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MINISTRY OF HEALTH

EAST AFRICA'S CENTERS OF EXCELLENCE FOR SKILLS AND
TERTIARY EDUCATION IN BIOMEDICAL SCIENCES

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KITCHEN AND LAUNDRY EQUIPMENT INSTALLATIONS
(ALL RATES EXCLUSIVE OF TAXES)

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1. PART A: GENERAL MECHANICAL SPECIFICATION

1.1. GENERAL

This section specifies the general requirements for plant, equipment and materials forming part of the Sub-Contract Works and shall apply except where specifically stated elsewhere in the Specification or on the Contract Drawings.

1.2. QUALITY OF MATERIALS

All plant, equipment and materials supplied as part of the Sub-Contract Works shall be new and of first-class commercial quality, shall be free from defects and imperfections and where indicated shall be of grades and classifications designated herein.

All products or materials not manufactured by the Sub-Contractor shall be the products of reputable manufacturers and so far as if they had been manufactured by the Sub-Contractor.

Materials and apparatus required for the complete installation as called for by the Specification and Contract Drawings shall be supplied by the Sub-Contractor unless mention is made otherwise.

Materials and apparatus supplied by others for installation and connection by the Sub-Contractor shall be carefully examined on receipt and stored. Should any defects be noted, the Sub-Contractor shall immediately notify the Engineer.

Defective equipment or that damaged in the course of installation or tests shall be replaced or repaired to the approval of the Engineer.

1.3. REGULATIONS AND STANDARDS

The Sub-Contract Works shall comply with the current editions of the following:-

- (a) The Kenya Government Regulations.
- (b) The United Kingdom Institution of Electrical Engineering Regulations for the electrical equipment of buildings.
- (c) The United Kingdom Chartered Institution of Building Services' Guides.
- (d) The Kenya Bureau of Standards Specifications.
- (e) British Standards and Codes of Practice as published by the British Standards Institution.
- (f) The Local Council By-laws.
- (g) The electricity Supply Authority By-laws.
- (h) The Kenya Building Regulations.

1.4. ELECTRICAL REQUIREMENTS

Plant and equipment supplied under this Sub-Contract shall be complete with all necessary motor starters, control boards, and other control apparatus. Where control panels incorporating several starters are supplied they shall be complete with a main isolator.

The supply power up to and including local isolators will be provided and installed by the Electrical Sub-Contractor. All other wiring shall be as described in the Particular Specification.

The sub-contractor shall supply three copies of all schematic, cabling and wiring diagrams for the Engineer's approval.

The starting current of all electric motors and equipment shall not exceed the maximum permissible starting currents described in the Kenya Power and Lighting Company Ltd.'s By-laws.

All electrical plant and equipment supplied by the Sub-Contractor shall be rated for the supply voltage and frequency obtained in Kenya that is 415 volts, 50HZ, 3-phase or 240 volts, 50HZ 1-phase as specified in the particular specification.

Any equipment that is not rated for the above voltage and frequencies may be rejected by the Engineer.

1.5. TRANSPORT AND STORAGE

All plant and equipment shall, during transportation be suitably packed, crated and protected to minimise the possibility of damage, and to prevent corrosion or other deterioration.

On arrival at site all plant and equipment shall be examined and any damage to parts and protective priming coats made good before storage or installation.

Adequate measures shall be taken by the Sub-Contractor to ensure that plant and equipment do not suffer any deterioration during storage.

Prior to installation all piping, plant and equipment shall be thoroughly cleaned.

If, in the opinion of the Engineer any equipment has deteriorated or been damaged to such an extent that it is not suitable for installation, the Sub-Contractor shall replace this equipment at his own cost.

1.6. SITE SUPERVISION

The Sub-Contractor shall ensure that there is an English-speaking supervisor on the site at all times during normal working hours.

1.7. INSTALLATION

Installation of all special plant and equipment shall be carried out by the Sub-Contractor under adequate supervision from skilled staff provided by the plant and equipment manufacturer or his appointed agent, in accordance with the best standards of modern practice to the relevant regulations and standards described under clause 2.3 of this section.

1.8. TESTING

1.8.1. General

All testing shall be carried out to the entire satisfaction of the Engineer.

The following sub-clause are intended to define the Sub Contractor's responsibilities with respect to testing and inspection.

1.8.2. Materials Tests

All materials for plant and equipment to be installed under this sub-contract shall be tested, unless otherwise directed, in accordance with the relevant B.S. Specification concerned.

For materials where no B.S Specification exist tests are to be made in accordance with the best modern commercial methods to the approval of the Engineer having regard to the particular type and application of materials concerned.

The Sub-Contractor shall prepare specimens and performance tests and analyses to demonstrate conformance of the various materials with the applicable standards.

If stock material, which has not been specifically manufactured for the plant and equipment specified is used, then the sub-contractor shall submit satisfactory evidence to the Engineer that such materials conform to the requirements stated herein in which case test of material may be partially or completely waived. Certified mill test reports of plates, piping and other materials shall be deemed acceptable.

1.8.3. Manufactured Plant and Equipment - Works Test.

The rights of the Engineer relating to the inspection, examination and testing of plant and equipment during manufacture shall be applicable to the Insurance Companies or Inspection Authorities so nominated by the Engineer.

The sub-contractor shall give two weeks' notice to the Engineer of the manufacturer's intention to carry out work tests and inspection.

The Engineer or his representative shall be entitled to witness such tests and inspections. The costs of such tests and inspections shall be borne by the Sub-Contractor.

Six copies of all test and inspection certificates and performance graphs shall be submitted to the Engineer for his approval as soon as possible after the completion of such tests and inspections.

Plant and equipment which is shipped before the relevant test certificate has been approved by the Engineer shall be shipped at the Sub-Contractor's own risk and should the test and inspection certificate not be approved, new tests may be ordered by the Engineer at the Sub-Contractor's expense.

1.8.4. **Pressure testing**

All pipework installation shall be pressure tested in accordance with the requirements of the various sections of this Specification. The installation may be tested in sections to suit the progress of the works but all tests must be carried out before the work is buried or concealed behind building finishes. All tests must be witnessed by the Engineer or his representative, and the Sub-Contractor shall give 48 hours' notice to the Engineer of his intention to carry out such tests.

Any pipework that is buried or concealed before witnessed pressure tests have been carried out shall be exposed at the expense of the Sub-Contractor and the specified tests shall then be applied.

The Sub-Contractor shall prepare test certificates for signature by the Engineer and shall keep a progressive and up-to-date record of the sections of the work that have been tested.

1.9. **COLOUR CODING**

Unless stated otherwise in the Particular Specification all pipework shall be colour coded in accordance with the latest edition of B.S.1710.

1.10. **WELDING**

1.10.1. **Preparation**

Joints to be made by welding shall be accurately cut to size with edges sheared, flame cut or machined to suit and the required type of joint. The prepared surfaces shall be free from all visible defects such as laminations, surface imperfections due to shearing or flame cutting operation, etc., and shall be free from rust scale, grease and other foreign matter.

1.10.2. **Method**

All welding shall be carried out by the electric arc process using covered electrodes in accordance with B.S. 639.

Gas welding may be employed in certain circumstances providing that prior approval is obtained from the Engineer.

1.10.3. **Welding Codes and Construction**

All welded joints shall be carried out in accordance with the following specification:-

a) **Pipe Welding**

All pipe welds shall be carried out in accordance with the requirements of B.S. 806.

b) General Welding

All welding of mild steel components other than pipework shall comply with the general requirements of B.S.5135:1974.

1.10.4. **Welder's Qualifications**

Any welder employed on this sub-contract shall have passed the trade test as laid down by the Government of Kenya.

Trade engineer may require to see the appropriate certificate obtained by any welder and should it be proved that the welder does not have the necessary qualifications the Engineer may instruct the Sub-Contractor to replace him by a qualified welder.

2. PART B: GENERAL SPECIFICATIONS FOR KITCHEN EQUIPMENT

These are general specifications of various kitchen equipment .Details that are particular to a project like power ratings, gas consumption and sizes have not been included. These shall be specified at design stage for particular projects either in these specifications or in the bills of quantities.

2.1. SOLID TOP ELECTRIC COOKING RANGE

Electrically heated solid top cooking range complying with KS 04-1111-15:1993 constructed as follows:

- Exterior satin finish 18/10 stainless steel, minimum 2mm thick.
- Electrically heated cast iron radiant plates with built in thermostats.
- Number of plates and power rating for each plate shall be as specified.
- Heat resistant power control knobs for the plates.
- “Power on “indicator lights for all the plates.
- High temp limit thermostat with manual reset
- Minimum 0.8mm thick Drip tray in stainless steel

The unit shall have an electrically heated thermally insulated oven constructed as follows: -

- Double oven walls in stainless steel insulated with high density fiber glass
- Oven heating elements positioned at the top and under the oven base plate with total loading to be specified.
- Thermostatically controlled oven temperature to range from 50⁰ C- 350⁰C with adjustable thermostat.
- High temp limit thermostat with manual reset
- Indicator lamp to show mains on.
- Double skinned counter balanced fiber glass insulated door with heat resistant handles.
- There shall be Chromium plated oven shelves with at least three levels for shelf setting.

The unit shall be on adjustable stainless steel feet, padded on the bottom to avoid scratching the floor.

The total rating of range and oven shall be as specified and suitable for 415V, 50 HZ or 240V 50Hz supply with proper earthing. Power shall be supplied through heat resistant cables. Its external dimensions shall be as specified.

2.2. GAS COOKING RANGE.

Gas heated cooking range with oven constructed as follows: -

- Exterior satin finish 18/10 stainless steel, minimum 2mm thick.
- Open burners in enamelled cast iron with double crown cover in printed brass.
- The number of burners and their gas consumption shall be as specified.
- Heat resistant gas knobs and thermocouple controlled flame failure gas shut off device.
- Automatic burners lighting device with pilot flame.
- Cast iron pan supports.
- Minimum 0.8mm thick Drip tray in stainless steel.

The oven and door shall be double walled with fibre glass insulation, complete with: -

- Stainless steel burner with automatic lighting device. Burner gas consumption shall be as specified.
- Thermocouple controlled flame failure gas shut off device.
- There shall be Chromium plated oven shelves with at least three levels for shelf setting.
- Secondary drip tray below burners (in stainless steel)
- Thermostatically controlled oven temp to range from 50⁰ C- 350⁰C.
- The unit shall be on adjustable stainless steel feet, padded on the bottom to avoid scratching the floor.

The unit shall operate on L.P gas at 0.15 bars. It external dimensions shall be as specified.

2.3. STOCKPOT STAND

L.P. gas heated stockpot stand on a sturdy stainless steel frame constructed as follows: -

- Minimum 2mm thick exterior satin finish 18/10 stainless steel
- Cast iron burner with Automatic lighting device and flame failure device.
- Stainless steel drip tray, minimum 0.8mm thick.
- Enamelled cast iron pan supports.
- Adjustable Stainless steel feet.

The unit gas consumption and external dimensions shall be as specified.

