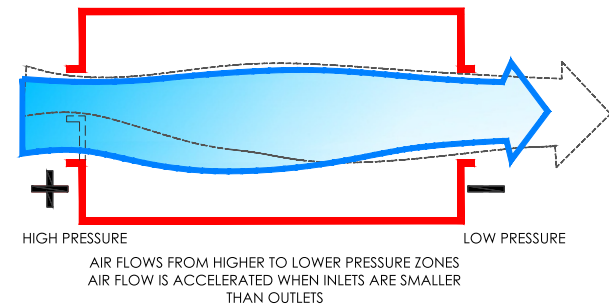
## ii. Exhaust Systems

An effective exhaust system should get rid of:

- Heat.
- Particulate matter.
- Grease laden steam.
- Cooking vapors.

Exhaust systems consists of exhaust fans, exhaust hoods, make-up air units, and HVAC units operating on set parameters, to provide ambient working conditions.

- The balance of the ventilation system shall be such that there are no draughts within the kitchen or 'wind tunnels' between rooms. The design shall ensure that cooking odors do not drift from the kitchen to other areas.
- At air intake points a very fine filter should be installed to prevent the smallest flying insects entering the kitchen.
- The make-up air units should be as far away as possible from the source of the pollutants to maximize cross ventilation. All exhaust gases should be discharged through ducts and away from the source of air-intakes and neighboring properties.
- Where refrigerated and frozen food storage cabinets are installed in closed rooms, the area shall be well ventilated by providing exhausts above the cabinets to extract the heat produced.





## 1. Exhaust Fans

- Exhaust fans must be placed in the cooking area and food preparation area.
- The rate at which the exhaust fans collect the airborne waste shall be equivalent to the rate at which the make-up air units replace the volume of extracted air. This will enable sufficient supply of fresh air flowing in to the kitchen.

## 2. Exhaust Hoods

- Hoods should be installed over stoves. Filters and other parts requiring cleaning or replacement must be easily accessible.
  - Overhang of the hood: min. 450 mm
  - The bottom edge of the hood: min. of 2 meters from FFL.(Refer Exhibit 9)
  - Rate of ventilation:
    - 1) 500 cfm/sq. m. above cooking stoves.
    - 2) 100 cfm/sq. m. in rest of the areas.
- Hoods shall be fitted to air-handling unit to ensure the efficient removal of water vapor and prevent condensation to the surrounding area.
- Temperature should be maintained at 25°C in cooking areas and less than 16°C in butchery.
- If the extraction fan of ventilation hood fails, the gas supply to the equipment should automatically turn off through a gas supply cut-out mechanism.

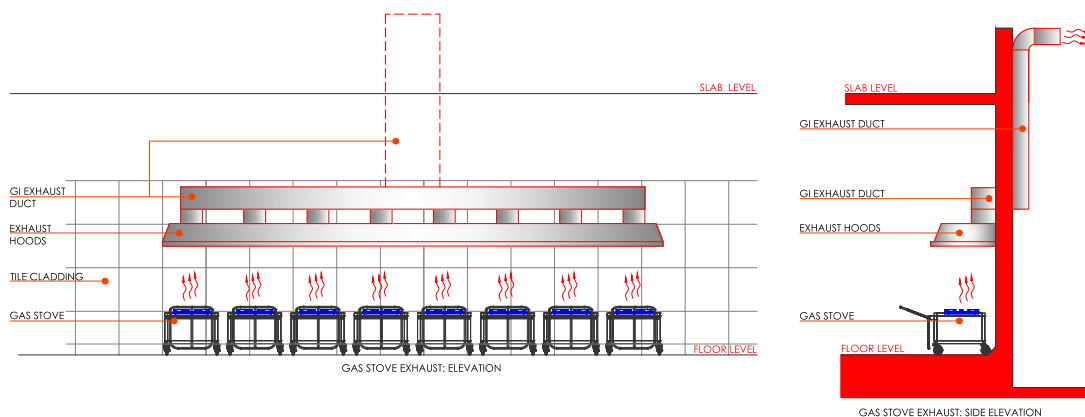


Exhibit 09: EXHAUST HOODS



## E. Gas Bank & Piping

For efficient and safe supply of fuel into the kitchens using LPG cylinders, providing a gas bank is the most optimum solution irrespective of the size of the kitchen.