2.4. GAS HEATED TILTING BRAT PAN

Directly heated L. P. gas tilting bratt pan constructed as follows:

- Exterior surface finish 18/10 stainless steel, minimum 2mm thick
- 18/10 stainless steel counter balanced lid with helicoidal spring, shaped to assist in containing condensation within the pan. Lid shall have heat resistant handles
- Pan in 18/10 stainless steel with stainless steel thermal diffusion bottom and a shaped front side for easy discharge of oil.
- Robust Manual worm and wheel tilting mechanism with heat resistant handle
- A water spout with tap at front of appliance
- Stainless steel multi-pipe burners with automatic burner ignition device, flame failure protection device and thermostat to control cooking temperature (500 – 300OC)
- Safety device for switching off burner during lifting of pan
- High temperature limit thermostat with manual reset
- Adjustable Stainless steel feet

The unit gas consumption, pan capacity and external dimensions shall be as specified.

2.5. FIXED GAS HEATED BOILING PAN

- Fixed Boiling pan constructed as above but mounted on Adjustable stainless steel feet to provide a clearance of 300mm above the floor.

2.6. ELECTRIC HEATED TILTING BRAT PAN

Directly heated Electric tilting bratt pan, with pan capacity to be specified.

It shall be constructed as follows:

- Exterior surface finish 18/10 stainless steel, minimum 2mm thick
- 18/10 stainless steel counter balanced lid with helicoidal spring, shaped to assist in containing condensation within the pan. Lid shall have heat resistant handles
- Pan in 18/10 stainless steel with stainless steel thermal diffusion bottom and shaped front side for easy discharge of oil.
- Robust Manual worm and wheel tilting mechanism with heat resistant handle
- A water spout with tap at front of appliance
- Thermostatically controlled armoured stainless steel elements fixed on bottom of pan
- Safety device for switching off burner during lifting of pan
- High temperature limit thermostat with manual reset
- Signal lamps for indicating electricity ON.
- Adjustable Stainless steel feet

The total rating of unit shall be as specified and suitable for 415V, 50 HZ or 240V 50Hz supply with proper earthing. Power shall be supplied through insulated heat resistant cables. Its external dimensions shall be as specified.

2.7. FIXED ELECTRIC HEATED BOILING PAN

Boiling pan constructed as above but mounted on a sturdy stainless steel frame without manual worm gear and wheel tilting mechanism.

2.8. FIXED INDIRECTLY HEATED GAS HEATED BOILING PAN

A cylindrical indirectly heated gas-boiling pan constructed as follows:

- Satin finished 18/10 stainless steel pan and cavity both 2mm thick.
- Satin finished 18/10 stainless steel spring balanced lid with heat resistant handle.
- 32mm pan outlet with tap for discharge.
- Removable vegetable basket.
- Cast iron ring burners with Automatic ignition device, pilot flame and flame failure protection device.
- High temperature limit thermostat with manual resetting
- Glass wool thermal insulation of combustion chamber.
- Water supply connections.
- Pressure relief valve to operate at 0.5 bar
- Cavity discharge tap, water inlet valve with level control and thermometer
- Adjustable stainless steel feet to provide a clearance of 300mm above the floor.

The unit gas consumption, pan capacity and external dimensions shall be as specified

2.9. GAS HEATED DEEP FAT FRYER

L.P gas heated pedestal deep fat fryer constructed as follows:-

- Exterior satin finish in 18/10 stainless steel, minimum 2mm thick.
- Fryer wells shall be of 18/10 stainless steel with oil draw off tap.
- Stainless steel lid with heat resistant handles.
- Stainless steel oil collection bin.
- S. Steel Frying baskets with heat resistant handles.
- Deep cool zone for residual particles.
- Cast iron burners with automatic ignition device, flame failure protection device and oil temperature regulation thermostat ranging from 900C to 2700 C.
- Manually resettable high limit safety thermostat.
- Adjustable stainless steel feet.

The number of wells and their oil capacity, gas consumption and external dimensions shall be as specified.

2.10. ELECTRIC HEATED DEEP FAT FRYER

Electric heated deep fat fryer constructed as follows:-

- Exterior satin finish 18/10 stainless steel 2mm thick.
- Fryer wells shall be of 18/10 stainless steel with oil draw off tap.
- Stainless steel lid with heat resistant handles.
- Stainless steel oil collection bin.
- Frying S. Steel baskets with heat resistant handles.
- Deep cool zone for residual particles.
- Armoured electric heaters with oil temperature regulation thermostat ranging from 900C to 2700 C.
- Manually resettable high limit safety thermostat.
- Operation Status indicator light

The number of wells and their oil capacity shall be as specified. The total power rating of unit shall be as specified and suitable for 415V, 50 HZ or 240V 50Hz supply with proper earthing. Power shall be supplied through insulated heat resistant cables. Its external dimensions shall be as specified.

2.11. CHICKEN GRILL

Rotary chicken grill of stainless steel construction with tempered double pane hinged glass doors. It shall have a robust removable rotor, splits, drip tray & stainless steel bars. It shall be electrically heated to cook by both convection and radiant heat & shall be equipped with thermostat, timer, overload protection and lighting. The bird capacity dimensions and power rating shall be as specified.

It shall be operating on 240V, 50Hz power supply.

2.12. COMBI OVEN

A gas heated combination oven with both convective and steam heating constructed as follows:-

- Panelling, oven door and control panel in 18/10 stainless steel
- Cooking chamber with well rounded corners to facilitate cleaning. The chamber door shall double glazed heat tempered glass with a seal fitted all round to form an air tight enclosure. It shall open out at 180 o to allow easy movement of the trays and shall have a heat resistant handle. It shall have racks in stainless steel. The position of the racks shall be adjustable within the chamber.
- The chamber temperature shall be thermostatically controlled for cooking at 50o to 270oC by convective heating. It shall also be equipped with heating elements a circulation fan, a timer, end of cooking acoustic signal, extract fan to eliminate vapours, a circulation fan, chamber lighting and condensation tray with drain.
- It shall also cook by steam and shall therefore have Stainless steel steam generator with pressure relief valve, water level controller, overheat safety cut-out, and water supply connection with automatic level device and lime remover unit.
- A microprocessor to control operations like lighting of burners for the chamber and boiler, boiling and cooking time, fan's control, and temperature control.

The oven dimensions, number of racks and power rating shall be as specified.
It shall be suitable for 415V, 50 HZ or 240V 50Hz supply with proper earthing.

2.13. MICROWAVE OVEN

Microwave Oven equipped with motor driven turn table. It shall have a glass door for visual monitoring of cooking process. It shall incorporate safety features such as a safety interlock system to shut off power when the door is opened or not properly closed. It shall have simple electronic digital power and time control. It shall be complete with circulation fan for even cooking.
It shall operate on 240 V 50Hz power supply.

2.14. COFFEE/TEA URN

Electrically heated coffee/tea urn constructed from stainless steel casing with lift off cover
The urn shall be complete with non-drip draw off tap and drain plug and water supply arm with control valve and drain plug.

It shall have a thermostatically controlled immersion electric element with selector switch and automatic safety cut-out. The capacity of the urn and power rating shall be as specified.
It shall operate on 240 V 50Hz power supply and shall be earthed.

2.15. MILK URN

Electrically heated stainless steel milk urn with water jacket for indirect heating complete with stainless steel lift off cover.

It shall be complete with non-drip draw off tap, water drain plugs and water supply arm. There shall be a gauge to indicate the water level in the water jacket.

It shall have a thermostatically controlled immersion electric element with selector switch and automatic safety cut-out.

It shall operate on 240 V 50Hz power supply and shall be earthed.

The capacity of the urn and power rating shall be as specified.

2.16. COFFEE MAKING MACHINE

Electrically heated, automatically regulated coffee making machine. The outer casing, inner tank and brewing head with filter plates shall be made with stainless steel 18/10.

The machine shall be equipped with Teflon coated hot plates with cast-in heating elements. It shall also have robust heat resistant glass bowls.

The output, number of hotplates/glass bowls and power rating shall be as specified. It shall operate on 240 V 50Hz power supply and shall be earthed.

2.17. ELECTRIC HEATED BAIN MARIE/HOT CUPBOARD

Electric heated upper half Bain Marie and lower half hot cupboard unit constructed from polished 16.s.w.g. Stainless steel sheet 18/10. The Bain Marie shall be of the water well type complete with food serving pots and lids.

The Bain Marie top shall be divided into sections to carry Gastronome food container pots of minimum 200mm deep and to be drawn from polished 16.s.w.g. Stainless steel sheet.

The water well shall be thermostatically controlled from 30°C to 80°C.

There shall be a 15 mm chrome plated water supply valve and 25mm drain with a chrome plated valve.

The hot cupboard shall be equipped with stainless steel sliding doors and fitted with two stainless steel shelves. The doors, side panels, top and underside shall be double cased and insulated. The door handles to be strong and heat resistant.

The unit shall be fitted with armoured heating elements with pilot lights and thermostats to separately control temperature in the water well and oven from 30°C to 80°C.

The whole unit shall be constructed in stainless steel on a strong angular framework with stainless steel adjustable feet. The dimensions, number of pots and gas consumption of the unit shall be as specified.

The total power rating of unit shall be as specified and suitable for 415V, 50 HZ or 240V 50Hz supply with proper earthing. Power shall be supplied through insulated heat resistant cables.

2.18. GAS BAIN MARIE/HOT CUPBOARD

Gas heated upper half Bain Marie and lower half hot cupboard unit constructed from polished 16.s.w.g. Stainless steel sheet 18/10. The Bain Marie shall be of the water well type complete with food serving pots and lids.

The Bain Marie top shall be divided into sections to carry Gastronome food container pots of minimum 200mm deep and to be drawn from polished 16.s.w.g. Stainless steel sheet. The water well shall be thermostatically controlled from 30°C to 80°C.

There shall be a 15 mm chrome plated water supply valve and 25mm drain with a chrome plated valve.

The hot cupboard shall be equipped with stainless steel sliding doors and fitted with two stainless steel shelves. The doors, side panels, top and underside shall be double cased and insulated. The door handles to be strong and heat resistant.

The unit shall be fitted with chrome plated gas isolating cocks. There shall be Cast iron burners with automatic ignition device, flame failure protection device and thermostats to separately control temperature in the water well and oven from 30°C to 80°C

The whole unit shall be constructed in stainless steel on a strong angular framework with stainless steel adjustable feet.

The dimensions, number of pots and gas consumption of the unit shall be as specified.

2.19. STAINLESS STEEL HOT CUPBOARD GAS HEATED.

Gas heated hot cupboard as above constructed with polished stainless steel sheet of 14 SWG for the top and 16 S.W.G stainless steel sheet for the other parts.

The whole unit shall be constructed on a strong stainless steel angular framework on stainless steel adjustable feet. The dimensions and gas consumption of the unit shall be as specified.

2.20. POTATO PEELER

Heavy duty floor mounted Potato peeler with body, drum and peeling plate constructed in Aluminium alloy casting. The plate shall be sea wave shaped. The drum interior and the plate shall be coated with abrasive embedded in epoxy resin and both shall be replaceable.

It shall also have suitable water inlet and drainage hose connections. It shall be equipped with a **peel trap** unit.

The door shall have a positive cam latch door with a safety switch to isolate power when the door opens.