### Layout Considerations:

- Gas bank should be minimum 3 m away from any structure, parking bay, plot boundary, transformer, generator and any development plan (DP) road adjoining site. It should not be in parking. **(Refer Exhibit 10, pg 20)**
- A 4-hour fire-rated deflection walls (RCC) of 2.0 m height may be constructed to reduce safety distance between gas bank and kitchen.
- There should not be any high tension electrical line passing near or above gas bank.
- In cases where the gas bank cannot be provided as separate shed then it shall be separated from the rest of the kitchen by surrounding walls having 4 h fire resistance rating full height RCC walls. The separation shall be absolute in such manner that it will have no openings of access from the kitchen. **(Refer Exhibit 11, pg 20)**
- The plinth of gas bank shall be minimum 100 mm, in concrete with IPS or tremix flooring. The floor shall be of smooth, as rough surface may cause sparking during cylinder handling.
- The walls of the gas bank shed should be in RCC (2.0 m height). These should be well finished and painted.
- Door in MS sheet of minimum 1.50m size shall be provided. Wooden or any other doors are not acceptable.
- Gas banks must have good natural ventilation to ensure safe dilution of leaking gas. Perforated MS sheet should be used for windows. (Perforation size should not exceed 2 mm)
- One or more cylinders may be installed below a window, provided that there is a minimum distance of 150 mm between the top of any cylinder valve and the bottom of the window opening.
- There should not be any electrical connection / point in gas bank; if it is there then it should be of flame proof fittings only.