Electrically run, it shall have a continuously rated motor with overload protection and suitable for 415V, 50 HZ or 240V 50Hz supply with proper earthing.

All electrical components shall be adequately insulated and shall be splash proof.

The peeling capacity shall be as specified.

2.21. ELECTRIC POTATO CHIPPER

Heavy duty rotary action electrically operated, bench mounted potato chipper capable of producing various sizes of chips.

The body and the bulk feed hopper shall be in stainless steel. The rotary feed and chipping unit shall be in Aluminium alloy casting or stainless steel. The motor, gearbox and bearings shall be factory lubricated for maintenance free operation.

It shall have an inbuilt switch which breaks power supply to the motor when it's opened. The motor shall also have inbuilt overload protection. There shall also be a device wired such that it prevents the machine starting should power be interrupted and then restored.

The unit shall be suitable for 415V, 50 HZ or 240V 50Hz supply with proper earthing. The power rating, chipping capacity and chips sizes shall be as specified.

2.22. MANUAL POTATO CHIPPER

Heavy duty manually operated and bench mounted potato chipper. It shall be constructed from a cast iron body and equipped with replaceable stainless steel knives. The operating handle shall be spring loaded to ensure it remains in open position. The knife shall be positioned that the chips can be conveniently taken out.

2.23. MEAT SLICING MACHINE

Gravity feed meat-slicing machine constructed of anodized aluminium body and a hardened chrome steel knife. It shall be equipped with a built in self-setting knife sharpening unit and a stainless steel carriage guard. It shall also have a mechanism to control the thickness of the cut products.

There shall be a safety switch to isolate power when the guard is opened. There shall also be a pilot lamp to indicate that the knife is running. Additional safety feature shall be a system to ensure that the machine can only be restarted manually from the start button when power is restored after a power failure.

The power rating, knife size and maximum size of material it can cut shall be as specified.

The unit shall be suitable for 415V, 50 HZ or 240V 50Hz supply with proper earthing.

2.24. UNIVERSAL MIXING MACHINE

Electrically driven mixing and general-purpose machine complete with a stainless steel bowl, bowl guard, beater, whisk and spiral dough hook. It shall have a spindle for attachment of a meat mincer and vegetable preparation machine.

It shall be constructed from a rigid one piece Aluminium alloy casting with a belt drive motor system equipped with belt tensioner and factory lubricated and sealed components. The motor shall have a thermal overload protection switch.

The bowl, cradle and bowl guard shall be interlocked such that the machine shall only operate with the bowl, guard and cradle in the operating position. It shall have a system to ensure that the machine can only be restarted manually from the start button when power is restored after a power failure.

It shall be capable of operating at different speeds to suite the various operations. There shall be a variable timer on the control panel and an emergency stop button.

The power rating and bowl capacity shall be as specified.

The unit shall be suitable for 415V, 50 HZ or 240V 50Hz supply with proper earthing.

2.25. WEIGHT SCALE

Electronic weight scale of capacity 150kg with 50g graduations. It shall have a weighing platform in stainless steel. There shall be a programmable digital indicator system with LCD display mounted on a rigid frame. It shall indicate measurements in Kgs only.

2.26. DIAL INDICATOR BENCH SCALE

Bench types dial indicator scale (0-25Kg) with 50G graduations. The unit shall be constructed in enamelled steel and the weighing platform to be finished in polished stainless steel suitable for weighting wet foodstuffs during preparation.

2.27. CHEST TYPE FREEZER CABINET

A chest type cabinet freezer constructed from stainless steel body and have a one piece toughened plastic interior with insulation in between. The freezer shall have an insulated hinged lid with a magnetic seal. There shall be adequate protection of the insulation against ingress of moisture. There shall be a drainage port for use when cleaning or defrosting.

It shall have a hermetic compressor with thermal overload protection, condenser fan and evaporator fan. The system shall utilize R 134a refrigerant or any other CFC free refrigerant.

There shall be a thermostat for setting of storage temperature up to – 18⁰C. The unit shall have a green “power on” indicator light and a red to go off when pre-set temperature is achieved. It shall have a digital VISUAL temperature display panel. There shall also be a heat pump defrosting system to operate both manually and automatically.

The whole unit shall be on a strong framework with stainless steel adjustable feet.

The power rating and volume capacity shall be as specified.

The unit shall be suitable for 415V, 50 HZ or 240V 50Hz supply with proper earthing. It shall also be provided with a power protection unit to protect against voltage fluctuations.

2.28. UPRIGHT REFRIGERATOR

An upright refrigerator constructed from stainless steel body and has a one piece toughened plastic interior with insulation in between. There shall be adequate protection of the insulation against ingress of moisture. The fridge shall have a hinged tempered glass door with a magnetic seal. It shall also have adjustable stainless steel shelves in the compartment.

It shall have a hermetic compressor with thermal overload protection, condenser fan and evaporator fan. The system shall utilize R 134a refrigerant or any other CFC free refrigerant.

There shall be a thermostat for setting of storage temperature up to +2°C. The unit shall have a green “power on” indicator light and a red to go off when pre-set temperature is achieved. It shall have a digital VISUAL temperature display panel. The whole unit shall be on a strong framework with stainless steel adjustable feet.

The power rating and volume capacity shall be as specified.

The unit shall be suitable for 415V, 50 HZ or 240V 50Hz supply with proper earthing. It shall also be provided with a power protection unit to protect against voltage fluctuations.

2.29. DISH WASHER

Electrically heated conveyor dish washing machine capable of washing and rinsing dishes using standard 500x500mm standard trays. The chassis, housing guides and legs shall all be in 18/10 stainless steel. It shall have the following features

- Stainless steel washing and rinsing water heaters each with thermostatically controlled armoured heating elements. The water supply to the tanks shall incorporate filters. Each heater shall have water level and pressure regulation valves. There shall also be separate washing and rinsing pumps in the system.
- Doors with safety devices to cut off power when they open.
- Separator curtains between different sections of the washing tunnel.
- Acid and water resistant conveyor protected against traction and compression loads.
- Device to stop machine when there are no washing baskets on the conveyor.
- Indicator lights to show the stages of various operating process

The machine shall have easily accessible and splash proof controls. The unit shall be suitable for 415V, 50 HZ or 240V 50Hz supply with proper earthing.

The production capacity in baskets per hour and the power rating shall be specified.

2.30. MEAT CHOPPING BLOCK.

Chopping block on a stainless steel stand with adjustable stainless steel feet. The block shall be made from food grade Teflon block or equal and approved.

It shall be securely mounted on a stand such that the top surface of the block is roughly 800mm above the finished floor. The size of the chopping block shall be as specified.

2.31. INSECTOCUTOR

Insectocutor with a protected high-tension grid operating at a voltage of about 16000 volts. It shall have a facility to emit ultra – violet light to attract insects to the high voltage grid. It shall be constructed of stainless steel housing with powder coated safety grille, removable plastic tray and wall mounting brackets.

The unit shall be suitable for 415V, 50 HZ or 240V 50Hz supply with proper earthing.

2.32. DOUBLE BOWL DOUBLE DRAINER SINK ON STAND

Double Bowl Double Drainer (DBDD) stainless steel Sink with 2No.bowls size 600x450x300mm deep each centrally placed with a 50mm backsplash.

It shall have a stainless steel grid under shelf and a 250mm stainless steel skirting below the sink rim covering all sides of the sink.

The top and sink shall be of 16 s.w.g. Stainless steel 18\10. The bowls shall be pressed in a single piece with rounded corners. Each bowl shall be fitted with a perforated removable corner strainer in full own height, a 40 mm waster outlet with stand overflow outlet fitting and a pillar type heavy duty hot/cold water sink mixer with over arm swivel outlet .

Unit frame shall be 32mm R.H.S. stainless steel and each leg to be equipped with a stainless steel adjustable sanitary foot to maintain a sink height of 850mm from the floor. The feet/stand shall have a spacing of maximum 1000mm.

The length and width of the sink shall be as specified.

2.33. SINGLE BOWL DOUBLE DRAINER SINK ON STAND

Sink constructed as above but with one bowl. The length and width of the sink shall be as specified.

2.34. STAINLESS STEEL WORKTOP

Stainless steel table with a stainless steel grid shelf .The top shall be of 16 s.w.g. Stainless steel sheet 18\10 backed with 4 mm thick mild steel for reinforcement.

The unit frame to be 32mm stainless steel square tube. Stainless steel and each leg to be equipped with a stainless steel adjustable sanitary foot to maintain a sink height of 850mm from the floor. The table top shall have turned down edges in front and ends to strengthen and give stability. The top shall be strengthened with the frame such that it takes heavy loads without sagging.

The length and width of the table shall be as specified.

2.35. LOUVRED PLATE STACKING RACK

Louvered Stainless steel plate stacking rack .Each shelf shall be constructed in 16s.w.g stainless steel sheet 18\10 with a 100mm up stand all round. It shall have stainless steel grill constructed from 6mm rods at 25mm centre to centre designed such that it can hold 150mm and 250 mm diameter earthenware plates in an almost upright position. The clearance from one shelf to the other shall be

about 450mm. The whole unit shall be substantially constructed such that each shelf can accommodate its full capacity of 250mm diameter earthenware plates without deflection.

The unit frame shall be 32mm stainless steel square tube, with stainless steel adjustable sanitary feet.

The number of trays, length, depth and height of the rack shall be as specified.

2.36. PLATE STACKING RACK

Stainless steel plate stacking rack .Each shelf shall be constructed in 16s.w.g stainless steel sheet 18\10 with a 100mm up stand all round. The whole unit shall be substantially constructed such that each shelf can accommodate at least 150No.9 inch diameter earthenware plates without deflection. The clearance from one shelf to the other shall not be less than 450mm.The unit frame shall be 32mm stainless steel square tube, with stainless steel adjustable sanitary feet.

The number of trays, length, depth and height of the rack shall be as specified.

2.37. GLASS STACKING RACK

Rack constructed as above with 10mm diameter perforated holes all over the shelf surface. The number of trays, length, depth and height of the rack shall be as specified.

2.38. POT STACKING RACK

Stainless steel pot stacking rack .Each shelf shall be constructed in 16s.w.g stainless steel sheet 18\10 with a 100mm up stand all round. The whole unit shall be constructed such that the clearance from one shelf to the other shall not be less than 600mm. The unit frame shall be 32mm stainless steel square tube, with stainless steel adjustable sanitary feet.

The number of trays, length, depth and height of the rack shall be as specified.

2.39. GENERAL PURPOSE TROLLEY

General-purpose Stainless steel mobile trolley constructed sturdily with made of 16 s.w.g. Stainless steel sheet 18\10 backed with plywood for rigidity and noise/shock absorption. The unit to run on 4No.150mm diameter heavy-duty castors (2 fixed, 2 swivels). It shall be equipped with a stainless steel holding bar.

The number of trays, length, depth and height of the trolley shall be as specified.

2.40. TRAY SLIDE

1.2mm thick by 300mm wide stainless steel tray slide with reinforced construction fixed at approx. 700mm high. It shall have stainless steel tubular supports of 32mm diameter at approximately 1500mm centres. Overall length shall be specified.