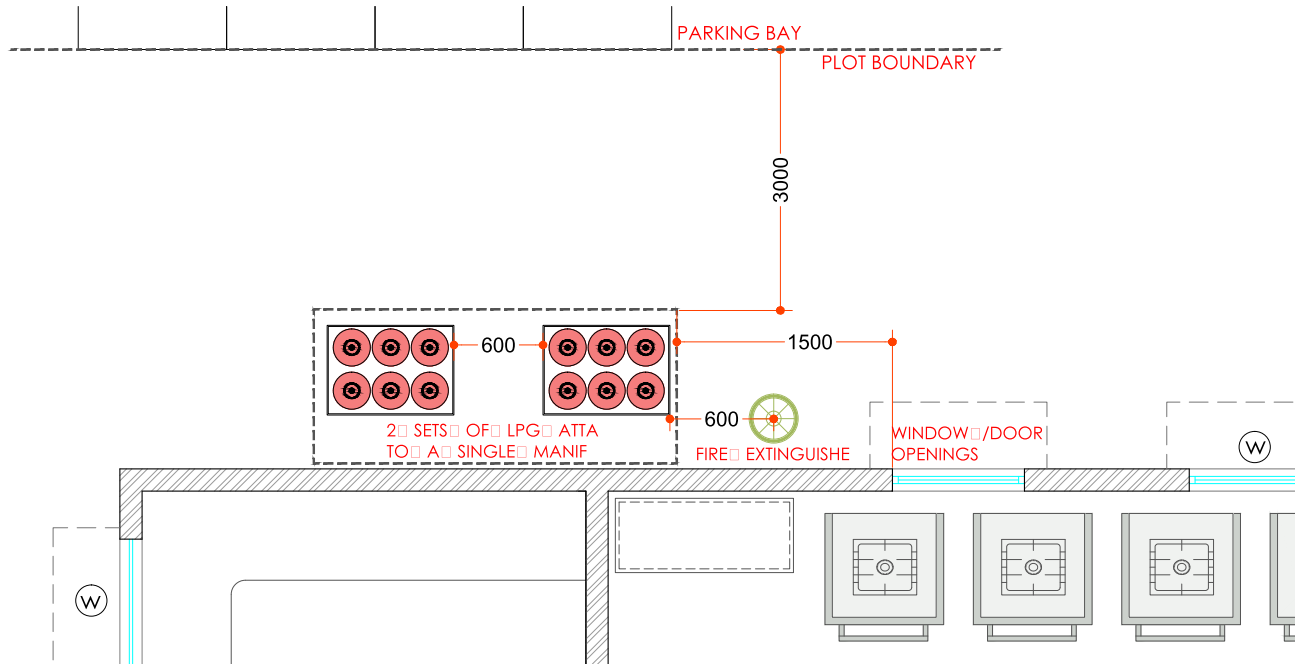


Exhibit 10: **KEY DISTANCES FOR OUTDOOR GAS BANKS**

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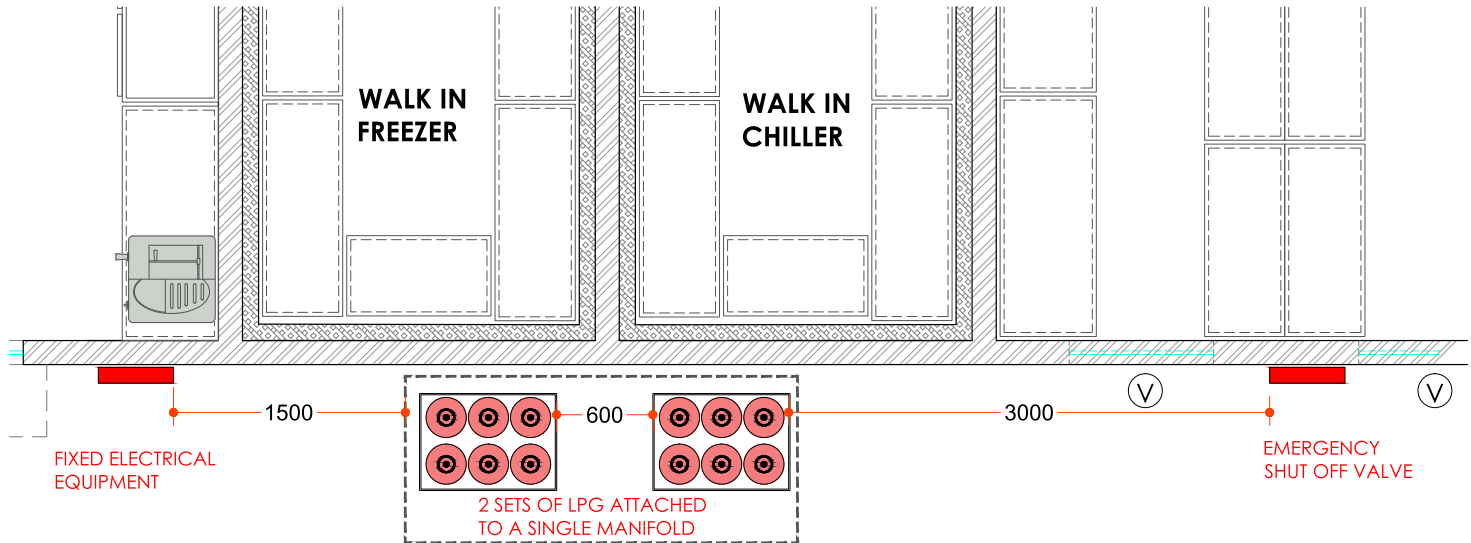


Exhibit 11: **KEY DISTANCES FOR OUTDOOR GAS BANKS**



## LPG Piping Considerations:

- A gas bank is divided into two parts: active & standby.
- Stop cock should be provided to:
  - i. The main supply line,
  - ii. Main line of each set of cylinders
  - iii. Each of the cylinders
- Each cylinder should have a non return valve.
- Each set should have a gauge to show the pressure of the gas in the cylinders. Provide pressure regulators to ensure supply at low pressure and to make the system safer.
- Gas supply pipes shall be:
  - i. Kept as short as possible,
  - ii. Exposed
  - iii. Labeled and painted with acrylic non-chip ochre yellow paint.
  - iv. Minimum 50 mm between a gas pipe and any other service.
  - v. Avoided being in same trench or in close proximity with electric cables, water/drain pipes to avoid being affected by them.
  - vi. Of standard materials like copper or carbon steel with fittings in, steel, copper or polyethylene.
  - vii. Provided with:
    - a . Isolation valves: for servicing and maintenance
    - b. Isolation shut off valve: for emergency situations. Fire proof, manually or automatically operable from a remote location to enable remote shut-off during emergency **(Refer Exhibit 11, pg 20)**
- Connection to cooking equipment shall be done using flexible connection and brass valves. The length of connecting hose or tube from the gas cock to the appliance shall not exceed 1.5 m. The material of the hose or tube shall be rubber or copper
- Gas cocks shall be away from flames or where heat from flame could have any significant effect on it or the gas hose.
- In a gas bank, each set should contain a minimum of 3 gas cylinders and a maximum of 6 cylinders. Multiple such sets of cylinders should be made according to the kitchen usage for uninterrupted cooking.

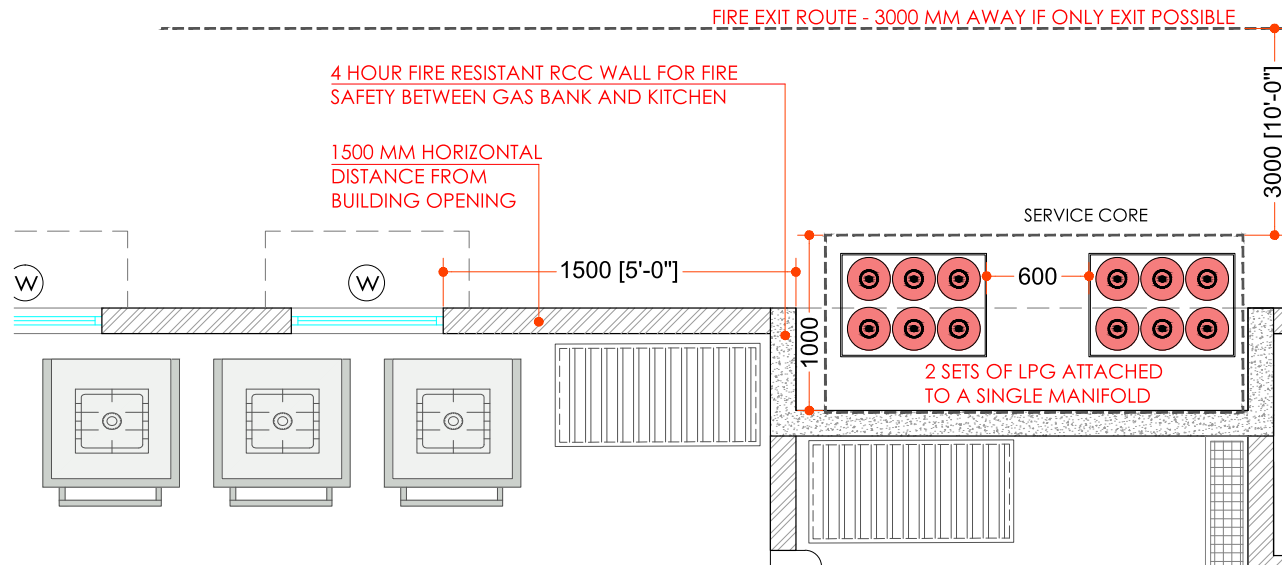


Exhibit 12: **KEY DISTANCES FOR RECESSED GAS BANKS**

## F. Fire Fighting

### i. Emergency Procedures

- Fire exits and their routes should be made clear and illuminated. Fire exit signs should be provided at each exit.
- Gas shut off valve shuts off the gas to appliances in the kitchen. This should be situated at the emergency exits, easily seen and accessible.
- First aid kit should be put in a clean, accessible area and should be clearly labeled. It should have sterile bandages, burn cream, antiseptic, cotton, latex gloves, paracetamol etc.



## ii. Emergency Devices

- Emergency devices should be strategically located around the kitchen; all should not be in the same area.
- Fire blankets must be located in an obvious and accessible place and are only to be used to extinguish small cooking and clothing fires.
- Smoke detectors do not work very well in kitchens, instead heat detectors shall be used.
- Sprinkler systems and fire hoses are not recommended in a kitchen as water is volatile against fats, oils and electrical fires.

## iii. Fire Extinguishers

- Shall be along the exit route.
- Easy to access in a hurry.
- 100mm above the floor; the top of the extinguisher should be 1200mm from the floor.

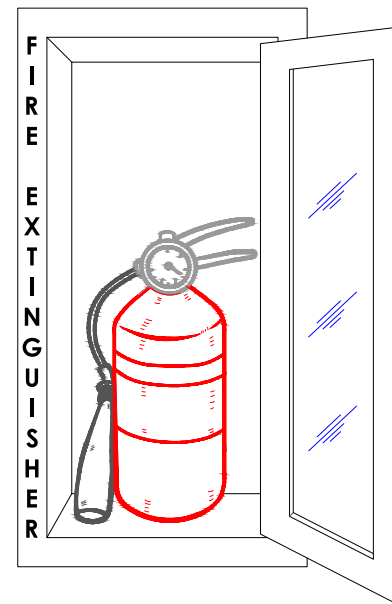


Exhibit 13: **TYPICAL FIRE SAFETY CABINET**

## G. Pest & Rodent Management

Common practices used for pest management are:

- **Air curtains:** Machine typically mounted above an opening, (although vertical mounting is also possible) that creates an air draft across an opening, which prevents flying insects from entering.
- **Fly door:** Door that allows air to flow through but not pests.
- **Fly strips:** Row of over-lapping plastic strips that hang in a doorway preventing entry by flying pests.
- **Traps:** Device used to seal passages so that pest and rodents can not enter through drainage pipes.