**GENERAL SPECIFICATION
FOR
L.P. GAS INSTALLATIONS**

3. PART C: GENERAL SPECIFICATION FOR L.P. GAS INSTALLATIONS

3.1. GENERAL

The specification covers the storage and transmission of liquefied petroleum gas (L.P.G) which refers to butane, propane or a mixture of both stored in liquid form under pressure. When mixed with air at atmospheric pressure, the gas requires a concentration of 2% of the vapour for ignition to take place. The percentage fill in the storage vessel is about 85%.

3.2. REGULATIONS AND STANDARDS

Material, equipment, installations and workmanship shall comply with the requirements of the latest Editions of the following:

- (a) Kenya Government By-laws.
- (b) Relevant standards published by the Kenya Bureau of Standards.
- (c) Relevant British Standards, Specifications & Codes of Practice; referred to as B.S. & B.S.C.P respectively in this document.
- (d) Requirements of the clients proposed local L.P Gas Supplier.
- (e) This specification and the contract drawings.

3.3. L.P.GAS BULK STORAGE TANKS

The L.P Gas bulk storage tank shall be of either vertical or horizontal cylindrical mild steel construction manufactured from rolled carbon steel plate, welded together in compliance with the requirements of KS 200:2002 and BS 5500 or ASME (American Society of mechanical Engineers) Codes. The tank shall be earthed to protect against accumulation of static electricity.

The storage tank shall have the following minimum pressure requirements:-

Test Pressure: 25 bars

Working pressure: 9 bars at 20o c

A test certificate shall be provided with the tank. It shall contain details such as the Standards to which the tank has been manufactured, tests done, results of such tests, etc.

The tank shall be supplied complete with:

- (a) Filing valve, take off connection with first stage regulator, Pressure relief valve, Pressure gauge and magnetic float gauge, all housed under a lockable-hinged cover, forming integral part of the tank.
- (b) Drain plug.

- (c) Main isolating Valve.
- (d) Lifting lugs welded at both ends of the tank
- (e) Mounting feet welded to the base of tank .These shall be used to bolt the tank to a concrete base to secure it.

The tank shall be pickled and primed on the outside and painted with two coats of weather resistant paint.

It shall also have a stamp showing the supplier, test pressure and the date of testing.

The tanks are manufactured in various sizes but the following are the standard sizes used in commercial kitchen applications.

Tank capacity 0.5 Ton	1000mm diameter	2000mm long
Tank capacity 1.0 Ton	1000mm diameter	3000mm long
Tank capacity 2.0 Ton	1220mm diameter	4100mm long

Apart from the above minimum specification for the bulk L.P Gas storage tank, any additional requirements may be specified by the L.P. Gas supplier.

The vertical cylinder shall be fitted with a discharge isolation valve, pressure relief valve. Where there is a multiple cylinder bank installation, an automatic change-over valve with a regulator to reduce pressure to 37 mbar shall be incorporated.

Tank sizes are determined by the LPG dealers and they are available in various sizes.

Each tank shall be identified with the following minimum information, permanently marked on the tank shell or imprinted on a stainless steel name plate affixed to the tank in a position normally accessible through the inspection chamber:

- « The name of the Vendor
- « The construction standard to which the tank is built
- « A reference number unique to the tank
- « The date of manufacture
- « The tank capacity

3.4. PIPEWORK

Pipes and gas manifolds for L.P. Gas installations shall be galvanized mild steel tubing to B.S. 1387: Class C with Pipe threads to B.S. 21 or copper pipes to B.S 2871 with compression fittings to B.S 864.Only P.T.F.E tape or jointing compound specifically made for LPG shall be used. Use of hemp shall not be allowed.

The L.P. Gas pipe work installation shall comply with the requirements of B.S.C.P. 331: Part 3.

Pipe fittings shall be either welded or seamless wrought steel pipe fittings to B.S. 1740: Class C. A union shall be provided on all straight runs of pipe work at a maximum interval of six meters.

Pipe work laid underground shall be wrapped with pipe wrapping material having vapour permeability of less than 0.11g/m²/d at 250 C and 75% relative humidity. The pipe wrapping material shall have high resistance to mineral acids, alkalis and salts and shall be on non-cracking and non-hardening characteristics.

Underground L.P. Gas distribution pipe work shall be laid to a slope of 1 in 200. Gas service pipes, from the gas distribution pipes to the parts of building they service, shall be laid to rise from the distribution pipe at a slope of 1 in 200. All pipes under the ground shall rest throughout their length on a 150mm deep, flue sand topping, followed by an approved backfilling.

Where the pipe passes through the building fabric, it shall be located within a pipe sleeve, one diameter larger than the pipe passing through it. The void between the pipe and the sleeve shall be packed with bitumen or approved equal material.

Horizontal and vertical pipes within the building shall be fixed off the walls with brass built brackets or spacer type steel pipe clips. The pipe supports spacing intervals for both the horizontal and vertical pipe runs shall be as follows:

Pipe nominal diameter:	15mm	Interval:	1.82 metres
:	20 & 25mm	:	2.44 metres
:	32 & 40mm	:	2.75 metres
:	50mm	:	3.00 metres
:	65mm	:	3.65 metres

The pipe work underneath the tables worktops to which shall be connected the gas outlets shall be made from gas quality copper.

Pipework shall be bonded in accordance with I.E.E regulations.

3.5. GAS ISOLATION VALVES

The L.P. Gas isolation valves shall be quarter turn; lever operated ball valve of brass or stainless steel construction.

The valve shall have “open” and “closed” positions clearly marked on the valve body.

3.6. TANK SITING AND SAFETY

3.6.1. Siting

The position of the tank shall not be less than 7meters away from adjacent buildings. It shall be the responsibility of others to construct a concrete plinth constructed to structural engineer’s specifications to support the tank. The tank should not be sited in a location known to be susceptible to flooding.

3.6.2. Safety

A 1.8m high fence with lockable gates around the cylinders to protect them shall be provided. The fence shall be at least 1.5 m away from the tank.

A crash barrier shall also be erected at 2 meters from the fence to stop any vehicles from the access road crashing into the facility.

Two approved **NON-SMOKING OR NAKED LIGHTS** notices in red background shall be fixed on the surrounding fence. They shall be of such a size that can be read from a distance of 20 meters.

A portable carbon dioxide fire extinguishers and shall comply with B.S. EN 3/BS 1449 and B.S. 1004. shall be mounted on the fence next to the entrance.

3.7. TESTING AND COMISSIONING

The whole pipe work system shall be pressure tested using compressed air. The test pressure shall be 7.0 bars. When this pressure is achieved, the pipework shall be uniformly coated with a soap solution. Particular attention should be paid to all connection points. Leaks shall be detected by the presence of bubbles. If bubbles are found around fittings, the fittings should be checked for tightness and repaired as necessary.

The pressure test on pipe work shall be made before any part of the pipe work is concealed in any manner.

The test pressure shall be maintained for a period of six hours. If the pressure drops during this period, leaks in the pipe work shall be made good and the pressure test repeated for a further six hours.

The bulk gas storage tank shall be pressure tested using compressed air and soap solution. Test pressure of 25 bars shall be applied and soap solution applied uniformly on the entire surface of the tank. If leaks are detected in seams or the shell, notify the tank Vendor.

After completion of pressure tests and installation, the L.P. Gas installations shall be balanced to give the required gas flows at each gas user's point.

**GENERAL SPECIFICATION
FOR
KITCHEN COLD AND FREEZER ROOMS**

4. PART D: SPECIFICATIONS FOR KITCHEN COLD AND FREEZER ROOMS

4.1. SCOPE OF WORKS

The works to be carried out comprise of the supply, delivery, installation, setting to work, testing and commissioning of all materials and equipment called for in this specification and shown in the contract drawings.

The tenderer shall include for all appurtenances and appliances not particularly called for in this specification or on the contract drawings but which are necessary for the completion and satisfactory functioning of the system.

No claim for extra payment shall be accepted from the contractor for non-compliance with the above requirements.

If in the opinion of the tenderer there exist difference between the specification and the contract drawings, the tenderer shall clarify the difference with the engineer before tendering.

The Works to be installed under the contract shall comply with the Ministry of Public Works requirements for contract works under “GENERAL MECHANICAL SPECIFICATION”.

4.2. CLIMATIC CONDITIONS

The following climatic conditions apply at the sites of the works and all materials and equipment used shall be suitable for these conditions:-

PARAMETERS	CONDITIONS
Maximum Design Temperature	35° C
Minimum Temperature	12° C
Relative Humidity	69%
Altitude	1,795m
Longitude	36.8219° E
Latitude	1.2921° S

4.3. DESIGN CONDITIONS

4.3.1. Kitchen Cold Rooms – Meat and Milk Products

- (a) Cold room temperatures - $0 \pm 2^{\circ}\text{C}$
- (b) Evaporator Temperatures - $-7 \pm 2^{\circ}\text{C}$

4.3.2. Kitchen Cold Rooms – Vegetable Products

- (a) Cold room temperatures - $12 \pm 2^{\circ}\text{C}$
- (b) Evaporator Temperatures - $4 \pm 2^{\circ}\text{C}$

4.3.3. Kitchen Freezer Rooms – Meat and Milk Products

- (a) Freezer room temperatures - $-20 \pm 5^{\circ}\text{C}$
- (b) Evaporator Temperatures - $-30 \pm 5^{\circ}\text{C}$

4.4. INSTALLATION

Installation of the **kitchen cold and freezer rooms** shall comprise of the following:

The overall external dimensions of the kitchen cold rooms shall be approximately 2250

Mm wide x 3000 mm high 4100 mm deep and 2250 mm wide x 3000 mm high 2050 mm deep.

And

The overall external dimensions of the kitchen freezer room shall be approximately 2250 mm wide x 3000 mm high 4100 mm deep and 2250 mm wide x 3000 mm high 2050 mm deep.

4.5. CONDENSING UNITS

Each condensing unit shall be of capacity to cope with evaporator cooling load of 3 Kw while using R410 refrigerant or other ozone friendly refrigerant as the cooling media under the specified conditions.

The condensing units shall be air-cooled, open type with indirect V-belt drive, similar or equal to those manufactured by Bitzer.

The complete assembly shall be provided with suitable vibration mountings and initial oil charge in the compressor.

The condensing units shall be mounted on belts and pulleys shall be protected by belt guard, which shall be simply demountable for easy access.

The unit shall be complete with compressor, electric motor air-cooled condenser of non-ferrous construction, liquid receiver, all mounted on a common base.

Each condensing unit shall be complete with the following items:-

1. A reciprocating compressor with a flywheel, service valves and initial oil charge
2. An air-cooled condenser of non-ferrous construction with fins mechanically bonded to by seamless tubing
3. A steel welded liquid receiver
4. A 3-phase electric motor fitted with a driving pulley and condenser-cooling fan
5. V-Belts

It shall be the responsibility of the sub-contractor to provide all the necessary anti-vibration mountings and mounting bolts.

4.6. COOLING COIL UNITS

Each coil unit shall consist of a cooling coil, air circulating fan and fan-guard, defrost electric heater element, and a thermostatic expansion valve. A timer unit shall be mounted in the control panel to both the de-frosting intervals and defrosting periods, both of which shall be variable.

The cooling coil unit shall be a 3 Kw cooling capacity under the specified conditions, and shall be of the dry expansion type, and preferably of similar make as that of the condensing units.

The coil shall be manufactured from seamless copper tubing with aluminium fins mechanically bonded to the tubes.

A defrost heater element shall be fitted alongside the cooling coil.

The air-circulating fan shall be manufactured from rigid aluminium sheet and finished in white casing. A drip tray with 25mm diameter connections shall be incorporated in the base of the casing.

4.7. EVAPORATORS

Generally, the evaporators shall consist of a cooling coil, air-circulating fan, fan guard, and defrost electric heater element and a thermostatic expansion valve. The valve shall be pressure equalized and manually adjustable. A timer unit shall be mounted in the control panel to control both the de-frosting intervals and defrosting period – both of which shall be variable. They shall be ceiling type unit with a drip tray fitted with a drainpipe to the outside of the building. The units shall be as GUNTER or equal and approved.

4.8. REFRIGERATION PIPEWORK.

Pipework shall be approved copper tubing and fitting shall be properly fixed in conformity with

‘APPROVED REFRIGERATION MANUAL’. Good workmanship shall be required to ensure that all the connections are completely airtight. The suction line shall be insulated with at least

25mm thickness of Armaflex or other approved material, which shall not have insulating properties inferior to those of cork.

4.9. REFRIGERATION SYSTEM COMPONENTS

The system shall be provided with the following components from the approved manufacturer:

Filter drier

Sight glass with moisture indicator

Solenoid valve

HP/LP cut out

Suction & delivery gauges

Room thermostat

100mm diameter surface mounted dial thermometer in degree Celsius

4.10. CONTROL PANEL

Each refrigeration system shall incorporate complete controls to ensure continuous system services. Such controls shall include protection against any possible motor overload and over-heat.

Each system provided with a purpose made control panel shall be fabricated from mild steel sheet of minimum SWG18 with a hinged door and then powder coated after manufacture. It shall be provided with an integral lock. It shall be complete with;

Isolator

Contactors

Controlling thermostat with temp range from -100C to +300C

80mm dial thermometer with temp range from -100C to +300C

MCBs

Phase failure relay

Over and under voltage protection

Timer switch for defrost control

Push buttons for start and stop

Audible and visual high temperature alarm with manual reset

Heater Contactor

Evaporator fan starter with overload protection

Compressor starter with overload protection

The panel shall also have the following pilot lamps:

- . Compressor trip – Red
- . Fan trip - Red
- . Compressor run – Green
- . Fan run - Green
- . Heater on – Yellow
- . Door open – Red light
- . Each pilot lamp should be labelled

4.11. ELECTRICAL INSTALLATION

The power supply to the control panel shall be provided by others. The sub-contractor shall be responsible for the final connections to the above equipment, all control wiring and for all wiring within the control panel.

4.12. INTERNAL ELECTRICAL FITTINGS

The sub-contractor shall supply and install a bulkhead vapour sealed 40 W energy saving light fittings in the cold room and a suitable door operated switch. Upon opening the door, the door switch shall put “on” the light and at the same time put “off” the air circulating fan.

4.13. DUCTWORK

Ductwork shall be constructed from 24SWG galvanized mild steel sheet, manufactured to BS

2989. The construction shall conform to the specification for sheet metal ductwork DW/121 for low pressure, low velocity systems.

The duct shall be stiffened as necessary with 25mm x 25mm x3mm thick mild steel angle sections and supported adequately at intervals not exceeding 1500mm.

Ductwork shall be insulated externally with 25mm thick polystyrene or polyurethane insulation or other approved equivalent and shall be finished with 2 coats of bitumastic paint and cladded with a galvanised mild steel 22SWG sheet.

4.14. GRILLES

Supply air and extract grilles shall be similar or equal to non-vision grilles type “z” as manufacture by Myson Group Ltd or other approved manufacturers. They shall be manufactured from high-grade extruded aluminium bars with aluminium silver grey finish and 32mm bevelled edges fixing flanges.

4.15. INSULATION AND FINAL WALL FINISHES

The insulating material shall be pre-fabricated rigid injected polyurethane foam or equal and approved with a conductivity of approximately 0.035 W/MOC and a density of approximately 40Kg/m³. It shall be CFC free and have a weight of approximately 14.5kg/m². The insulating material shall be encased in sheet metal in galvanized steel , coloured with white lacquer and 80microns of protective film (0.63mm)

The external panels (ceiling, floor and the sides) shall be of 100mm thickness while the chambers dividing panels shall be 50mm thick.

It shall be finished with galvanized sheet with stainless steel front and on the sides.

The panels shall be double jointed for smooth assembly. Only Panels with continuous joints shall be allowed. A PVC panel fastener approximately every 600mm shall be used to allow a fixed, hermetic join of panel or panels and corners.

The hygecobel fastening system or other approved system shall be used to join the panel with a ‘turn and pull’ movement. They shall be fixed inside by a hexagonal key. The sheet metal covers are cladded on each side and shall have a white, air proof stopper made of hard plastic which shall be highly resistant to wear and tear

4.16. INSULATION AND FINAL WALL FINISHES

The insulating material shall be polystyrene (or equal and approved) with a conductivity of approximately 0.035 W/MoC and a density of approx. 25Kg/m³ for the walls and ceiling and 40Kg/m³ for the floor.

It shall be applied in two/three layers each 50 mm thick with the second/third layers breaking joints with the first/second layers. The proposed freezer/cold/mortuary room insulation shall be 150/100mm thick and installed as described above.

Care must be taken to avoid breaking the vapour seal when fixing the insulation. Two more coats of vapour seal shall then be applied after application of insulation.

Hardwood battens shall be provided at regular intervals between insulation. Aluminium sheet (SWG 20) as specified on the drawing shall then be applied and secured on the hard wood. The main contractor shall then finish off the floor with 75 mm reinforced concrete and plaster under supervision of the sub-contractor.

4.17. INSULATED DOOR

The doors and frames shall be fabricated from heavy seasoned timber and insulated with two layers of 50mm thick polystyrene sandwiched between 10mm thick seasoned wood strips. They shall have a clear height of 1.8 m being hinged on one side so that it opens outward. The doors shall be completed with sufficient gaskets to ensure an airtight seal. The doors shall be fitted with automatic plunger type switches for operating the fan motors and interior lights such that when it is open, the light shall go on and the fan shall stop, and when it is closed, the lights shall go off and the fan shall start.

The doors shall be such that they can be padlocked from outside but with an inside release such that they can be opened from inside even when padlocked. All metal parts on the doors shall be chrome plated.

4.18. PURGING AND CHARGING THE SYSTEM

After completion of erection, the sub-contractor shall purge the system to get off air, moisture etc. and in order to purge effectively, the system shall be evacuated by drawing of vacuum with a vacuum pump and then feeding in a charge of refrigerant which shall then be evacuated again and so on. The compressor of the system shall be set at the median temperature range for the particular cold room/freezer in question.

4.19. TESTING AND COMMISSIONING

Before insulation of the suction pipe the refrigeration system shall be tested for pressure and leaks using the approved combine, method or approved equal. The refrigeration system shall be charged with R140 refrigerant and entire system raised to test pressure using nitrogen or other inert gas. The test pressure shall be twice the working pressure for the system.

Leaks shall be checked using soap bubble followed by using of electronic leak detector. After system is verified leak proof, it shall be maintained under test pressure for 24 hours.

If at the end of this time the gauge pressure has fallen, the complete system shall be re-tested. After the successful completion of the test, the system shall be evacuated using vacuum for 24 hours. If

there is loss of vacuum the system shall be dehydrated again and left under vacuum for a further 24 hours until the system is effectively dehydrated.

After this the system shall be charged with the correct type and quantity of the refrigerant. The system shall then be set to work and adjusted to ensure that it operates correctly and design conditions are achieved. It shall be left to operate for 72 hours and room temperatures recorded for this period using an automatic room temperature sensor and recorder.

The compressor shall be provided with identification plates stating the type of refrigerant used and the quantity required for the system

4.20. TECHNICAL DATA FOR TENDERED EQUIPMENT

ITEM	DESCRIPTION	<i>To be filled by the tenderer</i>
A.	<p>CONDENSING UNIT</p> <p>a. Manufacturer</p> <p>b. Model.....</p> <p>c. Length (mm)</p> <p>d. Width (mm)</p> <p>e. Height (mm)</p> <p>f. Weight (kg)</p> <p>g. Capacity</p> <p>h. Refrigerant</p> <p>i. Power rating (kW).....</p> <p>j. State if air cooled</p>	
B	<p>EVAPORATOR UNIT</p> <p>a. Manufacturer</p> <p>b. Model</p> <p>c. Length (mm)</p> <p>d. Width (mm)</p> <p>e. Height (mm)</p> <p>f. Weight (kg)</p> <p>g. Fan diameter (mm)</p> <p>h. Capacity</p>	

	<ul style="list-style-type: none"> i. Air throw j. Power rating (kW)..... 	
C	<p>INSULATION</p> <ul style="list-style-type: none"> a. Material b. Thickness (mm) c. Thermal Conductivity d. Working temperature range e. Density – for wall and ceiling <li style="padding-left: 40px;">- For floor 	
D	<p>INSTRUMENTATION & CONTROL</p> <ul style="list-style-type: none"> a. Temperature Gauge b. Alarm c. Automatic controls d. Thermostats e. Solenoid Valve f. LP/HP cut-out switch g. Sight Glass h. Filter Drier i. State any other 	

**GENERAL SPECIFICATIONS
FOR
LAUNDRY EQUIPMENT**

5. PART E: GENERAL SPECIFICATIONS FOR LAUNDRY EQUIPMENT

5.1. GENERAL

These are general specifications of various laundry equipment .Details that are particular to a project like power ratings, gas consumption and sizes have not been included. These shall be specified at design stage for particular projects either in these specifications or in the bills of quantities.

5.2. WASHER EXTRACTOR

Front loading washer extractor complying with KS ISO 10472-1/2:1997 and constructed and equipped as follows:-

- Heavy gauge stainless steel ribbed drum with the door interlocked such that the drum shall not rotate while the door is open. The drum shall be such that should an out of balance situation arise during extraction, the drum shall stop for re-distribution of linen. It shall also be possible to open door in case of power failure.
- Stainless steel body panels, treated for sound proofing
- Heavy duty cast iron frame
- Programmable Microprocessor controls for washing of various types of linen
- Adjustable electronic thermostat and timer
- Stainless steel soap dispenser.
- Water level control
- Continuously rated motor(s) with thermal protection.
- Power fluctuation protection device in-built into machine
- Water inlet and drain valves
- Steam inlet connection(For steam heated machines)
- Noise levels at 70 dB or less.

The extractor shall be constructed such that there shall be minimal vibrations transmitted to the floor. All bearings shall be factory lubricated and sealed.

The drum volume and capacity in kilogrammes, extraction speed mode of heating and power ratings shall be as specified. The machine shall be rated for 415V, 50 HZ or 240V 50Hz supply with proper earthing. Its external dimensions shall be as specified.