TABLE 05: FIRE TYPES AND EXTINGUISHERS

TYPE OF EXTINGUISHER	TYPE OF FIRE, CLASS AND SUITABILITY				
	A	B	C	D	E
	WOOD, PAPER, PLASTIC ETC	FLAMMABLE LIQUIDS	FLAMMABLE GASSES	ENERGISED ELECTRICAL EQUIPMENTS	COOKING OILS AND FATS
WATER	X	–	–	–	–
WET CHEMICAL	X	–	–	–	X
FOAM	X	X	–	–	LIMITED
POWDER ABE	X	X	X	X	–
POWDER BE	–	X	X	X	X
CARBON DIOXIDE	LIMITED	LIMITED	–	X	–
VAPORISING LIQUID	X	LIMITED	LIMITED	X	–
FIRE BLANKET	HUMAN TORCH	–	–	–	X

## i. Preventions

The following measures should be adopted to minimize the risk of pests entering the food premises.

### Externally:

- Install door closers or floor springs on entrance door.
- Ensure windows are tightly fitting and install fly screens where they can be opened.
- Cover external vents with wire mesh.
- Seal service points (electrical and plumbing services) in external walls.
- Min. 1200mm wide paved surface laid to slope around the premises.
- Avoid storing waste bins against external walls.
- Install rodent proof strips at all entrance doors.

### Internally:

- Ensure all floors are properly graded to prevent pooling of water.



### Storage Areas:

- Install appropriate exhaust systems.
- Position store room racks 300mm off floors and 50mm off walls.

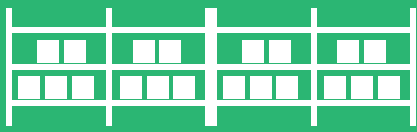
## ii. Insect Control

- Insect control devices should be installed for flying insects e.g. electronic insect killers. Such devices are located only at entrance / exits routes with uninterrupted power supply to eliminate the insects on entry. These should not be installed in preparation and cooking areas.
- Ventilation intake must have a filter fitted to stop flies and other airborne insects being introduced to the kitchen area.
- Crawling insects or rodents can be controlled through the use of various traps, e.g. rat and cockroach traps.

## H. Waste Management System

It's vitally important that food waste is disposed of in an effective, environmentally-friendly way, to eliminate problems of sanitation, odors and pest control. Type of wastes produced:

- **Organic**
- **Inorganic**
- **Recyclables**
- **Grease**
- While transporting, the waste should never pass through the kitchen. The bins or bags should be emptied to the external storage area or a municipal bin. Bins can be on wheels for ease of transport.
- Waste collection is to be done in color coded bins with lids lined with green bio-degradable bags. Bins must be easily accessible. Waste bins to be located at key locations including food preparation and pot wash areas.
- For larger sites and kitchens where space is not a constraint, vermi-culture decompositions methods for organic waste can also be used.



## i. External Storage

For large kitchens, a weatherproof enclosure is required to store waste storage bins.

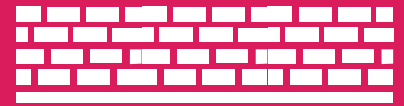
It should:

- Be at the rear of the kitchen complex with vehicular access to avoid possible contamination.
- Be suitably screened to block vision from other facilities.
- Be well-ventilated enclosure, which is fly, vermin and weather proof
- Be provided with external power points and lighting, water supply (with flexible hoze), and drainage for wash down.
- Ensure water used in cleaning exits only through a drain into grease trap and does not escape into surroundings.

## ii. Flooring

The Floor of waste collection area should be:

- Hard and of impervious material.
- Laid to slope towards floor drain.



## 2. SPECIFICATIONS

The success of the design is when it eliminates the risk of cross contamination, and provides finishes for efficiency, longevity, energy conservation, ease of cleaning and maintenance.