5.3. TUMBLE DRYER

Front loading Tumble dryer complying with KS ISO 10472-4:1997 constructed and equipped as follows:-

- Stainless steel drum and door. The door shall have a switch to stop a drying cycle when it's opened.
- Axial air flow through the drum, with drum perforations at the front and rear only.
- A lint filter.
- Programmable Microprocessor controls with features such as drying and cool down time, temperature control, moisture control and status indicator lights

- Continuously rated motors with thermal protection.
- Power fluctuation protection device in-built into machine
- Steam inlet connection(For steam heated machines)

The dryer shall be constructed such that there shall be minimal vibrations transmitted to the floor. All bearings shall be factory lubricated and sealed.

The drum volume and capacity in kilogrammes, mode of heating and power ratings shall be as specified. The machine shall be rated for 415V, 50 HZ or 240V 50Hz supply with proper earthing its external dimensions shall be as specified.

5.4. CHEST IRONER

This unit shall be cylinder type return feed ironer complying with KS ISO 10472-5:1997.

It shall be constructed and equipped as follows:-

- Stainless steel ironing roller and galvanized steel body
- Finger guard covering entire length of heating roller bed
- Emergency stop
- Variable temperature control
- Roller Motor speed control. The motor shall have thermal protection.
- It shall be equipped with an exhaust fan.

The roller drum diameter and length and power ratings shall be as specified. The machine shall be rated for 415V, 50 HZ or 240V 50Hz supply with proper earthing its external dimensions shall be as specified.

**GENERAL SPECIFICATIONS
FOR
MORTUARY EQUIPMENT**

6. PART F; GENERAL SPECIFICATIONS FOR MORTUARY EQUIPMENT

6.1. SCOPE OF WORKS

The works to be carried out comprise of the supply, delivery, installation, setting to work, testing and commissioning of all materials and equipment called for in this specification and shown in the contract drawings.

The tenderer shall include for all appurtenances and appliances not particularly called for in this specification or on the contract drawings but which are necessary for the completion and satisfactory functioning of the system.

No claim for extra payment shall be accepted from the contractor for non-compliance with the above requirements.

If in the opinion of the tenderer there exists difference between the specification and the contract drawings, the tenderer shall clarify the difference with the engineer before tendering.

The Works to be installed under the contract shall comply with the Ministry of Public Works requirements for contract works under “GENERAL MECHANICAL SPECIFICATION”.

6.2. CLIMATIC CONDITIONS

The following climatic conditions apply at the sites of the works and all materials and equipment used shall be suitable for these conditions:-

PARAMETERS	CONDITIONS
Maximum Design Temperature	35° C
Minimum Temperature	12° C
Relative Humidity	69%
Altitude	1,795m
Longitude	36.8219° E
Latitude	1.2921° S

6.3. DESIGN CONDITIONS - CHOOSE FROM THE FOLLOWING:

MORTUARY

- (a) Mortuary/ cold room temperatures - $2 \pm 1^{\circ}\text{C}$
- (b) Evaporator Temperatures - $-7 \pm 2^{\circ}\text{C}$
- (c) Body Cool down time - three (3) bodies in 6 hours

6.4. INSTALLATION

Installation of the **mortuary body cold stores** shall comprise of the following:

2 No. Packaged Cold Chambers with 6 No. bodies each. Each packaged cold chamber shall have 6 No. Single hinged doors, 2 no. Body racks each with 3 No. Tiers and 3No.Stretchers.

The overall external dimensions of the mortuary unit shall be approximately 1830 mm wide x 2620 mm high 2440 mm deep.

6.5. CONDENSING UNITS

Each condensing unit shall be of capacity to cope with evaporator cooling load of 3 Kw while using R410 refrigerant or other ozone friendly refrigerant as the cooling media under the specified conditions.

The condensing units shall be air-cooled, open type with indirect V-belt drive, similar or equal to those manufactured by Kuba.

The complete assembly shall be provided with suitable vibration mountings and initial oil charge in the compressor.

The condensing units shall be mounted on belts and pulleys shall be protected by belt guard, which shall be simply demountable for easy access.

The unit shall be complete with compressor, electric motor air-cooled condenser of non-ferrous construction, liquid receiver, all mounted on a common base.

Each condensing unit shall be complete with the following items:-

1. A reciprocating compressor with a flywheel, service valves and initial oil charge
2. An air-cooled condenser of non-ferrous construction with fins mechanically bonded to by seamless tubing
3. A steel welded liquid receiver

4. A 3-phase electric motor fitted with a driving pulley and condenser-cooling fan
5. V-Belts

It shall be the responsibility of the sub-contractor to provide all the necessary anti-vibration mountings and mounting bolts.

6.6. COOLING COIL UNITS

Each coil unit shall consist of a cooling coil, air circulating fan and fan-guard, defrost electric heater element, and a thermostatic expansion valve. A timer unit shall be mounted in the control panel to both the de-frosting intervals and defrosting periods, both of which shall be variable.

The cooling coil unit shall be a 3 Kw cooling capacity under the specified conditions, and shall be of the dry expansion type, and preferably of similar make as that of the condensing units.

The coil shall be manufactured from seamless copper tubing with aluminium fins mechanically bonded to the tubes.

A defrost heater element shall be fitted alongside the cooling coil.

The air-circulating fan shall be manufactured from rigid aluminium sheet and finished in white casing. A drip tray with 25mm diameter connections shall be incorporated in the base of the casing.

6.7. EVAPORATORS

Generally, the evaporators shall consist of a cooling coil, air-circulating fan, fan guard, and defrost electric heater element and a thermostatic expansion valve. The valve shall be pressure equalized and manually adjustable. A timer unit shall be mounted in the control panel to control both the de-frosting intervals and defrosting period – both of which shall be variable. They shall be ceiling type unit with a drip tray fitted with a drainpipe to the outside of the building. The units shall be as GUNTER or equal and approved.

6.8. REFRIGERATION PIPEWORK.

Pipework shall be approved copper tubing and fitting shall be properly fixed in conformity with

‘TRANR REFRIGERATION MANUAL’. Good workmanship shall be required to ensure that all the connections are completely airtight. The suction line shall be insulated with at least

25mm thickness of Armaflex or other approved material, which shall not have insulating properties inferior to those of cork.

6.9. REFRIGERATION SYSTEM COMPONENTS

The system shall be provided with the following components from the approved manufacturer:

Filter drier

Sight glass with moisture indicator

Solenoid valve

HP/LP cut out

Suction & delivery gauges

Room thermostat

100mm diameter surface mounted dial thermometer in degree Celsius

6.10. CONTROL PANEL

Each refrigeration system shall incorporate complete controls to ensure continuous system services. Such controls shall include protection against any possible motor overload and over-heat.

Each system provided with a purpose made control panel shall be fabricated from mild steel sheet of minimum SWG18 with a hinged door and then powder coated after manufacture. It shall be provided with an integral lock. It shall be complete with;

Isolator

Contactors

Controlling thermostat with temp range from -10°C to $+30^{\circ}\text{C}$

80mm dial thermometer with temp range from -10°C to $+30^{\circ}\text{C}$

MCBs

Phase failure relay

Over and under voltage protection

Timer switch for defrost control

Push buttons for start and stop

Audible and visual high temperature alarm with manual reset

Heater Contactor

Evaporator fan starter with overload protection

Compressor starter with overload protection

The panel shall also have the following pilot lamps:

- . Compressor trip – Red
- . Fan trip - Red
- . Compressor run – Green
- . Fan run - Green
- . Heater on – Yellow
- . Door open – Red light
- . Each pilot lamp should be labelled

6.11. ELECTRICAL INSTALLATION

The power supply to the control panel shall be provided by others. The sub-contractor shall be responsible for the final connections to the above equipment, all control wiring and for all wiring within the control panel.

6.12. INTERNAL ELECTRICAL FITTINGS

The sub-contractor shall supply and install a bulkhead vapor sealed 40 W energy saving light fittings in the cold room and a suitable door operated switch. Upon opening the door, the door switch shall put “on” the light and at the same time put “off” the air circulating fan.

6.13. DUCTWORK

Ductwork shall be constructed from 24SWG galvanized mild steel sheet, manufactured to BS

2989. The construction shall conform to the specification for sheet metal ductwork DW/121 for low pressure, low velocity systems.

The duct shall be stiffened as necessary with 25mm x 25mm x3mm thick mild steel angle sections and supported adequately at intervals not exceeding 1500mm.

Ductwork shall be insulated externally with 25mm thick polystyrene or polyurethane insulation or other approved equivalent and shall be finished with 2 coats of bitumastic paint and cladded with a galvanised mild steel 22SWG sheet.

6.14. GRILLES

Supply air and extract grilles shall be similar or equal to non-vision grilles type “z” as manufacture by Myson Group Ltd or other approved manufacturers. They shall be manufactured from high-grade extruded aluminium bars with aluminium silver grey finish and 32mm beveled edges fixing flanges.

6.15. INSULATION AND FINAL WALL FINISHES

The insulating material shall be pre-fabricated rigid injected polyurethane foam or equal and approved with a conductivity of approximately $0.035 \text{ W/M}^0\text{C}$ and a density of approximately 40Kg/m^3 . It shall be CFC free and have a weight of approximately 14.5kg/m^2 . The insulating material shall be encased in sheet metal in galvanized steel, coloured with white lacquer and 80microns of protective film (0.63mm)

The external panels (ceiling, floor and the sides) shall be of 100mm thickness while the chambers dividing panels shall be 50mm thick.

It shall be finished with galvanized sheet with stainless steel front and on the sides.

The panels shall be double jointed for smooth assembly. Only Panels with continuous joints shall be allowed. A PVC panel fastener approximately every 600mm shall be used to allow a fixed, hermetic join of panel or panels and corners.

The hygecobel fastening system or other approved system shall be used to join the panel with a ‘turn and pull’ movement. They shall be fixed inside by a hexagonal key. The sheet metal covers are cladded on each side and shall have a white, air proof stopper made of hard plastic which shall be highly resistant to wear and tear

6.16. INSULATION AND FINAL WALL FINISHES

The insulating material shall be polystyrene (or equal and approved) with a conductivity of approximately $0.035 \text{ W/M}^0\text{C}$ and a density of approx. 25Kg/m^3 for the walls and ceiling and 40Kg/m^3 for the floor.

It shall be applied in two/three layers each 50 mm thick with the second/third layers breaking joints with the first/second layers. The proposed freezer/cold/mortuary room insulation shall be 150/100mm thick and installed as described above.

Care must be taken to avoid breaking the vapor seal when fixing the insulation. Two more coats of vapour seal shall then be applied after application of insulation.

Hardwood battens shall be provided at regular intervals between insulation. Aluminium sheet (SWG 20) as specified on the drawing shall then be applied and secured on the hard wood. The main contractor shall then finish off the floor with 75 mm reinforced concrete and plaster under supervision of the sub-contractor.

6.17. INSULATED DOOR

The cold chamber unit shall have 1 No. Prefabricated and insulated doors of size 1800mm by 1000mm by 175mm and which shall open clear outwards.

Door fasteners shall include spring and roller bolt type mechanism. The locking devices shall provide for the doors to be opened from both outside and inside the cold chambers.