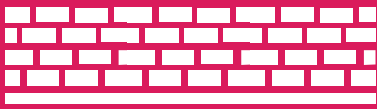
### A. General Considerations

#### Construction material or finishes should be:

- Stable and strong enough to
  - Take dead and live-load of the roof and superstructure above.
  - Resist natural hazards like earthquake, landslide, flood, cyclone etc.
  - Take extreme weather conditions in the area.
- Designed to take expansion as per need (horizontal / vertical). The joint to be fitted with a suitable non corrosive material profile and suitable insert.
- Impervious to grease, food particles and water.
- Fire resistant and fire retardant.
- Water proof.
- Constructed and maintained locally.
- Easy to maintain and replace.
- Non porous especially for surfaces, e.g. stainless steel.
- Secure enough to avoid any thefts or vandalism.
- Easy to clean, disinfect and wipe with minimum water.

#### Construction materials or finishes should not:

- Include any substance that may add toxic materials to food either by direct contact or by vapor.
- Lead to shedding of particles.
- Be stained easily.
- Be wooden.



## B. Item Specific Considerations

### i. Foundation

It should not allow dampness to rise above the super structure.

### ii. Walls (Internal & External)

- Cavity walls and service ducts to be avoided to prevent the harborage of insects and pests.
- Low height internal walls (1.8m/2.1m) for maximum penetration of natural light, e.g. pot wash from the kitchen.

#### 1. Wall Finishes

- **Wall Cladding:**
  - Height: up to 2.1m or lintel level
  - Material: light color ceramic tiles, GRP lining, vinyl or epoxy
  - Behind stove: stainless steel
  - Thermal insulation for cold rooms
- **Paints:**
  - Oil-based paints : in heavily traffic areas
  - Satin emulsion paints: In low traffic areas
  - External areas: External grade apex paints

#### 2. Wall Protection

- Stainless steel, high-impact resistant PVC or granite shall be used as vertical (corners/edges) and horizontal protections to avoid the damages from mobile/fixed equipments. **(Refer Exhibit 14, pg 29)**
- Corner guards must be fitted before tiling, to have a flush joint.
- The horizontal protection shall be installed at an appropriate height as per the room, equipments and functions. E.g. For low-height equipment: 300mm to 500mm from FFL). **(Refer Exhibit 14, pg 29)**
- All exposed edges and voids shall be sealed to prevent harborage of pests.

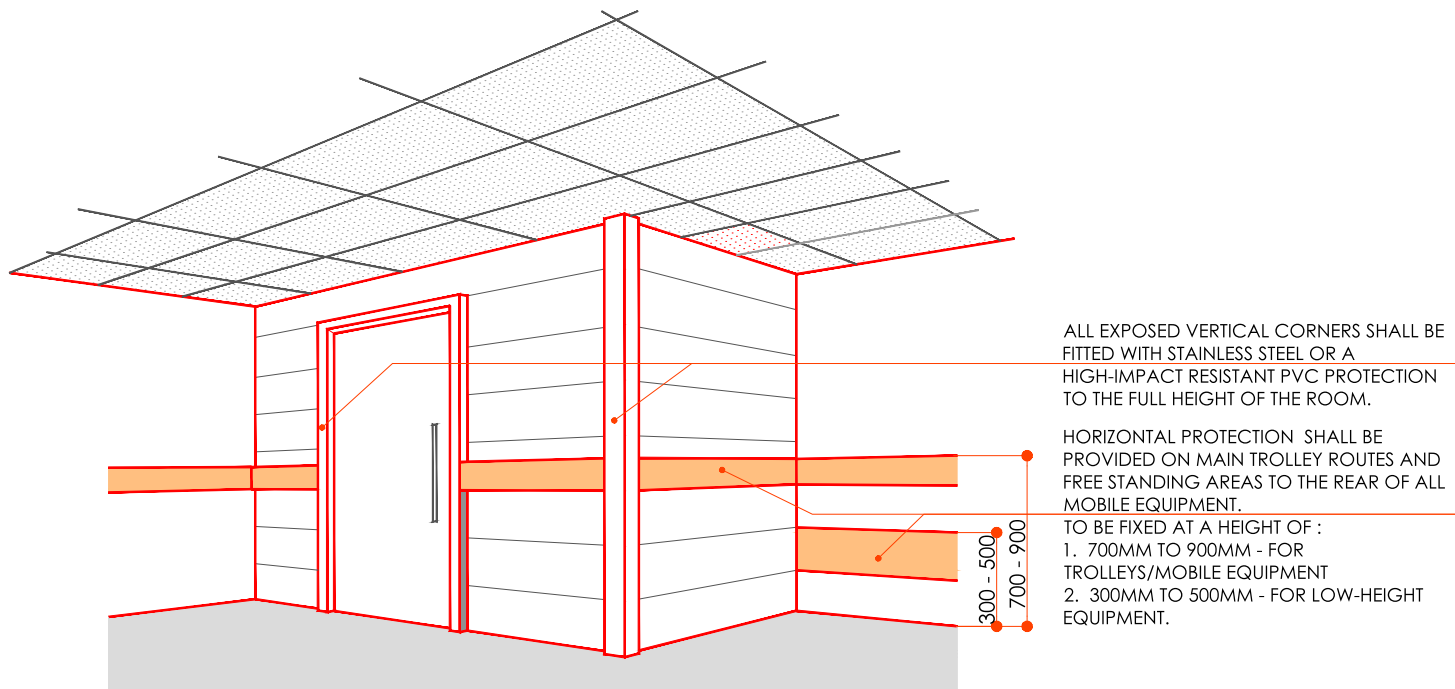
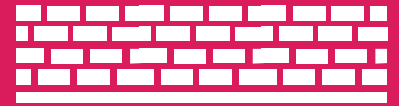


Exhibit 14: **WALL PROTECTION**

### 3. Roofing

- Stable and strong enough to take self-load of:
  - Maintenance personnel working on roof top
  - Super structure/ water tank if any
- Detailing should provide enough thermal insulation to keep inside temperature comfortable in all weathers.



## 4. Flooring

### a. FLOOR FINISHES

- Flooring should be:
  - Stable and strong enough to take day to day movement of people, raw food, mobile or fixed equipments and heavy utensils.
  - Laid to slope to have the desired flow during cleaning and avoid pooling of water.
  - Non slippery / anti skid e.g. kota stone, ceramic floor tiles.

### b. FLOOR DRAINS

- There should be stainless steel grating on floor drains.

### c. FLOOR AND WALL INTERSECTIONS

- The coving/curving or chamfer of floor at the intersection of the floor and wall surfaces, to be provided
  - To make a smooth and continuous curved skirting.
  - To allow ease of cleaning.
  - For effective protection from trolley traffic, etc.
  - With a flush joint between adjacent floor tiles and wall.
- An expansion joint with grout shall be provided, flushed to the floor tiles and the coving.
- External coving for corner protection to be installed.
- Grouting lines shall run continuous from the floor tile (wall - coving - floor joints should match).

### d. GROUTING

- Epoxy-resin grouting material should ideally be used.
- Grouts should be finished flush with the surface of the tile.
- Joints between the tiles shall not exceed 4 mm.



## 5. Door & Window Openings

- Should allow enough light and ventilation as per need and use.
- Should be protected with only non toxic coating / paint internally and externally.
- Should be sealed to prevent entry of vermin, pests and rodent by fitting flexible seals to the base and vertical gaps.
- To make the best use of wall space for racks and refrigeration cabinets, ventilators / higher level windows should be planned.
- Window sills shall be laid at slope. **(Refer Exhibit 15)**
- All joints shall be sealed with silicon.
- Windows should have a stainless steel fly screen/mosquito net. **(Refer Exhibit 15)**
- Door openings shall:
  - Be sufficient to allow the ease of movement of mobile equipment.
  - Have minimum accessible width 900 mm wide.
  - Be 1600/1800 mm wide for double swing door.
- Doors shall:
  - Be fitted with a vision panel for visibility in all working areas.
  - Not have louvers or cut out grills.
  - Have appropriate signage.
- Materials
  - Should withstand heavy usage with a smooth easy-to-clean finish.
  - Door and window frames shall be of granite or any suitable stone.
  - Doors located in the goods delivery area/main trolley routes and main preparation/service areas shall be fitted with stainless steel to the 'strike' side up to 1200 mm.
  - The finish on doors should be GRP, laminate, painted, melamine stainless steel or PVC finish.