Each door shall be complete with enough gaskets to ensure an air-tight seal. The doorjamb and sills shall be metal clad for protection and door fittings shall be chrome plated.

6.18. PURGING AND CHARGING THE SYSTEM

After completion of erection, the sub-contractor shall purge the system to get off air, moisture etc. and in order to purge effectively, the system shall be evacuated by drawing of vacuum with a vacuum pump and then feeding in a charge of refrigerant which shall then be evacuated again and so on.

The compressor of the system shall be set at -7°C .

6.19. MORTUARY RACKS

There shall be 6 No. bay mortuary racks of overall dimensions 685 x 560 x 2235 mm high. The rack shall be made from 38mm diameter Class B GMS tubing with 25mm diameter pin welded to the shaft.

The shaft to be made from 38mm diameter galvanised mild steel Class B and to have 15mm radius groove all round to accommodate the stretcher and to be complete with ball bearing and rollers.

6.20. STRETCHERS

6 No. metal stretchers of overall dimensions 685 x 2235 mm each made from 14SWG stainless steel sheet, bent, formed, stiffened and welded to 25mm diameter stainless steel tube welded on the lower side of the stretcher and along the lengths of the stretcher.

6.21. TESTING AND COMMISSIONING

Before insulation of the suction pipe the refrigeration system shall be tested for pressure and leaks using the approved combine, method or approved equal. The refrigeration system shall be charged with R140 refrigerant and entire system raised to test pressure using nitrogen or other inert gas. The test pressure shall be twice the working pressure for the system.

Leaks shall be checked using soap bubble followed by using of electronic leak detector. After system is verified leak proof, it shall be maintained under test pressure for 24 hours.

If at the end of this time the gauge pressure has fallen, the complete system shall be re-tested. After the successful completion of the test, the system shall be evacuated using vacuum for 24 hours. If there is loss of vacuum the system shall be dehydrated again and left under vacuum for a further 24 hrs until the system is effectively dehydrated.

After this the system shall be charged with the correct type and quantity of the refrigerant. The system shall then be set to work and adjusted to ensure that it operates correctly and design conditions are

achieved. It shall be left to operate for 72 Hrs and room temperatures recorded for this period using an automatic room temperature sensor and recorder.

The compressor shall be provided with identification plates stating the type of refrigerant used and the quantity required for the system

6.22. TECHNICAL DATA FOR TENDERED EQUIPMENT

ITEM	DESCRIPTION	<i>To be filled by the tenderer</i>
A.	<p>CONDENSING UNIT</p> <p>a. Manufacturer</p> <p>b. Model.....</p> <p>c. Length (mm)</p> <p>d. Width (mm)</p> <p>e. Height (mm)</p> <p>f. Weight (kg)</p> <p>g. Capacity</p> <p>h. Refrigerant</p> <p>i. Power rating (kW).....</p> <p>j. State if air cooled</p>	
B	<p>EVAPORATOR UNIT</p> <p>a. Manufacturer</p> <p>b. Model</p> <p>c. Length (mm)</p> <p>d. Width (mm)</p> <p>e. Height (mm)</p> <p>f. Weight (kg)</p> <p>g. Fan diameter (mm)</p> <p>h. Capacity</p>	

	i. Air throw j. Power rating (kW).....	
C	INSULATION a. Material b. Thickness (mm) c. Thermal Conductivity d. Working temperature range e. Density – for wall and ceiling - For floor	
D	INSTRUMENTATION & CONTROL a. Temperature Gauge b. Alarm c. Automatic controls d. Thermostats e. Solenoid Valve f. LP/HP cut-out switch g. Sight Glass h. Filter Drier i. State any other	

7.1 INTRODUCTION

The document below details the particular specifications for the installation of an automatic, pre-engineered, fixed, fire suppression system designed to protect cooking equipment and ventilation equipment.

The system shall be installed in locations that provide weather proof protection to the equipment, within tested temperature limitations.

The regulated release and tank assemblies must also be mounted in an area where the air temperature will not fall below 32 °F (0 °C) or exceed 130 °F (54 °C). The system must be installed within the guidelines of the UL Listed Design, Installation, Recharge, and Maintenance Manual.

When actuated, the system is to discharge a fixed amount of proprietary wet chemical agent followed by water through the same nozzles, 13 in number.

Water is to be provided by connections to the domestic or sprinkler water supply.

The system is to be capable of automatic detection and actuation and/ or remote manual actuation.

Additional equipment (where necessary) and provisions are to be availed to allow for mechanical or electrical power functional applications i.e. specifically for integration with the BMS and Fire Alarm systems.

Automatic detection shall be by means of specific alloy rated fusible link detectors or electric thermal detectors or any other means necessary to facilitate detection.

7.2 APPLICABLE CODES AND STANDARDS

1. Underwriters Laboratories, Inc. (UL)
2. UL Standard 300
3. Underwriters Laboratories of Canada (ULC)
4. National Fire Protection Association (NFPA)
- NFPA 96 1.1.3.2 and NFPA 17A
5. International Association of Plumbing and Mechanical Officials (IAPMO)
6. PS 108-98

7.3 SUBMITTALS

Submit two sets of manufacturer's data sheets.

Submit two sets of piping design drawings

7.4 SYSTEM DESCRIPTION

The system shall be an automatic fire suppression system using a dual agent concept; wet chemical agent and water for grease-related fires.

The system shall be approved for uniform, overlapping appliance protection.

The system shall be capable of suppressing fires in the following areas associated with cooking equipment: ventilating equipment including hoods, ducts, plenums, and filters; fryers, griddles and range tops; upright, natural charcoal, or chain-type broilers; electric, lava rock, mesquite or gas-radiant char-broilers; woks.

The system shall be the pre-engineered type having minimum and maximum guidelines established by the manufacturer and listed by Underwriters Laboratories, Inc. (UL) and Underwriters Laboratories of Canada (ULC).

The system is to be capable of automatic detection and actuation and/ or remote manual actuation.

Additional equipment (where necessary) and provisions shall be availed to allow for mechanical or electrical power control/functional applications i.e. specifically for integration with the BMS and Fire Alarm systems.

Automatic detection shall be by means of specific alloy rated fusible link detectors or electric thermal detectors or any other means necessary to facilitate detection.

The system shall be installed and serviced by personnel trained by the manufacturer.

7.5 QUALITY CONTROL

Manufacturer:

The Restaurant Fire Suppression System shall be manufactured by a company with over fifty years' experience in the design and manufacture of pre-engineered fire suppression systems. The manufacturer shall be ISO 9001 registered.

Certificates:

The wet agent shall be a specially formulated, aqueous solution of inorganic salts with a pH range between 9.5 – 10.5, designed for rapid flame knockdown and securement of grease-related fires, and specifically constituted to provide continuous evolution of foam when sprayed with water.

7.6 WARRANTY, DISCLAIMER, AND LIMITATIONS

The pre-engineered restaurant fire suppression system components shall be warranted for five years from date of delivery against defects in workmanship and materials. Any purchased components, such as electric gas valves, reset relays, solenoids, pressure relief valves, regulators, electric switches, etc. shall be warranted for one year from date of purchase.

7.7 DELIVERY

Packaging: All system components shall be securely packaged to provide protection during shipment.

7.8 ENVIRONMENTAL CONDITIONS

The system shall be capable of operating in a temperature range of 32 °F to 130 °F (0 °C to 54 °C).

7.9 SYSTEM COMPONENTS

The basic system shall consist of a regulated release assembly which includes a regulated release mechanism, stainless steel enclosure, anti-siphon vacuum breaker (domestic and sprinkler water supply option only), and water flow valve (domestic and sprinkler water supply option only).

The agent storage tank shall be mounted within the enclosure.

Nozzles, blow-off caps, detectors, cartridges, agent, fusible links, and pulley elbows shall be supplied in separate packages and in quantities as needed for the proper arrangements and functioning of fire suppression system.

Additional equipment shall include remote manual pull station, mechanical and electrical gas valves and electrical switches for automatic equipment and gas line shut-off.

7.10 WET CHEMICAL AGENT

The fire suppressant shall be a specially formulated, aqueous solution of inorganic salts with a pH range between 9.5 – 10.5, designed for rapid flame knockdown and securement of grease-related fires.

7.11 AGENT TANK

The agent tank shall be installed in a stainless-steel enclosure.

The tank shall also be constructed of stainless steel.

The tanks shall have a working pressure of 150 psi (10.3 bar), a test pressure of 450 psi (31.0 bar), and a minimum burst pressure of 900 psi (62.1 bar).

The tank shall include an adaptor/tube assembly containing a burst disc union.

7.12 TANK VALVE

The tank valve shall be designed to discharge dual agent onto the hazards being protected.

The valve shall automatically shuttle to switch from wet chemical agent discharge to water discharge.

7.13 REGULATED RELEASE MECHANISM

The regulated release mechanism shall be a spring-loaded, mechanical/ pneumatic type capable of providing the expellant gas supply via a pressurized cartridge to a single agent tank. It shall contain a factory installed regulator deadset at 150 psi (10.3 bar) with an internal relief of approximately 190 psi (13.1 bar).

It shall have automatic actuation by a fusible link or electric detection system and remote manual actuation by a mechanical pull station.

The regulated release mechanism shall contain a release assembly, regulator, expellant gas hose, anti-siphon vacuum breaker, and agent storage tank housed in a stainless-steel enclosure with cover. The enclosure shall contain knock-outs for 1/2 in. conduit. The cover shall contain an opening for a visual status indicator.

It shall be compatible with mechanical gas shut-off devices or, when equipped with a field or factory-installed switch, compatible with electric gas line or appliance shut-off devices.

It shall also be suited for compatibility with BMS and Fire Alarm systems.

7.14 DISCHARGE NOZZLES

Four types of discharge nozzles shall be tested and listed with the system for all applications. Discharge Nozzles are available for low, medium, or high proximity applications.

When using high proximity nozzles, nozzle drop piping can be kept to a minimum. In some applications, nozzles may be installed above the cooking appliance line directly in hood seals penetrating top of the hood.

The P34 and P41 types shall be used for high proximity appliance protection, nozzle height ranges from 54 In. (1.371 mm) to 84 In. (2.133 mm).

The AP type shall be used for medium proximity appliance and plenum protection, nozzle height ranges from 40 In. (1.016 mm) to 48 In. (1.219 mm), and the DL type shall be used for all duct and low proximity appliance protection, nozzle height ranges from 13 In. (330 mm) to 24 In. (610 mm).

Each nozzle shall have a metal blow-off cap to keep the nozzle tip orifice free of cooking grease build-up.

7.15 DISTRIBUTION PIPING

Distribution piping shall be Schedule 40 black iron, chrome-plated, or stainless-steel pipe conforming to ASTM A120, A53, or A106.

7.16 DETECTORS

The detectors shall be the fusible link or electric thermal type designed to separate at a specific temperature.

7.17 CARTRIDGES

The cartridge shall be a sealed steel pressure vessel containing nitrogen gas.

The cartridge seal shall be designed to be punctured by the releasing device supplying the required pressure to expel the wet chemical agent from the storage tank.