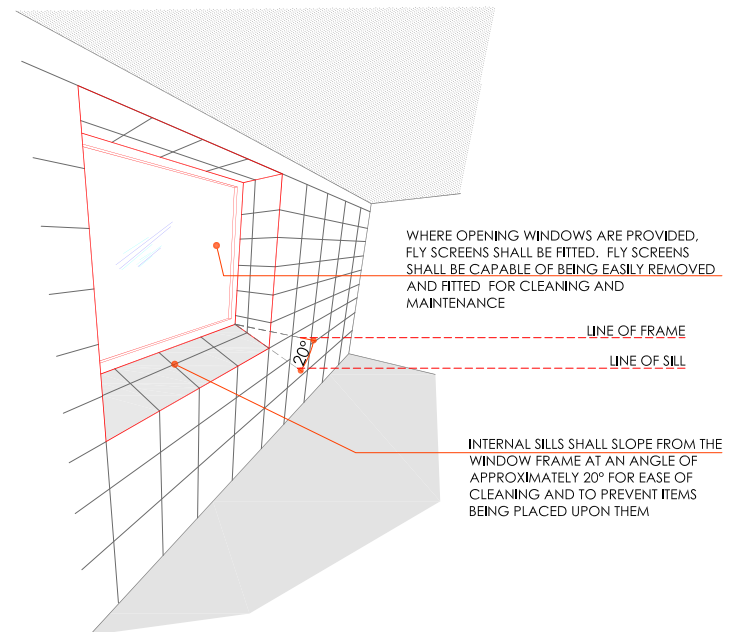


Exhibit 15: **WINDOW SILL**



## 5. Fixtures, Fittings & Equipment

### a. KITCHEN EQUIPMENTS

- Must be adequate for the safe production of food.
- Type of equipments:
  - in chilled storage - cool rooms and refrigerators
  - in preparation area - Benches and work tables
  - in cooking area - Stoves and other such equipment
- All equipment should be installed such that it can be easily cleaned to prevent any food spillage building up behind or underneath the equipment.
- Equipments shall be provided with lockable casters and flexible gas hoses of sufficient length to enable movement for cleaning and servicing easily.
- Surfaces of cupboards and cabinets should be smooth, washable finish with adjustable shelves.

TABLE 06: MATERIALS FOR KITCHEN EQUIPMENTS		
MATERIAL	QUALITY	SUITABILITY
STAINLESS STEEL	<ul style="list-style-type: none"><li>• RUST PROOF, 304 GRADE STEEL ( LOW CONTENT OF IRON)</li><li>• SUITABLE IN DIRECT CONTACT WITH FOOD.</li><li>• DURABLE</li><li>• CHEMICAL RESISTANT.</li></ul>	CAN BE USED
PLASTICS	<ul style="list-style-type: none"><li>• SUITABLE SURFACES FOR FOOD PREPARATION.</li><li>• NON POROUS - EASY TO CLEAN.</li></ul>	CAN BE USED
TIMBER	<ul style="list-style-type: none"><li>• POROUS</li><li>• FLAMMABLE</li></ul>	NOT TO BE USED
IRON AND MILD STEEL	<ul style="list-style-type: none"><li>• RUST PRONE</li><li>• REACTS WITH CHEMICAL</li></ul>	NOT TO BE USED



## **b. TOILET FIXTURES & FITTINGS**

### **i. EASTERN W.C.**

- Eastern W.C. pan shall be Orissa pattern with a 100mm diameter cast iron or porcelain P trap with or without vent horn; flushed by means of a concealed type flush valve.
- The W.C. and trap shall be set in cement concrete.

### **ii. WESTERN W.C.**

- Western W.C. with seat cover shall be wall mounted with flushing cistern or concealed type flush valve, Flush pipe/bend shall be connected to the W.C. by means of suitable rubber adapter. Wall hung W.C. shall be supported by C.I. floor mounted chair.

### **iii. BASINS**

- Basins shall be counter top or supported on R.S. or C.I. brackets and clips.
- Each basin shall be provided with 32mm dia C.P. waste with overflow, 32mm dia C.P.Brass bottle trap with C.P. pipe to wall and flange.
- Each basin shall be provided with adequate fittings for hot and cold water as required.
- Basins shall be fixed 790 mm above the floor.

### **iv. SINKS**

- Sinks shall be of stainless steel, counter top of fitted with R.S. or C.I. brackets and clips.
- Each sink shall be provided with 40mm dia C.P. waste with chain and plug.
- Sinks shall be provided with adequate fittings for hot and cold water as required.







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This booklet is **Part II** of three parts that constitute the FMB guidelines for a smart kitchen.  
For complete understanding please also refer to:

Part I

Part III