7.18 WATER SUPPLY PIPEWORK

The water supply piping portion of the dual agent system shall contain a lockable ball valve.

The lockable ball valve shall be installed in the water supply piping to allow authorized personnel to close the valve after a system actuation and stop the flow of water into the hazard area.

7.19 WATER SHUTDOWN DEVICE

With the approval of the AHJ, a water shutdown device shall be installed. This device shall automatically shut down the flow of water to the discharge nozzles approximately 10 minutes after system actuation.

7.20 AGENT DISTRIBUTION HOSE

Kitchen appliances manufactured with or resting on casters (wheels/rollers) which have the fire suppression system hard piped, shall include a UL Listed agent distribution hose as a component of the suppression system.

This option shall allow the appliance to be moved for cleaning purposes without disconnecting the appliance fire suppression protection. Hose assembly shall include a restraining cable kit to limit the appliance movement within the range (length) of the flexible hose.

7.21 FLEXIBLE CONDUIT

The manufacturer supplying the restaurant fire suppression system shall offer flexible conduit as an option to rigid EMT conduit for the installation of pull stations and/or

mechanical gas valves. The flexible conduit shall be UL Listed and include all approved components for proper installation.

7.22 PULL STATION ASSEMBLY

The fire suppression system shall include a remote pull station for manual system actuation. The pull station shall include a built-in guard to protect the pull handle. The pull station shall also be designed with a pull handle to allow for three finger operation and shall be red in color for quick visibility.

7.23 INSTALLATION

The fire suppression system shall be designed, installed, inspected, maintained, and recharged in accordance with the manufacturer's listed instruction manual.

7.24 TRAINING

Employees shall be instructed in personal safety and the operation of the system by authorized distributor(s) who are trained by the manufacturer.

PART C
BILLS OF QUANTITIES

8.0 PART G: BILLS OF QUANTITIES

8.1 GENERAL NOTES TO TENDERERS

1. The Bills of Quantities form part of the contract documents and are to be read in conjunction with the contract drawings and general specifications of materials and works.
2. The prices quoted shall be deemed to include for all obligations under the sub-contract including but not limited to supply of materials, labour, delivery to site, storage on site, installation, testing, commissioning (**excluding 16% VAT**).
3. All prices omitted from any item, section or part of the Bills of Quantities shall be deemed to have been included to another item, section or part thereof.
4. The brief description of the items given in the Bills of Quantities are for the purpose of establishing a standard to which the sub-contractor shall adhere. Otherwise alternative brands of **equal** and **approved** quality will be accepted.
5. Should the sub-contractor install any material not specified here in before receiving **written approval** from the Project Manager, the sub-contractor shall remove the material in question and, **at his own cost**, install the proper material.
6. The grand total of prices in the Summary of Volume 1 must be carried forward to the **Form of Tender for the tender to be deemed valid**.
7. The Bills of Quantities are divided generally into three sections:-

a. Contractual Requirements – Bill 1

Sub-contractors contractual requirements as called for the bill of quantities shall be priced and included in the tender. However the Tenderer is free to include and price any other items he deems necessary taking into consideration conditions he is likely to encounter on site.

b. Installation Items – Other Bills

The brief description of the items in these Bills of Quantities should in no way modify or supersede the detailed descriptions in the contract Drawings, conditions of contract and specifications. The unit of measurements and observations are as per Volume 1 or as indicated in the Bills of Quantities.

c. Summary

The summary contains tabulation of the separate parts of the Bills of Quantities carried forward with provisional sum, summary volume included. The sub-contractor shall insert his totals and enter his grand total tender sum in the summary of prices of Volume 1.

8.2 BILLS OF QUANTITIES

SECTION D.W. 1: KITCHEN EQUIPMENT - ESSENTIAL INFRASTRUCTURE

Item	Code	Description	Unit	Qty	Rate	Total(Kshs)
A		<p><u>Essential Infrastructure</u> 300mm by 300mm stainless steel floor drain with integral air trap complete with flanged stainless steel strainer basket, with handle, and stainless steel cover grating. Stainless steel drain channel 100mm deep by 300mm wide, as Advance tabco, complete with SS drain channel body (bottom and sides) with anti-splash guard, with stainless steel cover grating and all other accessories. All finishing to be to SS satin finish</p>	No.	5		
B		<p><u>LPG Installations</u> <u>All equipment, components and installations to be to BS 4250:1997, BS 5482-1 and to UKLPG codes of practice COP 1, COP 2, COP 3, COP 22 and to local standards and codes of practice.</u></p>	LM	25		
C		LPG piping, Dia 22mm copper pipe into 40 Dia. mm GI sleeve.	Lm	150		
D		LPG piping, Dia 15mm copper pipe into 25 Dia. mm GI sleeve.	Lm	40		
Total Carried to Main Collection						
Page						

SECTION D.W. 2: KITCHEN FIRE SUPPRESSION SYSTEM

Item		Description	Unit	Qty	Rate	KShs.
A		<p>- Allow for Commercial Kitchen Fire Suppression Systems as PIRANHA-13 Complete with wet chemical agent/tank, Gas and Water Pipework, regulators .anti-siphonage valve, actuators, discharge nozzles, blow-off caps, detectors, cartridges, agent, fusible links, and pulley elbows. System to be complete with remote manual pull station, mechanical and electrical gas valves, pressure switches, electrical switches, and with automatic gas line shut-off valve.</p>	Item	3		
B		<p>Allow for any other item to complete the above installations:-</p> <p>-</p> <p>-</p> <p>-</p>	Item	1		
Sub-total Carried to Sub-Collection Page						

**SECTION D.W. 2: KITCHEN FIRE SUPPRESSION SYSTEM -
SUB-COLLECTION PAGE**

Item		Description	Rate			KShs.
1		<p>- COLLECTION PAGE</p> <p>Kitchen Fire Suppression System</p> <p>TOTAL FOR KITCHEN FIRE SUPPRESSION SYSTEM</p>				
Total Carried to Main Collection Page						

SECTION D.W. 3: KITCHEN HOODS AND KITCHEN EXTRACT SYSTEMS

Item	Code	Description	Unit	Qty	Rate	Total(Kshs)
A		<p><u>KITCHEN EXTRACT SYSTEM</u> The following in galvanised sheet steel ductwork inclusive of all joints, bracing, and gaskets support stiffeners, turning vanes, splitters and any other equipment to completion. <u>Straight Lengths, Radius Bends and Transformation Pieces</u> Ductwork material thickness 0.8mm.</p>	SM	140		
B		<p><u>Kitchenhood</u> 3000 x 8000 x 650mm high kitchenhood in polished aluminium 20 gauge inclusive of stiffeners, 4 No. Thorn Olv - 4800 lighting fittings (heat resistant) moisture drain, channel, hangers, supports, cleanable type grease DS 10/4 filter as vokes and all other items to complete hood.</p>	No.	1		
C		<p>Ditto but 1500mm by 2000mm by 400mm high.</p>	No.	1		
D		<p><u>Extract Fan</u> Axial fan capable of extracting 9m³/s against a static pressure of 200Pa. The fan shall be as "WOODS" or approved complete with a direct drive mixed flow fan or equal and approved. Power rating 9 kW, 3 phase, 2840 rpm</p>	No.	1		
E		<p>Ditto but 1.2m³/s against a static pressure of 200Pa. Power rating 2,8 kW.</p>	No.	2		
F		<p><u>Flexible Connections</u> The fan shall be connected to ductwork through a flexible connections of approved material.</p>	Item	3		
G		<p>Fan starter and electrical wiring.</p>	Item	3		
Sub-Total Carried to Sub Collection Page						

SECTION D.W. 3: KITCHEN HOODS AND KITCHEN EXTRACT SYSTEMS

Item	Code	Description	Unit	Qty	Rate	Total(Kshs)
A		<p><u>Fire Damper</u> Supply and install double rebaye type fire damper, with a 2 hour standard and shall be complete with fusible link or other suitable devise and set to close the damper automatically at 68 degrees centigrade. A micro- switch to be operated by the damper blade shall switch off the fan when the blade shuts off the airflow. Access opening of the damper blade and the micro-switch shall be provided. The damper to fit a duct section of size 600 x 400mm</p>	No.	3		
B		<p><u>Anti-vibration Mountings</u> The fans shall be installed on anti-vibration mountings so as to isolate vibrations from the buildings structure.</p>				
C		<p>The mountings shall be selected from those manufactured by "WOODS" of Colchester for the specified or equal and approved.</p>	Item	3		
D		<p>Allow for fans final power connection from isolator to fan motors including power surge protectors, overload/under voltages phase failure relays wiring and conduits.</p>	Item			
E		<p>Allow for setting to work, testing and commissioning to the approval of the Engineer.</p>	Item			
Sub-Total Carried to Sub Collection Page						

SECTION D.W. 3: KITCHEN HOODS & EXTRACT SYSTEMS - SUB-COLLECTION PAGE

Item	Description				KShs.
	<p>- SUB-COLLECTION PAGE</p> <p>Kitchen Hood, Extract Fan, Flexibles</p> <p>Fire Damper, Anti-Vibration Mounting</p> <p>TOTAL FOR KITCHEN HOODS & KITCHEN EXTRACTION</p>				
<p>Total Carried to Main Collection Page</p>					

Item	Description	KShs.
<u>PROPOSED RESEARCH AND TEACHING COMPLEX FOR THE EAST AFRICAN KIDNEY INSTITUTE TO BE LOCATED AT THE KENYATTA NATIONAL HOSPITAL GROUNDS, NAIROBI</u>		
<u>-</u> <u>MAIN SUMMARY</u>		
SECTION ITEM FROM PAGE		
(i)	Contractual Requirements and General Conditions	
DW 1	Kitchen Equipment - Essential Infrastructure	
DW 2	Kitchen Fire Suppression System	
DW 3	Kitchen Hoods and Kitchen Extract Systems	
Total Carried to Main Summary Page of Vol.1		

9.0 PART H: TECHNICAL SCHEDULE

9.1 Documentation Requirements

Document	With Bid	Before Manufacture	During FAT	Upon Delivery
Preliminary general arrangement drawing (with dimensions)	YES			
QA / QC Plan in accordance with ISO 9001:2008		YES		
General arrangement drawing (with dimensions)		YES		
Schematics/Line diagrams for construction	N/A	YES	N/A	N/A
Recommended Spares List	N/A	N/A	N/A	YES
Routine Test Reports / Certificates			YES	
Type Test Reports / Certificates	N/A	N/A	YES	N/A
Commissioning Procedure	N/A	N/A	N/A	YES
As-built General arrangement drawing			YES	
As-built Schematics			YES	
Site Test Reports / Certificates				YES
Special Test Reports / Certificates	N/A	N/A	YES	NO

9.2 TECHNICAL SCHEDULE

The tenderer **MUST SUBMIT** comprehensive manufacturer's technical brochures and performance details for all items listed in this schedule (fill forms attached).

ITEM No.	Description	Manufacturer	Country of origin	Remarks (Catalogue No. etc.)
A	Freezers			
B	Extract Fans			
C	Kitchen Fire Suppression System			

10.0 PART I: DRAWING SCHEDULE

10.1 DRAWING SCHEDULE:

As shall be provided during project implementation.